JOINT LEADERSHIP TEAM FOR PUBLIC HEALTH SYSTEM TRANSFORMATION

Memo

To: Local and state public health leadership and staff who participated in the 2022 cost and capacity assessment conducted by the University of Minnesota

From: The Joint Leadership Team for Public Health System Transformation

Date: October 16, 2023

Subject: Cost and capacity assessment: Key findings and next steps

Background

This memo contains the Joint Leadership Team for Public Health System Transformation synthesis of key findings from the 2022 cost and capacity assessment of the Minnesota governmental public health system conducted by the University of Minnesota, along with next steps using these findings.

This assessment is one of many steps toward a seamless, responsive, and publicly-supported governmental public health system in Minnesota.

Assessment purpose and scope

At the direction of the Joint Leadership Team, in fall 2022 the University of Minnesota Center for Public Health Systems surveyed all Minnesota local health departments and the Minnesota Department of Health, to answer the following questions:

- To what extent is our local-state governmental public health system currently fulfilling an agreed-upon set of foundational public health responsibilities (which includes the areas and capabilities noted below)?
- How much are we spending right now on this work, across the entire system?
- As a whole, what investment does the system need to fully carry out these areas and capabilities (i.e., to complete this work)?

Goal: Measuring the system's capacity, not individual departments

This assessment helps us set a baseline against which we can measure future progress toward achieving our shared vision of a seamless, responsive, and publicly-supported public health system.

Assessment results illuminated the state-local governmental public health system's strengths, weaknesses, and places for further exploration; and estimated the resources the system needs to collectively fully carry out foundational responsibilities.

The assessment did not serve to compare health departments, or to evaluate the efficiency, effectiveness, or full scope of services delivered by Minnesota's public health departments.

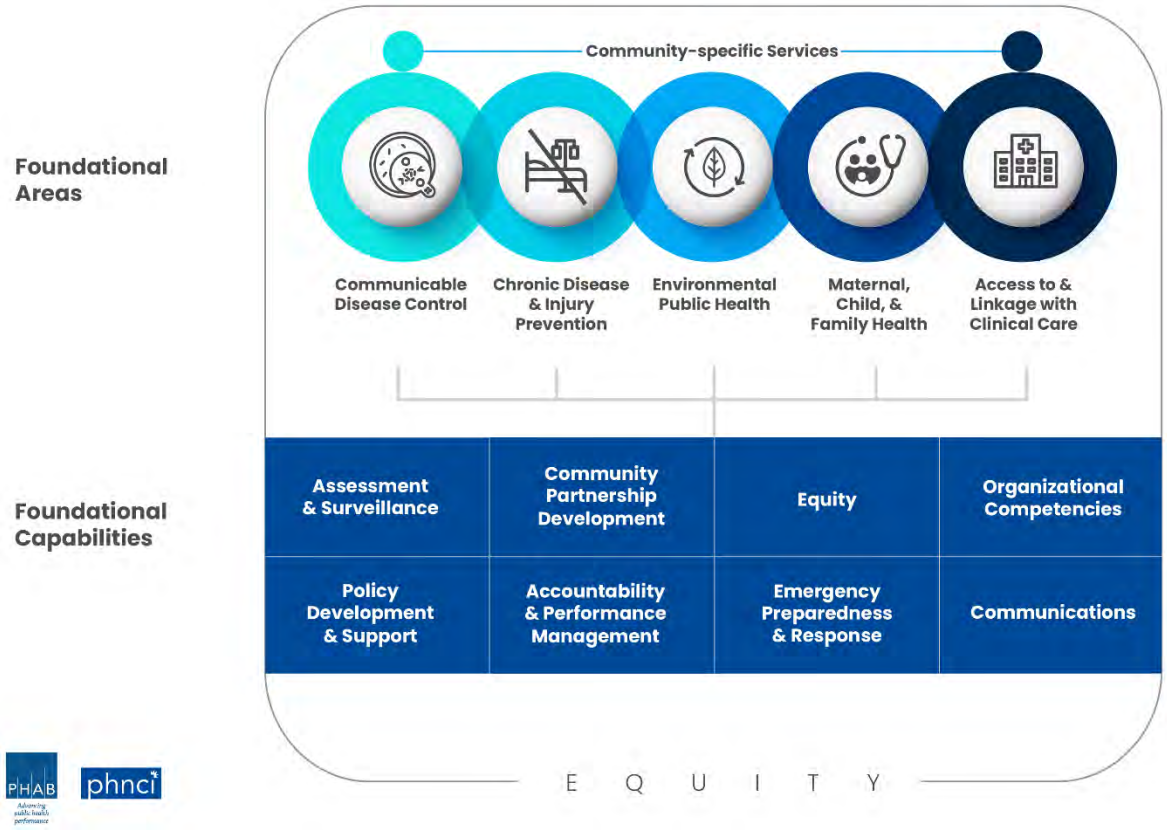
Methods and limitations

100% of Minnesota's health departments participated in this assessment.

This assessment represents a point in time of the state-local government public health system in 2021. Data is self-reported and is heavily influenced by respondents' work in the COVID-19 pandemic response; despite these issues, the data is relevant. The assessment does not reflect investments made after 2021.

The measures used in this assessment followed a framework of foundational responsibilities specific to Minnesota (see: A new framework for governmental public health in Minnesota (PDF)). Although the areas and capabilities in that state-specific framework are titled and organized differently than the national framework currently in use in Minnesota, the measures **within** each area/capability, and the data collected in 2022, align with the currently-used national framework (see: Foundational public health responsibilities).

Foundational public health responsibilities

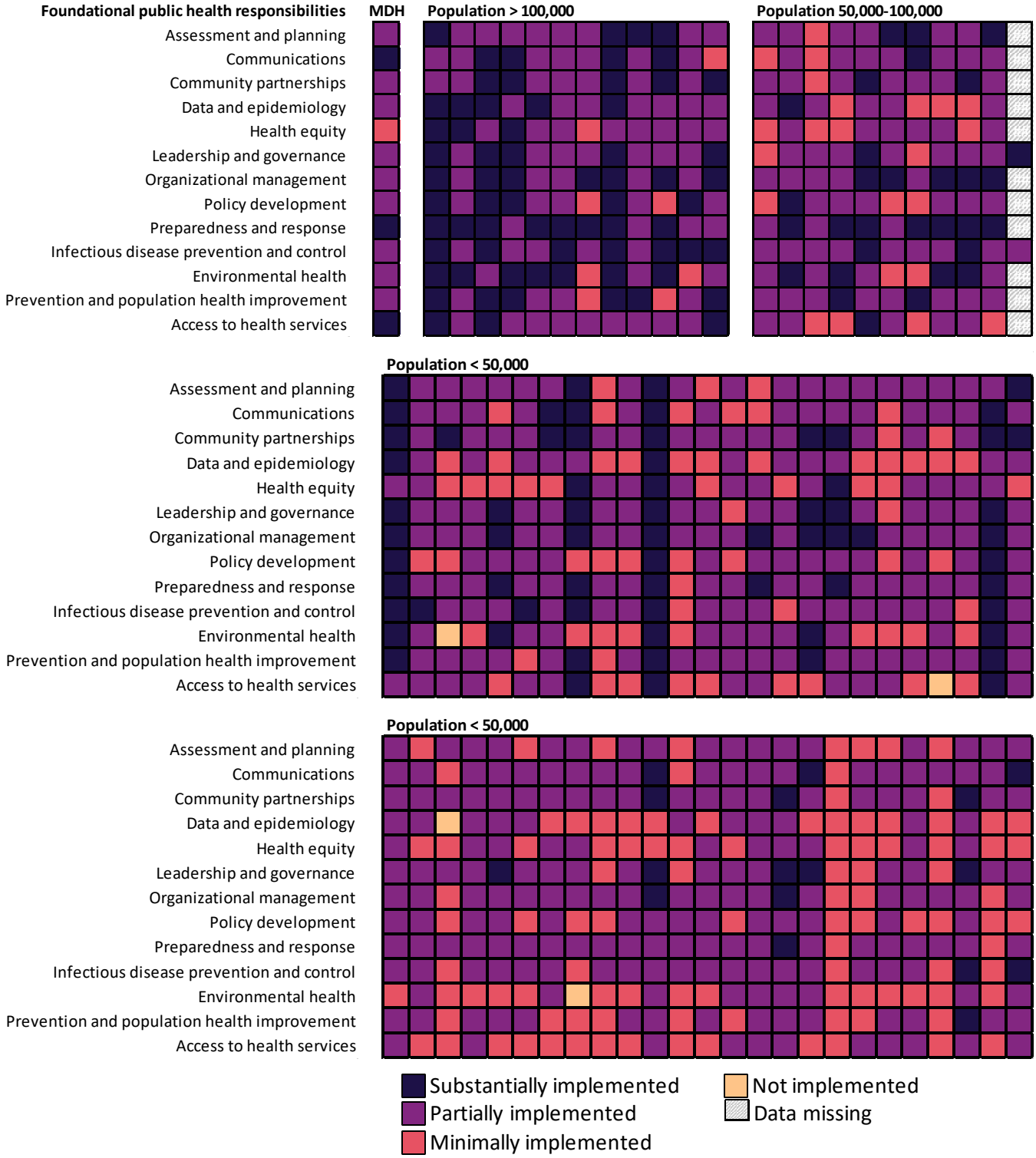


Findings

The system can partially carry out foundational responsibilities, with wide variation in capacity

- **As a whole**, the state-local governmental public health system has partially implemented the foundational public health responsibilities noted above.
- **When examining specific areas and capabilities more closely**, we can see wide variation and gaps in capacity across the system (see figure, next page), along with opportunities for exploration, innovation, and investment.

Level of implementation of foundational responsibilities by department (weighted)



How to read this figure: Each column in this figure represents a local health department or the Minnesota Department of Health. Each row shows that jurisdiction's ability to assure foundational public health responsibilities. Dark indigo squares signal that a local health department, or in some cases its community partners, has the capacity and expertise to substantially implement the corresponding foundational responsibility. The lighter the square, the less the jurisdiction has capacity in that responsibility.

We see specific gaps and opportunities in the data

- **Gaps in specific capabilities**: The entire state-local system was collectively least able to carry out activities in the capabilities of policy development, data and epidemiology, and health equity.

  Opportunity for learning, innovation, investment: We can support learning and innovation in foundational responsibilities where the data shows the system has less capacity, and target investments.

- **Gap in capacity based on population**: The data shows that health departments serving more than 100,000 people were more able to carry out foundational responsibilities.

  Opportunity to learn what drives capacity: We can explore factors that may drive those departments' capacity.

- **Gap in reporting roles and responsibilities**: The assessment also illuminated discrepancies between state and local departments on implementation when reporting their data.

  Opportunity to clarify roles and leverage local/state strengths: We can clarify roles and responsibilities in carrying out responsibilities, and leverage local and state strengths to best serve all Minnesotans.

The local-state governmental public health system needs additional, sustained, annual investments to fully implement foundational public health responsibilities in Minnesota

At this time, the University of Minnesota estimates this additional cost to be $557 million per year across the entire system (this equates to an investment of approximately $100 per capita across the system; this per capita estimate is **not** the cost to be borne or required by individual departments).

This is a point-in-time, planning-level estimate, in 2022 dollars. It does not account for investments made since the assessment was completed, nor efficiencies we anticipate continuing to discover through innovation projects and clarifying roles.

Next steps

The Joint Leadership Team has identified several steps to take next, including:

- **Access your data**: The University of Minnesota will host interactive web-based dashboards to display your data across different responsibilities. MDH is working with UMN to create a guide or training to help orient you to the dashboards and help you navigate them.
- **Share assessment findings broadly**: In the coming months, the Joint Leadership Team will share user-friendly reports and visuals that communicate the findings noted above, which we can all use to frame conversations with partners and requests for support for the public health system from decision-makers.
- **Department-specific profiles**: Participants can expect data profiles for each individual health department.
- **Host regional conversations**: The Joint Leadership Team and/or its participating sectors will host regional and topic-specific conversations to digest assessment data together, and collectively identify opportunities to clarify roles, pilot innovation projects, and seek places for overall improvement.
- **Compare results from other surveys and assessments**: To identify strategies that can support moving toward the vision for a seamless, responsive, and publicly-supported public health system, the Joint Leadership Team will compare the findings from this cost/capacity assessment with results from other concurrent system-wide assessments surveying the relationships, policies, and power dynamics that support or hinder how Minnesota's governmental public health system functions.

- **Identify opportunities for investment and collaboration**: Community health boards should use their agencies' results to determine where they might want to invest new funding dedicated to foundational public health responsibilities, and identify spaces to partner with other jurisdiction(s) to carry out foundational responsibilities. This could include participating in innovation/pilot projects via the Infrastructure Fund, with lessons learned for the entire system.
- **Develop performance measures**: The new SCHSAC Performance Measurement Workgroup will use this assessment's findings to help inform their work in developing new annual system-wide performance measures.

Questions and assistance

Based on the collaborative nature of this work, please direct any questions or feedback to the Joint Leadership Team members from your sector of the local-state partnership. You can find a roster of members at Joint Leadership Team (click on "Members").

For general questions, please contact the MDH Center for Public Health Practice at health.ophp@state.mn.us.

Joint Leadership Team for Public Health System Transformation
Local Public Health Association of Minnesota (LPHA)
Minnesota Department of Health (MDH)
State Community Health Services Advisory Committee (SCHSAC)
651-201-3880 | health.ophp@state.mn.us | www.health.state.mn.us

October 2023

To obtain this information in a different format, contact 651-201-3880 or health.ophp@state.mn.us

Links embedded in this memo:

Joint Leadership Team for Public Health System Transformation:
https://www.health.state.mn.us/communities/practice/systemtransformation/jointleadteam.html

University of Minnesota Center for Public Health Systems: https://www.sph.umn.edu/research/centers/cphs/

A new framework for governmental public health in Minnesota (PDF):
https://www.health.state.mn.us/communities/practice/schsac/workgroups/docs/201906StrengtheningANewFramework.pdf

Foundational public health responsibilities:
https://www.health.state.mn.us/communities/practice/systemtransformation/foundationalresponsibilities.html

SCHSAC Performance Measurement Workgroup:
https://www.health.state.mn.us/communities/practice/schsac/workgroups.html

SCHOOL OF
PUBLIC HEALTH
UNIVERSITY OF MINNESOTA

CENTER FOR PUBLIC HEALTH SYSTEMS

Minnesota Public Health Cost and Capacity Assessment

Summative Report

Minnesota Public Health Cost and Capacity Assessment

Summative Report

The Center for Public Health Systems (CPHS) at the University of Minnesota School of Public Health was established in 2021. The Center has a core staff of talented practitioners, academic researchers, and collaborating faculty with diverse expertise from the University of Minnesota and other institutions. All are deeply committed to solving challenging problems and improving public health systems and outcomes. CPHS benefits from Minnesota's ground-breaking and innovative environment that supports collaboration around issues of individual and population health.

CPHS Project Team

Principal Investigator
Jonathon P. Leider, PhD

Project Director
Jason M. Orr, PhD(c), MPH

Contractor
Annie Sieger – *Sieger Consulting SPC*

Project Researchers
Chelsey Kirkland, PhD, MPH, CHW
Harshada Karnik, PhD, MPP, MS
Skky Martin, PhD, MA
Victoria Schoebel, MPH, BS
Sezen Ozcan Onal, PhD, MA

Research Assistants
Abby Vogel, MS
Kyeongki Park, MA

Activity Experts and Support Staff
Rachel Schulman, MSPH, CPH
Rebecca Wurtz, MD, MPH
Sarah Trachet, CPA
Feather LaRoche, MTAG

Acknowledgments

The Minnesota Public Health Cost and Capacity Assessment (referenced as the Assessment) was sponsored by the Minnesota Department of Health. This report was prepared for the Minnesota Department of Health, with guidance and support provided by the Minnesota Department of Health Leadership team and the Cost and Capacity Advisory Group, which included partners from state and local public health stakeholders. The Assessment and this report were made possible through data submitted by the governmental public health agencies across Minnesota.

Minnesota Department of Health Leadership Team

- Chelsie Huntley, Community Health Division
- Kim Milbrath, Community Health Division
- DeeAnn Finley, Community Health Division
- Linda Kopecky, Community Health Division
- Jake Rueter, Community Health Division

Cost and Capacity Advisory Group

- Ann Stehn, Horizon Public Health
- Jim McDonough, St. Paul - Ramsey County Public Health
- Joanne Erspamer, Carlton County Public Health
- Joshua Bunker, Minnesota Department of Health
- Kari Oldfield-Tabbert, Local Public Health Association of Minnesota
- Kristin Sweet, Minnesota Department of Health
- Marlee Morrison, CHI St. Joseph's Health Community Health (Hubbard County)
- Nicole Ruhoff, Sherburne County Public Health
- Pam Kellogg-Marmsoler, Mower County Public Health
- Sara Benson, Renville County Public Health
- Susan Palchick, Hennepin County Public Health
- Tom Hogan, Minnesota Department of Health
- Amy Westbrook, St. Louis County Public Health

Governmental Public Health Participants

- Minnesota Department of Health
- Aitkin County Public Health
- Anoka County Public Health
- Becker County Public Health
- Beltrami County Public Health
- Benton County Public Health
- Bloomington Public Health
- Blue Earth County Public Health
- Brown County Public Health
- Carlton County Public Health
- Carver County Public Health
- Cass County Public Health
- Chisago County Public Health
- Clay County Public Health
- Clearwater County Public Health
- Cook County Public Health
- Countryside Public Health
- Crow Wing County Public Health
- Dakota County Public Health
- Des Moines Valley Health and Human Services
- Dodge County Public Health
- Edina Public Health
- Human Services of Faribault-Martin Counties
- Fillmore County Public Health
- Freeborn County Public Health
- Goodhue County Public Health
- Hennepin County Public Health
- Horizon Public Health
- Houston County Public Health
- CHI St. Joseph's Health Community Health (Hubbard County)
- Isanti County Public Health
- Itasca County Public Health
- Kanabec County Public Health
- Kandiyohi County Public Health
- Kittson Memorial Health Care (Kittson County)
- Koochiching County Public Health
- CHI LakeWood Health Public Health (Lake of the Woods County)
- Lake County Public Health
- LeSueur County Public Health
- North Valley Health Center Public Health (Marshall County)
- McLeod County Public Health
- Meeker County Public Health
- Mille Lacs County Public Health
- Minneapolis Health Department
- Morrison County Public Health
- Mower County Public Health
- Nicollet County Public Health
- Nobles County Public Health
- Norman-Mahnomen Public Health
- Olmsted County Public Health
- Otter Tail County Public Health
- Pennington and Red Lake County Public Health and Home Care
- Pine County Public Health
- Polk County Public Health
- Renville County Public Health
- Rice County Public Health
- Richfield Public Health
- LifeCare Medical Center Public Health (Roseau County)
- Scott County Public Health
- Sherburne County Public Health
- Sibley County Public Health
- Southwest Health and Human Services
- St. Louis County Public Health
- St. Paul - Ramsey County Public Health
- Stearns County Public Health
- Steele County Public Health
- Todd County Public Health
- Wabasha County Public Health
- Wadena County Public Health
- Waseca County Public Health
- Washington County Public Health
- Watonwan County Public Health
- Wilkin County Public Health
- Winona County Public Health
- Wright County Public Health

Description of Report and Contents

Description of Report

Executive Summary

The Executive Summary contains high-level key findings and interpretations and is designed to be used as a standalone report. Findings are curated for a general audience and important terms and concepts are summarized. Hyperlinks are included in the Executive Summary but there are no attached references.

Report Body

The report body includes relevant background information; brief summaries of methods important to understand results; overview of results in both high and moderate levels of detail (e.g., agency totals); focused discussions to interpret results, describe limitations, and identify next steps. The report body elements are curated for public health stakeholders and policy advisors to aid in prioritizing and addressing issues identified by the Assessment. The appendices should be retained with the report body.

Appendices

Appendices were developed to collect and organize more detailed information and connections beyond that of the report body. The appendices are curated to research and policy analysts to provide a deeper understanding of Assessment results and potential alternative scenarios.

- **Appendix A – Additional Resources**. This appendix contains additional resources that may provide context to the Assessment or the Minnesota public health system that may complement the report body.
- **Appendix B – Detailed Methods**. Whereas the methods disclosed in the report body were curated to be very brief, more detailed methods are made available in this appendix to allow audiences to better understand and interpret the Assessment's findings.
- **Appendix C – Additional Findings**. Whereas the results disclosed in the report body were curated to illustrate findings at high and moderate levels of detail, more detailed findings are made available in this appendix to display findings in greater detail (e.g., analysis of specific Assessment questions) and to illustrate some alternative findings (e.g., weighted vs unweighted self-assessment scores, reported resource gap vs resource gap adjusted for regional price indices).
- **Appendix D – Overview of Project Dashboards**. Two companion dashboards are included with this report (see **Project Dashboards**, below). This section overviews the content available within those dashboards. Links to relevant dashboards are included within the text.
- **Appendix E – Abbreviations and Glossary**. Key terms and abbreviations used within the report body and appendices are defined in this appendix.
- **Appendix F – References**. Works cited within the report body and appendices are included within this appendix.

Project Dashboards

The following are brief descriptions of dashboards developed for this project; see **Appendix D** for detailed descriptions and examples for those dashboards.

- **Public Health Cost and Capacity Foundational Dashboards** (z.umn.edu/TransformMNPH_Dashboard). This set of dashboards includes agency-level and aggregated self-assessment data that describe the implementation of Minnesota's Foundational Public Health Responsibilities, and detailed agency-level financial data.
- **Public Health Cost and Capacity Network Analysis Dashboard** (z.umn.edu/TransformMNPH_Network). This dashboard includes maps for the state of Minnesota that illustrate agency-level implementation of Minnesota's Foundational Public Health Responsibilities with overlays of inter-local (e.g., county-to-county) relationships.

Contents

TABLE OF FIGURES

TABLE OF TABLES

This space intentionally left blank

EXECUTIVE SUMMARY

The Minnesota Public Health Cost and Capacity Assessment ("the Assessment") collected data from all of Minnesota local health departments and the Minnesota Department of Health to investigate the perceived implementation of Foundational Public Health Responsibilities (FPHRs) by health departments, the human and financial resources directed toward the FPHRs, and what resources may be needed to fully implement FPHRs. Though the data was collected for a time period where there were substantial impacts to finances and services delivered due to COVID-19, valid findings were extracted to lay a foundation to aid the transformation governmental public health in Minnesota.

Governmental public health is responsible for assuring services to protect and promote the public's health. The resources to deliver upon this responsibility, however, have remained flat or have decreased over time. Such underinvestment has left public health ill-prepared to address contemporary challenges such as a global pandemic and addressing social and health inequities. From a national standpoint, research has shown that more than 38,000 full-time-equivalents—*16 percent of the national public health workforce*—departed between "the Great Recession" in 2008 and 2019. Meanwhile, other research has estimated that an additional 80,000 full-time equivalents are needed to assure population health services—*approximately an 80 percent increase*. Substantial and sustained investments are needed to do the complex prevention and protection work of public health in the future.

Minnesota's community health services system relies upon a strong partnership between state and local governments, as a decentralized state-local public health system, complementing each other to assure efficient and effective delivery of services. Services are delivered by the Minnesota Department of Health, each of the state's 51 community health boards, and their 74 local health departments. Minnesota's Local Public Health Act outlines the shared public health responsibilities between Minnesota's state and local governments. Minnesota's Tribal nations are served by their own health departments, including 4 Ojibwe/Anishinaabe nations health departments and 4 Dakota nations health departments.

State and local partners have pursued strategies to transform Minnesota's public health system. Through this, the Minnesota Department of Health and the Local Public Health Association of Minnesota, and its members, identified the need to clearly articulate what Minnesotans should expect from their state and local public health partnerships. Those state and local partners developed the Minnesota FPHR framework as a means to define a foundational level of public health services that are needed everywhere for services to work anywhere. Using the framework, the Assessment was designed to allow the Minnesota public health system an opportunity to document Minnesota's governmental public health spending and the resources needed to transform it.

Discussion: *The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.*

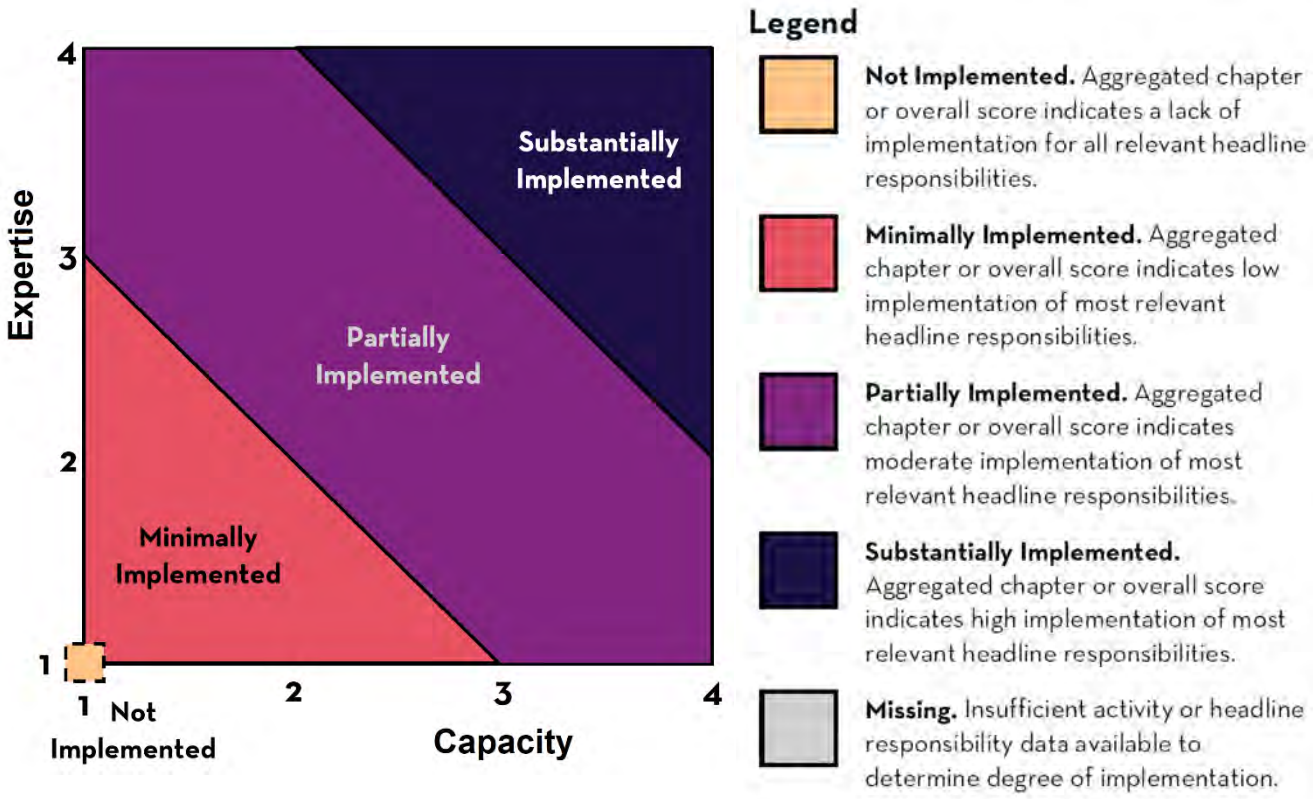
METHODS SUMMARY

Participating agencies (all 74 local health departments and Minnesota Department of Health) submitted detailed data for the Assessment between fall 2022 and spring 2023. These data were then cleaned and adjusted to produce statewide analyses. Administrative data submitted by health departments were analyzed to obtain descriptive statistics and totals (e.g., total revenues, total expenditures, total full-time equivalents). Data submitted by health departments that represented their communities' expertise and capacity to implement the FPHRs were analyzed to produce detailed agency-level findings and to aggregate for high-level findings (e.g., overall by population peer group, overall for state). The resulting implementation can be described along a spectrum from "not implemented" (expertise or capacity largely absent) to "substantially implemented" (largely involving high expertise or full capacity); see

Figure ES – 1 for descriptions of Degrees of Implementation. Detailed full-time equivalent and expenditures data for fiscal year (FY) 2021 and state fiscal year (SFY) 2022, allocated across the FPHR framework, submitted by health departments were analyzed to produce high-level statewide estimates of current resources (e.g., full-time equivalents & expenditures directed toward FPHRs). Detailed full-time equivalent and expenditure estimates for resources needed to fully implement the FPHRs submitted by health departments were analyzed to produce high-level statewide estimates of resource needs (e.g., full-time equivalents & expenditures needed to fully implement the FPHRs). Paired together, the resources needed to fully implement the FPHRs minus the resources currently directed toward the FPHRs led to the estimated resource gaps (e.g., increment of full-time equivalents & expenditures to achieve full implementation of FPHRs). Finally, data on interlocal services and resources sharing submitted by health departments were analyzed to produce maps of statewide relationships across the FPHR framework.

> **Methods Note:** *Assessment data were largely self-reported, and the collection period was heavily influenced by COVID-19 response. Even with these issues and missing data points, Assessment data quality was sufficient to allow for statewide analysis.*

Figure ES – 1. Degrees of Implementation Diagram



Key Findings

Totals for each agency (revenues, expenditures, full-time equivalents) were used to place the FPHR-related expenditures and effort—a subset of those totals—in context. Total agency revenues and expenditures obtained from local health departments representing the past three fiscal years, adjusted for inflation (i.e., represented as real 2022 dollars), show that revenues and expenditures have been relatively flat, hovering around $400 million and $425 million, respectively. Total local health department revenues and expenditures for FY 2021 were $388 million and $404 million, respectively. The proportional shares of local health department's mean revenues were generally consistent between

2019 and 2021 (with exception of the shifts caused by COVID-19 funding) with most local health department funding coming from local and federal sources.

Data obtained from local health departments indicated that the number of full-time equivalents grew minimally from 2,555 full-time equivalents (FY 2019) to 2,585 full-time equivalents (FY 2021). Nurses were the primary filled occupations in FY 2021 (894 full-time equivalents), followed by administrative support staff (296 full-time equivalents), then other public health specialists (e.g., social workers, business professionals, nutritionists) made up the majority of other occupations with 120–150 full-time equivalents. Differences were observed in staffing patterns across population bands. For example, nurses made up a substantial proportion of staffing for local health departments serving less than 50,000 persons whereas certain specialists were almost exclusive to local health departments serving greater than 50,000 persons (e.g., program specialists, counselors, regulatory specialists).

IMPLEMENTATION OF FPHRS

All agencies self-assessed the expertise and capacity, *in their communities*, to deliver FPHRs. Self-assessment scores were calculated across the framework, including for the 340 activities, 52 headline responsibilities, 13 foundational responsibilities, and for local health departments overall. These data were also organized according to population bands, for all local health departments, and statewide. Note that self-assessment findings aggregated for population bands, foundational responsibilities, or statewide overall may arise from a mixture of high and low capacity or expertise. *A majority of high pooled scores may obscure absent expertise and vice versa*.

Differences were observed in implementation across the state. Strengths were shown for local health departments serving greater than 100,000 persons. Overall, local health departments reported higher implementation in the Foundational Capabilities than in the Foundational Areas. The Foundational Capabilities overall for all but a few agencies were found to be partially to substantially implemented (**Figure ES - 2**). While only one agency fell within the minimal implementation zone for capabilities, nearly ten fell within this zone for areas (**Figure ES - 3**). Low implementation scores may lead to adverse impacts such as reducing the number of persons served by the agency or poorer population health outcomes versus other jurisdictions.

Figure ES - 2. All Foundational Capabilities Plotted as Degree of Implementation

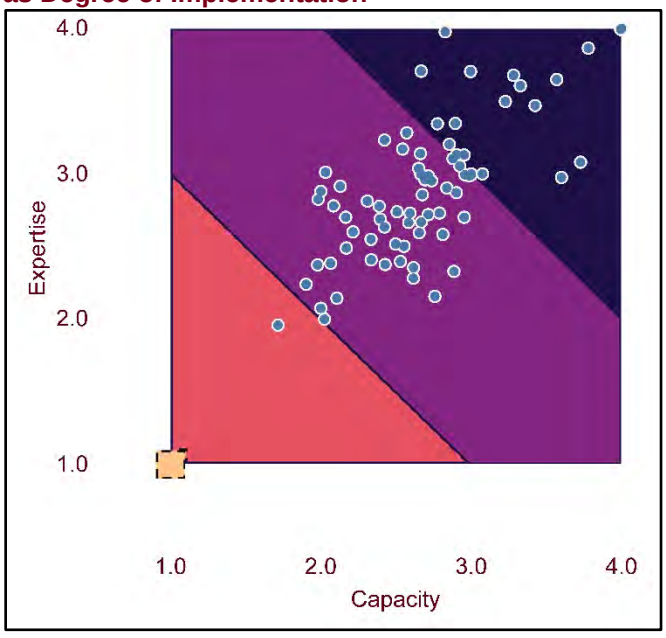
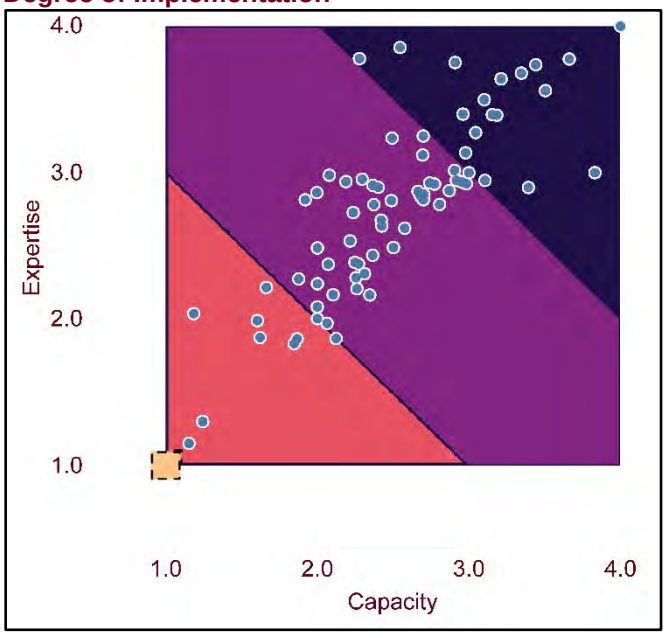


Figure ES - 3. All Foundational Areas Plotted as Degree of Implementation



The following 'icicle chart' (**Figure ES - 4**) displays the FPHRs for all local health departments in a cascading fashion from each Foundational Area or Capability (middle boxes with labels A–M) to their respective headline responsibilities (outer boxes with alpha and numeric labels).

Figure ES - 4. Statewide Implementation of the FPHR Framework

Note: Refer the section on Minnesota's Foundational Public Health Responsibilities as the key to this figure.

The icicle chart shows partial implementation across the foundational areas and capabilities, as well as most headline responsibilities. Scores for most headline responsibilities, thus most capabilities, areas, fell close to 3.0; the overall statewide degree of implementation was 3.0 (upper bound of partially implemented). While overall scores were moderately high, those scores arise from a mix of self-assessed capacity and expertise across a spectrum from absent to full implementation. The Foundational Capabilities displaying the highest overall degrees of implementation across the state were *Organizational Management* (especially financial management), *Community Partnerships* (especially maintaining partnerships), and *Preparedness and Response*. Capabilities displaying the lowest overall degrees of implementation were *Policy Development*, *Data and Epidemiology* (especially public health laboratory infrastructure), and *Health Equity*. The Foundational Areas of *Infectious Disease Prevention and Control* displayed the highest overall degree of implementation. Other areas, however, displayed lower implementation, particularly *Environmental Health* (especially development of environmental health plans), and *Access to Health Services* (especially ensuring health care facility and provider compliance).

The distribution of FPHR implementation for local public health across the state for all capabilities and all areas are presented in **Figure ES - 5** and **Figure ES - 6**, respectively. **Figure ES - 5** highlights regional variation in overall implementation of the Foundational Capabilities; *this statewide map is a representation of data shown in **Figure ES - 2***. Many local health departments in the Metro report, in aggregate, high levels of implementation for Foundational Capabilities, compared to South Central, Southwest, and Northwest Minnesota, where relatively more local health departments report Partially Implemented scores overall for Foundational Capabilities. Implementation varied greatly across the state. Notably, however, the vast majority of agencies reported high levels of implementation for Foundational Capabilities overall.

Figure ES - 6 highlights even more regional variation in implementation of the Foundational Areas across state; *this statewide map is a representation of data shown in **Figure ES - 3***. Implementation varied greatly across the state with only few areas of alignment with implementation of Foundational Capabilities. While the Metro region generally reports substantial implementation of the Foundational Areas, minimal to partial implementation is observed in the regions outside the metro, and in the remainder of the state. **Table 6** in the body of the report offers a critical perspective for the variation in implementation across the FPHR framework and across the state.

> **Key Finding:** *FPHRs were found to be partially implemented overall with large variation seen across the state. There were no headline responsibilities that were either absent nor fully implemented statewide; however, some agencies reported absence or full implementation of certain headline responsibilities.*

Description of PH Network

Health departments were also asked to describe services and resource sharing arrangements for their agency (**Figure ES - 7**). Most health departments reported some sort of interlocal sharing arrangement. The average number of interlocal connections amongst local health departments across headline responsibilities was 17 (i.e., local health departments partnered to deliver or assure 17 of the 52 headline responsibilities) with the largest number of interlocal connections occurring for the headline responsibility "*Develop, monitor, track, and update health improvement plans*" (n = 38) and the smallest number of connections for the headline responsibility "*Ensure licensed health care facilities and providers comply with laws and rules*" (n = 2).

Figure ES - 5. Local Health Department Degree of Implementation for Foundational Capabilities

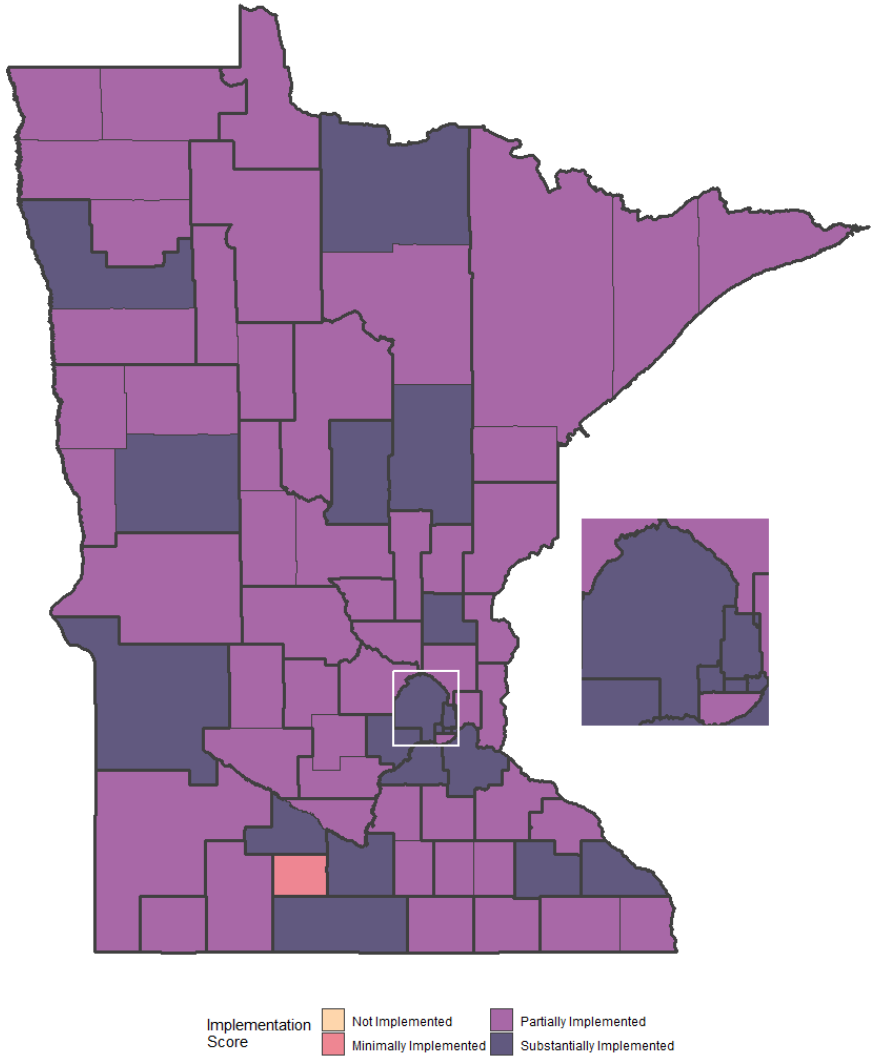


Figure ES - 6. Local Health Department Degree of Implementation for Foundational Areas

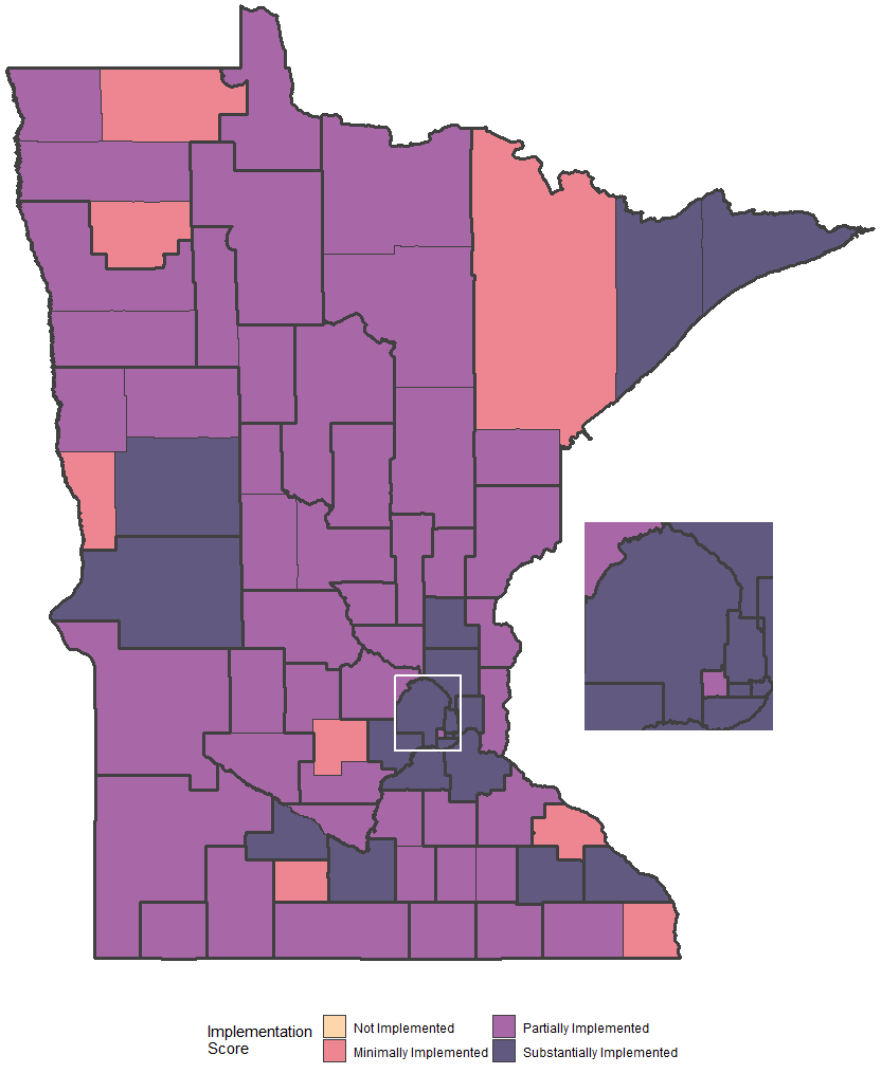
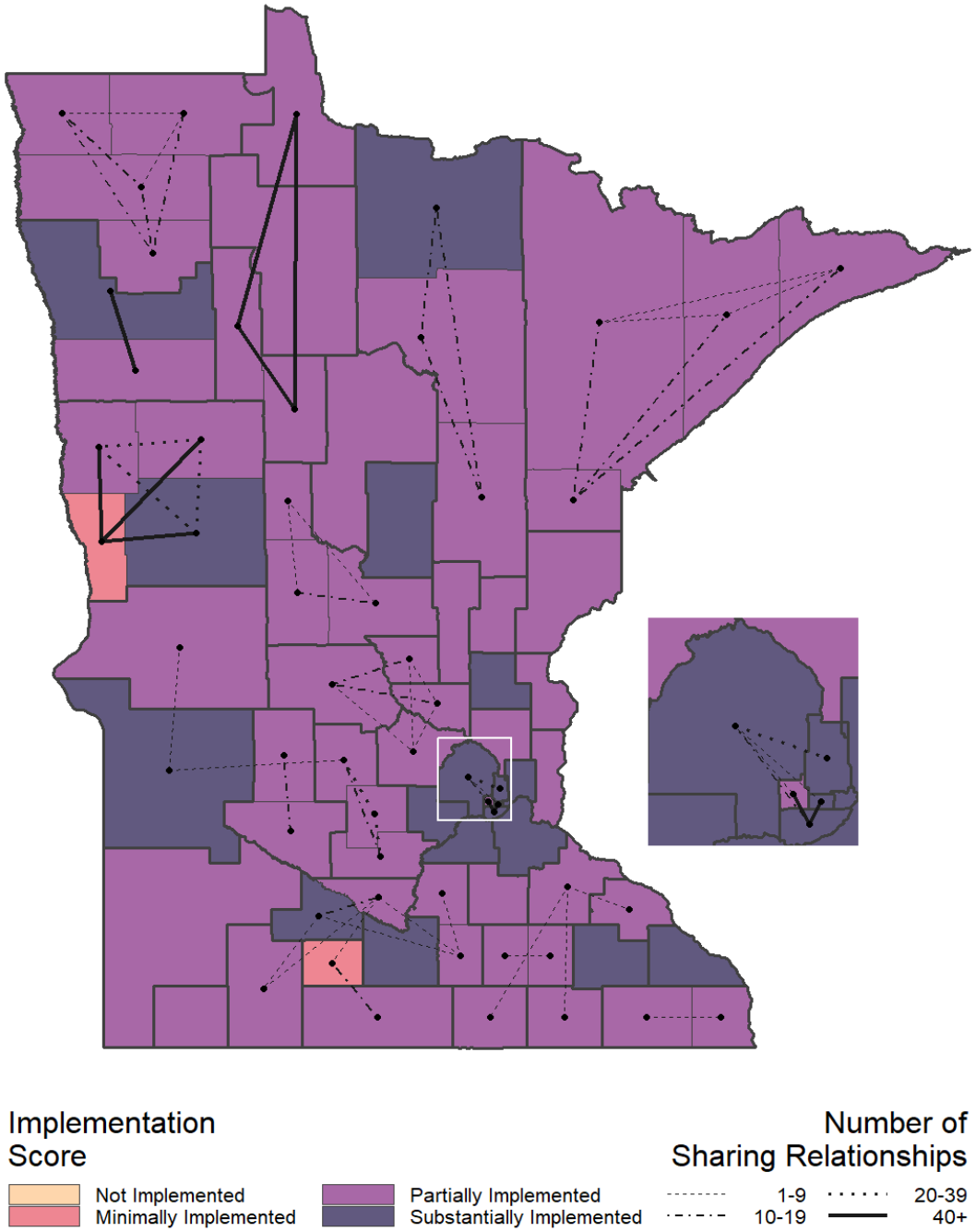


Figure ES - 7. Summative Sharing Relationships Overlayed on Overall FPHR implementation



The FPHRs with the highest density and distribution of sharing arrangements across Minnesota were *Assessment and Planning* and *Leadership and Governance*, followed by *Prevention and Population Health Improvement*. The FPHRs with the lowest density and distribution of sharing arrangements were *Access to Health Services*, *Data and Epidemiology*, and *Infectious Disease Prevention and Control*.

Though many relationships were observed amongst local health departments, higher densities of connections were between members within partially integrated community health boards, such as Partnership 4 Health and North Country. The community health boards for the cities of Bloomington, Richfield, and Edina were also substantially interconnected (see inset of **Figure ES - 7**). Notably, most

sharing reported by local health departments in the northern parts of Minnesota were in local health departments within their community health boards, whereas local health departments in the southern parts of Minnesota included many instances of sharing amongst community health boards and across regions. Overall, sharing relationships were indicative of existing governance structures (i.e., community health boards) and other natural sharing partnerships.

Overall, 59 of Minnesota's 74 local health departments indicated that they share at least some headline responsibilities with the Minnesota Department of Health. However, it appears likely that local health departments underreported sharing relationships, including instances in which they partnered with the Minnesota Department of Health. Among those 59 local health departments, an average of 17 headline responsibilities were shared with Minnesota Department of Health. The headline responsibilities that were most frequently shared were those within *Data and Epidemiology*, and those within *Infectious Disease Prevention and Control*, *Environmental Health*, and *Access to Health Services*; notably, services with strong regulatory or regional components. Regarding specific written documents and organizational policies, local health departments were generally unlikely to partner with Minnesota Department of Health in devising plans and policies.

Key Finding: *Sharing relationships were indicative of existing governance structures, such as within multi-county community health boards and other natural sharing partnerships. Relationships were likely underreported.*

Estimates of Resources for FPHR Implementation

The Assessment found that additional, sustained annual investments, not one-time investment, in human and financial resources are needed to fully implement the FPHRs in Minnesota (**Figure ES - 8**). The total annual statewide resource needs to fully implement the FPHRs in Minnesota are **4,935 full-time equivalents** and **$950 million** (*$166.45 per capita*); in 2022 real dollars. This full implementation investment includes to following approximate gaps in needed resources:

- **2,140 full-time equivalents** and **$557 million** statewide annually,
- **1,110 full-time equivalents** and **$138 million** for local public health annually, and
- **1,020 full-time equivalents** and **$418 million** for Minnesota Department of Health annually (*$136 million for labor expenditures and $282 million for other operating expenditures*).

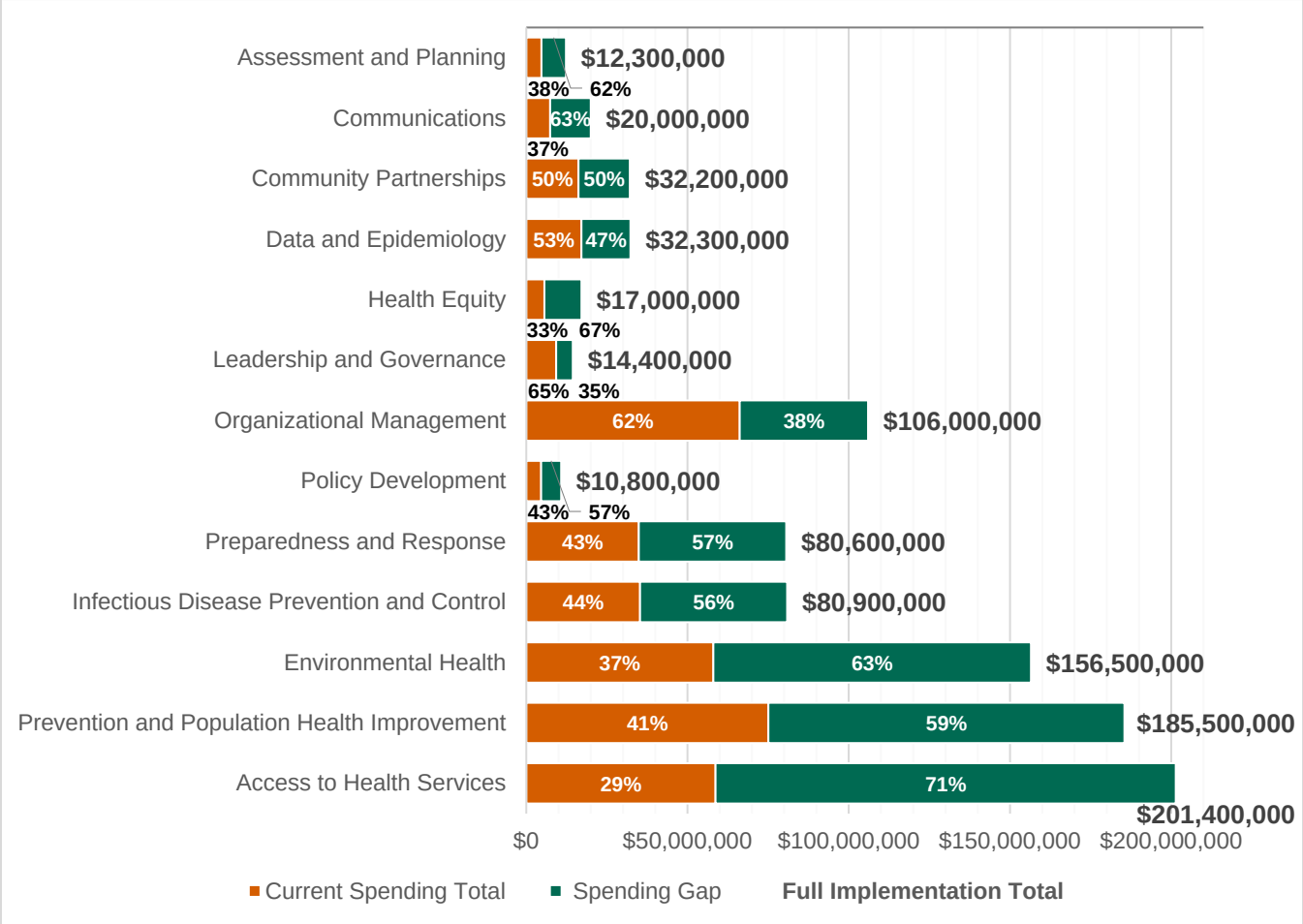
These estimates are intended to represent point-in-time, "planning-level estimates."

Spending on Foundational Areas were found to be approximately twice that of the Foundational Capabilities, which makes sense given that the programmatic functions of the Foundational Areas often require more resources than general infrastructure and expertise within the Foundational Capabilities. Capabilities of *Organizational Management* and *Preparedness and Response* are more financial and human resource-intensive, as well as areas of *Environmental Health*, *Prevention and Population Health Improvement*, and *Access to Health Services*. Looking more closely at current spending and gap estimates, most Foundational Capabilities may only need modest investments (to already modest spending), while the Foundational Areas and Organizational Management and Preparedness and Response garner much in current investments and need much more to fully implement (see **Figure ES - 9**). In particular, areas of *Environmental Health*, *Prevention and Population Health Improvement*, and *Access to Health Services* were found to both receive substantial current resources and to have sizeable gaps in needed resources.

Figure ES - 8. FPHR Spending and Effort Analyses for Minnesota's Public Health System

Foundational Responsibilities	Current Implementation Spending (2022 $)		Current Implementation FTEs (2080hrs)	Full Implementation Spending (2022 $)		Full Implementation FTEs (2080hrs)	Gap Spending (2022 $)		Gap FTEs (2080hrs)
Foundational Capabilities	**$166,000,000**	***per capita***	**1100**	**$325,600,000**	***per capita***	**1935**	**$159,600,000**	***per capita***	**835**
Assessment and Planning	$4,700,000	*$0.80*	35	$12,300,000	*$2.15*	95	$7,600,000	*$1.35*	60
Communications	$7,400,000	*$1.30*	60	$20,000,000	*$3.50*	140	$12,600,000	*$2.20*	80
Community Partnerships	$16,200,000	*$2.85*	105	$32,200,000	*$5.65*	175	$15,900,000	*$2.80*	70
Data and Epidemiology	$17,100,000	*$3.00*	110	$32,300,000	*$5.65*	215	$15,200,000	*$2.65*	105
Health Equity	$5,600,000	*$0.95*	45	$17,000,000	*$3.00*	100	$11,500,000	*$2.00*	55
Leadership and Governance	$9,300,000	*$1.60*	60	$14,400,000	*$2.50*	95	$5,100,000	*$0.90*	35
Organizational Management	$66,200,000	*$11.60*	410	$106,000,000	*$18.60*	550	$39,800,000	*$6.95*	140
Policy Development	$4,600,000	*$0.80*	30	$10,800,000	*$1.90*	80	$6,200,000	*$1.10*	50
Preparedness and Response	$34,900,000	*$6.10*	245	$80,600,000	*$14.15*	485	$45,700,000	*$8.00*	240
Foundational Areas	**$227,100,000**		**1680**	**$624,300,000**		**3000**	**$397,200,000**		**1300**
Infectious Disease Prevention and Control	$35,300,000	*$6.20*	255	$80,900,000	*$14.15*	450	$45,600,000	*$8.00*	190
Environmental Health	$58,000,000	*$10.15*	500	$156,500,000	*$27.40*	910	$98,500,000	*$17.25*	405
Prevention and Population Health Improvement	$75,100,000	*$13.15*	490	$185,500,000	*$32.50*	1025	$110,400,000	*$19.35*	530
Access to Health Services	$58,700,000	*$10.30*	435	$201,400,000	*$35.30*	615	$142,700,000	*$25.00*	175
Total	**$393,100,000**	***$68.80***	**2780**	**$949,900,000**	***$166.45***	**4935**	**$556,800,000**	***$97.55***	**2135**

Figure ES - 9. Distribution of Statewide Full Implementation Cost by Current Spending and Gap



Key Finding: *The estimated gaps in annual investments statewide were **2,140 full-time equivalents** and **$557 million**, needed annually in addition the current resourcing of 2,780 full-time equivalents and $393 million.*

Similar cost assessments have been conducted by other states in recent years that may place these investment needs in context, though all had been conducted prior to COVID-19. The following financial data are reported in real (2022) dollars:

- **Oregon (2016)**. The Oregon governmental public health system estimated annual investment needs of approximately $136 million ($31.97 per capita).[1]
- **Ohio (2018–2019)**. The Ohio governmental public health system estimated annual investment needs (for only local public health) of approximately $112 million ($9.55 per capita) and made subsequent revisions in 2019 for annual investment estimates of $144 million ($12.23 per capita).[1]
- **Washington (2018)**. The Washington governmental public health system estimated annual investment needs of approximately $272 million ($34.55 per capita).[1]
- **Colorado (2020).** The Colorado governmental public health system estimated annual investment needs of approximately $194 million ($33.27 per capita).[2]

Important questions relate to the scale of funds needed to fully implement the FPHRs in Minnesota. While COVID-19 response showed that Minnesota, like many states, had a strong public health system, the Assessment estimated a sizeable gap in resources needed to fully implement the FPHRs. Certainly, some investment has already begun – recent investments from the Minnesota Legislature have enhanced public health capacities. The Legislature has appropriated approximately $10 million per year toward local health departments and half a million dollars toward Tribal health departments, as well as $321,000 toward Public Health AmeriCorps. Additionally, approximately $30 million is allocated in the future for public health emergency preparedness at the state, local, and tribal levels. New initiatives are also underway that would change capacity and expertise of agencies, including the Minnesota Department of Health Offices of African American Health and American Indian Health, and unknowns associated with legalization of adult use cannabis.

As Minnesota moves toward public health modernization, sustained and sustainable funding will be key. A mix of state general fund, dedicated revenues, local support, and both cooperative agreement-based and grant-based federal funds are needed to grow a strong system of local health departments and maintain a robust state health agency in Minnesota Department of Health. But merely more funding will not result in a modernized system. It is important to recognize that public health exists in a post-COVID-19 world. It is not post-COVID-19 insomuch as COVID-19 response and recovery is still an active aspect of public health services, and COVID-19 case counts, morbidity, mortality, and disparities remain.

Discussion: *Assessment findings were agnostic to sources of resources for additional investment—a combination of state appropriations, local appropriations, federal funds, and other flexible and sustainable dollars are needed to transform governmental public health in Minnesota.*

Background

The United States' governmental public health system, which includes federal, state, and local agencies, holds a unique role in society by undertaking sole responsibility for assuring services to protect and promote the public's health. Governmental public health departments represent their governments' executive function of addressing population health needs, and their governing bodies (e.g., state legislatures, county commissions, and city councils) represent the government's legislative function in these areas. While the delivery of certain public health services may be delegated, public health executive and legislative authorities remain the responsibility of governments. The resources dedicated to these authorities, however, often remain flat or decreasing (especially considering inflation), following a patchwork of categorical or siloed funding.[3-5] This underinvestment has been observed for public health services in general and also for population-based services.[3,4,6,7] Such underinvestment has left the nation ill-prepared to address contemporary challenges facing communities, such as responding to a pandemic and addressing social and health inequities compared with its peer nations.[8]

Prior to the coronavirus pandemic ("COVID-19"), the nation experienced its first decline in health expectancy in decades, attributable to myriad factors including underinvestment in the public's health.[9] Then, COVID-19, and response to it, exposed the striking consequences of underinvestment in the communities that public health practice leaders are expected to protect.[4,10] At the same time, the national public health workforce has also been in flux. Research has estimated that more than 38,000 full-time-equivalents (FTEs)—16 percent of the national public health workforce—departed between "the Great Recession" in 2008 and 2019.[11] There were many reasons for this, including layoffs, separations, and other reasons, attributable to reduced satisfaction, market competition, stresses of COVID-19 response, and other factors.[11] Then, in 2021, approximately 44 percent of the governmental public health workforce reported considering retirement or separation within the next five years.[12] Additional research has estimated that the nation's public health workforce needs nearly 80,000 additional FTEs—approximately an 80 percent increase—to adequately deliver population health services.[11,13]

The issue of underinvestment is complex and requires determination of what money is spent on public health, what that money buys, and what money is needed to do the prevention work of public health in the future. Health departments cannot be expected to address the complex contemporary population health challenges without substantial and sustained investment in infrastructure and personnel.

Minnesota's Governmental Public Health System

Governmental public health responsibilities and structures differ widely across the nation, as each state and local government independently constructed their public health policies over the course of decades. The governmental public health system in Minnesota is a complex network of entities that work together to promote and protect the health of the state's population. Minnesota's public health system, as a decentralized state-local public health system, relies upon a strong partnership between state and local governments, complementing each other to assure efficient and effective delivery of services.

The Local Public Health Act

Public health activities are delivered through a state-local public health partnership first established in 1976 by the Community Health Services Act (Minn. Stat § 145A), known today as the Local Public Health Act ("145A").[14] The Act defines the shared public health responsibilities between Minnesota's state and local governments and

- outlines the requirements for community health boards (CHBs) as the legally recognized governing bodies for public health in Minnesota,
- establishes accountability for funding on statewide initiatives,
- provides guidelines for assessment and planning,
- requires documented progress toward the achievement of statewide goals, and
- assigns oversight of the statewide system to the commissioner of health.[15]

The state-local partnership described within 145A, known as the community health services system, enables state and local governments to combine resources to serve public health needs in an efficient, cost-effective way.[15] Through this community health services system, local and state governments may be aligned in goals and in activities toward those goals, creating resource and communication pathways and a strong, dynamic partnership.

Structure of the Minnesota Public Health System

At the state level, Minnesota Department of Health (MDH) serves as the central hub for coordinating and overseeing public health activities throughout the state. The department's mission is to protect, maintain and improve the health of all Minnesotans.[16,17] MDH serves all jurisdictions in the state and provides statutory and regulatory services to advance policy, environmental, and systems changes. MDH has about 1,500 employees and an annual budget of approximately $500 million in state, federal, and fee-based funds.[16,17] The Minnesota commissioner of health is advised by the State Community Health Services Advisory Committee (SCHSAC), a statutory advisory body comprising representatives from each of the state's CHBs.[15] SCHSAC provides a forum for the state and each CHB to discuss and address health issues and priorities for the state.

At the local level, CHBs are the governing authorities for public health services.[15] Under 145A, each board of county commissioners is to establish or join a CHB, with the conditions that each CHB serve a population of at least 30,000 persons or be composed of three or more contiguous counties.[14] Except for four single-city CHBs which were grandfathered into 145A upon its advent in 1976,the CHB may comprise a single county or multiple contiguous counties. CHBs may authorize cities or counties within the geopolitical boundaries of the CHB to assume powers or duties of the CHB, offering flexibility in integration and interdependence.[14] As such, some multi-county CHBs have fully integrated to have a single governing body across the served jurisdiction, while other multi-county CHBs remain partially integrated to allow for some local autonomy over public health services and are governed by a joint board.[14] Minnesota has 51 CHBs that are governed by either single cities (n = 4), single counties (n = 29), or multiple counties (n = 18), the last of which may be integrated (n = 5), mostly integrated (n = 2), or partially integrated (n = 11) CHBs.[18]

Most CHB services are delivered by local health departments (LHDs), according to the powers and duties delegated by CHBs. Most LHDs are served by governmental entities functioning as CHBs, though a small number of counties in Minnesota are served by hospitals or healthcare organizations. Of note, some LHDs operate as "umbrella organizations" in which the scope of services is not solely governmental public health but include other health care or social services (e.g., Carver Public Health is a subunit of the Carver Health and Human Services Division). Minnesota has 74 LHDs that operate at the city (n = 4), county (n = 62), city-county (n = 1), and multi-county (n = 7) levels.[18] Local public health comprises about 2,600 FTEs and expends approximately $360 million in state, federal, and fee-based funds annually.[16,17]

In addition to the local and state public health departments, Tribal nations are served by their own health departments, with health departments serving the Ojibwe/Anishinaabe nations (n = 7) and Dakota nations (n = 4).[18] *The present report only describes findings gathered from local and state public health departments.* The Minnesota Department of Health is supporting tribal health departments in conducting their own assessments.

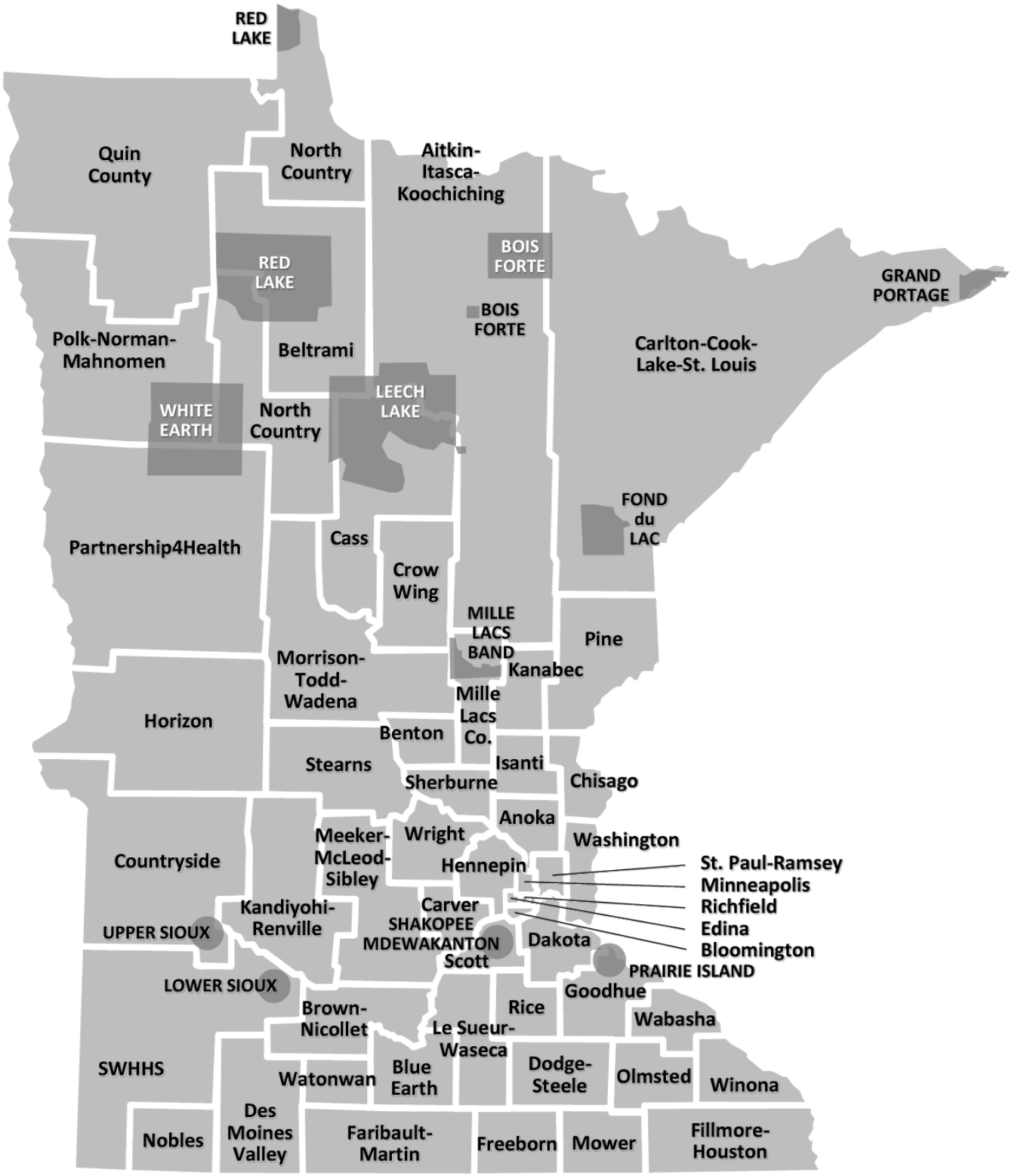
See **Figure 1** for a map of Minnesota's CHBs and Tribes.

Public Health Responsibilities

CHBs, and their LHD agents, are responsible for providing a wide range of public health services to the residents of the counties they serve, including health education, disease prevention and control, environmental health, and emergency preparedness. In Minnesota, CHBs retain the authority to determine public health priorities within their jurisdiction(s) and partner with MDH and other public and private organizations to deliver services. Governmental public health departments are collectively responsible for providing a range of public health services to their respective communities, such as disease surveillance and investigation, health promotion and education, immunizations, and emergency

preparedness. Some county health departments also serve populations such as low-income persons, elderly persons, individuals with disabilities, and persons living in rural areas with limited private healthcare facilities who may not have access to healthcare through other means.

Figure 1. Minnesota Community Health Boards and Tribes



Source: Minnesota Department of Health. 2019. *Minnesota Community Health Boards and Tribes*.

Through 145A, CHBs are charged with identifying local public health priorities and implementing activities to address those priorities as well as addressing the "areas of public health responsibility:"[14]

1. assure an adequate local public health infrastructure,
2. promote healthy communities and healthy behavior,
3. prevent the spread of communicable diseases,
4. protect against environmental health hazards,
5. prepare and respond to emergencies, and
6. assure health services.

Each of these services are crucial in preventing the spread of communicable diseases, ensuring that the environment is safe and healthy for residents, and promoting the public's health. These governmental services are provided as collective services for each of the communities served. By providing these essential public health services, governmental health departments help to promote the well-being of the entire community and improve overall health outcomes.

Additionally, MDH also develops and implements public health policies, provides technical assistance to LHDs, undertakes research and analysis projects to inform public health decision-making, and develops responses to public health emergencies such as outbreaks of infectious diseases or natural disasters.

The Shifting Public Health Landscape

Over the years, the roles and responsibilities of public health have increased while available funding, and operating budgets for staffing and programming, have decreased.[19] Some health departments have also moved toward taking on more clinical responsibilities or offering reimbursable services.[20] Traditionally, the role of LHDs was primarily disease control and prevention, necessitating heavy reliance on public health nurses. However, while the incidence of communicable diseases decreased over the years, the reliance on public health nurses (who are mainly trained for clinical work) for staffing remained the same.[21] Yet, in order to ensure healthy populations, it is important to understand the foundational nature of services provided by CHBs that cannot be provided or funded privately to enable governmental health departments in Minnesota to fulfill their core obligations.

However, public health, and particularly governmental public health in Minnesota and nationwide, is facing a number of challenges that are putting the health of Minnesotans at risk. At the same time, the continued evolution of the clinical health care system is somewhat reversing the role of public health from providing direct services to broader population-based prevention activities which had begun decades previous. Stakeholders including MDH, the Local Public Health Association of Minnesota (LPHA) and its members, and Minnesota's CHBs have joined many other states across the nation in considering opportunities for public health system transformation. These opportunities are focused on developing the modernized public health workforce and infrastructure needed to support population health in the 21st century.

Minnesota's Foundational Public Health Responsibilities

As part of its public health system transformation efforts, state and local public health practitioners identified the need to clearly articulate what Minnesotans should expect from their state and local public health partnerships. Following the examples of other states engaged in public health system transformation, MDH and LPHA and its members developed the Minnesota Foundational Public Health Responsibilities (FPHR) framework for defining the work of governmental public health in Minnesota.[22] The FPHR framework posits that there is a foundational level of public health services that are needed everywhere for services to work anywhere. The FPHR framework is a subset of all public health services that includes infrastructure and programs which (1) must be available to all people served by the governmental public health system, and (2) meet one or more of the following criteria[22]:

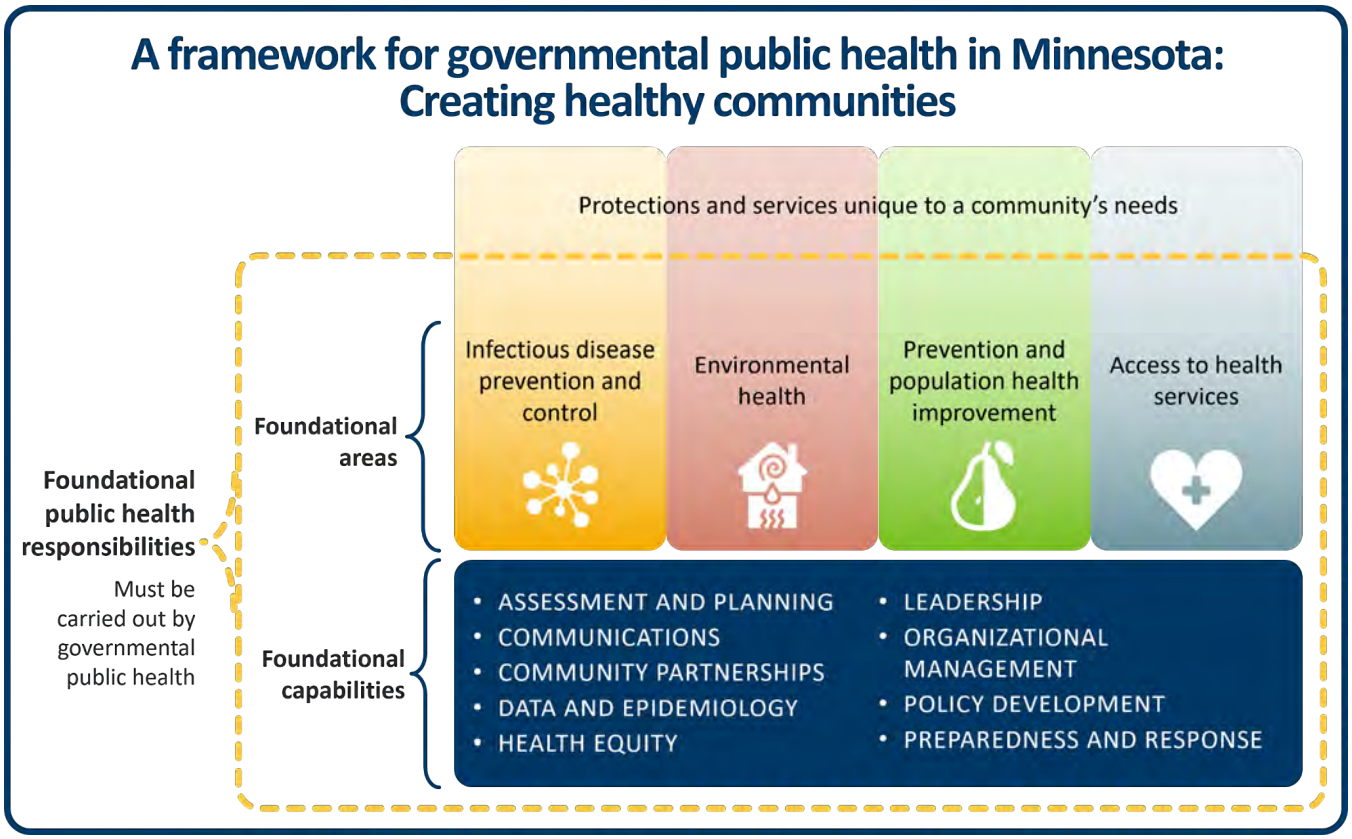
- services that are mandated by federal or state laws;
- services for which the governmental public health system is the only or primary provider of the service, statewide; and
- population-based services (versus individual services) that are focused on disease prevention and protection and promotion of health.

Minnesota's FPHRs align with 145A and national Foundational Public Health Services framework and define the services that governmental public health must carry out and which must be present in every community across the state to efficiently and effectively promote and protect the health of all people in Minnesota.[23]

- **Foundational Capabilities (FCs)** are the knowledge, skills, and abilities needed to successfully implement the basic public health protections key to ensuring the community's health and achieving equitable health outcomes.
- **Foundational Areas (FAs)** are those basic public health, topic-specific responsibilities aimed at improving the health of people and communities.
- **Protections and Services Unique to a Community's Needs** are responsibilities that are beyond the FPHR but still crucial to achieving population health goals. These protections and services are critical to a specific community's health. This work is very important, but unique to a given community.

The Minnesota FPHR framework includes nine (9) FCs and four (4) FAs, defined in this report as "foundational responsibilities." See **Figure 2** for a depiction of the Minnesota FPHR framework.

Figure 2. Minnesota's Foundational Public Health Responsibilities Framework



Source: Minnesota Department of Health. 2023. *Foundational public health responsibilities: Transforming the public health system in Minnesota*.

Detailed operational definitions—activity-level descriptions for which provision costs and implementation evaluations can be assessed—for the FPHR framework were defined such that they were comprehensive, mutually exclusive, and, to the extent possible, discrete, measurable activities. To support this, many other states implementing foundational services as part of their public health system transformation efforts have developed "operational definitions".[22] Following this, a set of operational definitions were defined for Minnesota's FPHR framework that:

- describe "what" FPHRs provide for Minnesota's communities, but not "how" the governmental public health system should provide it;

- are agnostic to which governmental public health provider should provide it;
- are reduced to discrete activities (defining as few actions as possible per statement) and begin with a verb identifying the action to be taken; and
- align with existing statutes, rules, regulations, and guidelines.

These operational definitions add detail by further defining foundational capabilities and areas into measurable components that identify the functions, elements, and activities that the governmental public health system must deliver for residents for the FPHRs to be fully implemented. The final set of operational deliverables for this project includes three levels of detail (from most granular to high-level): activities (specific statements describing discrete activities); headline responsibilities ([HRs], concise statements describing groups of activities); and FC and FA foundational responsibilities (categories of infrastructure and activities that contain groups of headline responsibilities). In the FPHR framework used in the Assessment, there were 340 activities, 52 HRs, and 13 foundational responsibilities (9 FCs and 4 FAs). This report only details findings for the 13 FPHR foundational responsibilities and 52 HRs.

Foundational Capabilities

A. Assessment and Planning
A.1. Use data to identify health priorities and share results.
A.2. Develop, implement, monitor, track, and update health improvement plans.

B. Communications
B.1. Develop and maintain systems and messaging for public-facing communication and health education.
B.2. Build and maintain ongoing relationships with the media.
B.3. Develop and implement strategies for risk communication.

C. Community Partnerships
C.1. Develop and maintain ongoing relationships with partners and convene and connect them to improve public health outcomes.
C.2. Engage the community, including those most impacted by health inequities, around public health priorities.

D. Data and Epidemiology
D.1. Identify, collect, analyze and interpret data from all sources, including through maintenance of statewide surveillance systems.
D.2. Effectively communicate data and its analysis, including through responding to data requests.
D.3. Maintain infrastructure and capabilities for delivering public health laboratory services.

E. Health Equity
E.1. Develop and demonstrate organizational commitment to health equity.
E.2. Inform and influence public and organizational policies to advance health equity.

F. Leadership and Governance
F.1. Establish the strategic direction for public health and lead internal and external stakeholders to action.
F.2. Maintain a governance structure for public health.

G. Organizational Management
G.1. Accountability, Performance Management, and Quality Improvement.
G.2. Electronic Information, Information Systems, and Technology.
G.3. Human Resources.
G.4. Financial Management.
G.5. Operations and Facilities.
G.6. Legal Services and Analysis.

H. Policy Development
H.1. Work with and convene partners and policy makers to develop, amend, and or enact new and update existing laws and policies that impact public health, including in response to changes in federal, state, and local rules, laws and regulations.
H.2. Inform and influence policies being considered by others that affect public health (Health in All Policies).
H.3. Plan, assure understanding of, and implement public health policies, statutes, regulations, and ordinances, orders.

I. Preparedness and Response
I.1. Establish governmental public health's role in preparedness and response to incidents.
I.2. Conduct or participate in risk assessments.
I.3. Develop, exercise and maintain preparedness and response plans.
I.4. Assure public health continuity of operations.
I.5. Respond to incidents.
I.6. Recover from incidents.

Foundational Areas

J. Infectious Disease Prevention and Control

J.1. Provide timely, relevant, scientifically accurate and locally relevant information on infectious diseases and their control.
J.2. Develop an infectious disease prevention plan, as well as plans for the prevention and control of specific infectious diseases.
J.3. Implement population-based disease prevention and control programs and strategies.
J.4. Inform, communicate, work cooperatively with, and influence others on policy, system, and programmatic changes for infectious disease prevention and control.
J.5. Conduct disease investigations and respond to infectious disease outbreaks.
J.6. Enforce public health laws to prevent and control infectious diseases.
J.7. Maintain a statewide immunization program and assure availability of immunizations to the public.

K. Environmental Health

K.1. Provide timely, scientifically accurate, and locally relevant information on the environment and environmental threats and their control.
K.2. Develop an environmental health prevention plan, as well as plans for specific environmental health threats.
K.3. Implement population-based environmental health programs and strategies.
K.4. Inform, communicate, work cooperatively with, and influence others who impact environmental health.
K.5. Diagnose, investigate, and respond to environmental threats to the public's health.
K.6. Conduct mandated environmental public health inspections and oversight to protect the public from hazards, in accordance with federal, state, and local laws and regulations.

L. Prevention and Population Health Improvement

L.1. Provide timely, scientifically accurate, and locally relevant information on maternal and child health, chronic disease, injury, and the factors that impact health.
L.2. Develop prevention plan(s) to address factors that influence health or threats to population health, including maternal and child health, as well as plans for the prevention and control of chronic disease and injury.
L.3. Implement population-based strategies to improve population health and address issues related to maternal and child health, chronic disease, and injury.
L.4. Inform, communicate, work cooperatively with, and influence others on policy, system, and environmental changes that will prevent harm and improve health.

M. Access to Health Services

M.1. Provide timely, scientifically accurate, and locally relevant information on the healthcare system and access to clinical care services, including barriers to care.
M.2. Develop a plan to address gaps and barriers and assure access to clinical care services.
M.3. Inform, communicate, work cooperatively with, and influence others on policy, system, and programmatic changes to facilitate access to health services.
M.4. Examine and monitor health care quality, effectiveness, and cost-efficiency.
M.5. Ensure licensed health care facilities and providers comply with laws and rules.
M.6. Assure mandated newborn screening and follow-up.

For additional detail on the FPHRs and detailed definitions across the framework, please access the *Operational Definitions Summary* (z.umn.edu/Op_Def_Sum).

The Minnesota Public Health Cost and Capacity Assessment

The Minnesota Public Health Cost and Capacity Assessment ("the Assessment") was designed to give Minnesota's governmental public health departments a direct opportunity to document Minnesota's governmental public health spending and the resources needed to transform it. In the Assessment, MDH and all LHDs provided primary data on 1) their current implementation of and staffing and spending associated with the Minnesota FPHRs and 2) anticipated staffing and spending needed to fully implement the FPHRs (i.e., what would it take to "fully deliver" the FPHRs if suitably resourced). The Assessment was designed to focus on the state's governmental public health providers (i.e., the 74 LHDs and MDH) and the resources available to them with respect to the communities they serve. The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.

Completing the Assessment required the expertise and knowledge of all of Minnesota's governmental public health departments. It required broad participation across public health departments, including

administration, finance, and programmatic staff of those health departments. A comprehensive review of the staffing and revenue sources and composition of the state's public health system was essential to understand the implementation of FPHRs in Minnesota. Adequate revenues are not only essential to enable the provision of services desired but often dictate the utilization of available resources. The following sections overview processes and procedures used to conduct the Assessment (see also **Appendix B**) and the findings of the Assessment (with additional findings in **Appendix C**). Though the data was collected for a time period where there were substantial impacts to finances and services delivered due to COVID-19, valid findings were extracted to lay a foundation to aid the transformation of governmental public health in Minnesota.

Discussion: *The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.*

This space intentionally left blank

Brief Methods

The present section briefly summarizes methods used to conduct and analyze the Assessment, including objectives of the Assessment, design and delivery of the Assessment, and analysis of the Assessment findings. The following information is meant to explain methods pertinent to understand the report findings and a **Detailed Methods** section is available in **Appendix B**.

Aim and Objectives

The Assessment aimed to collect statewide data from all Minnesota public health practitioners within MDH and LHDs to investigate the implementation of the FPHRs in 2021 ("current" time period). The Assessment had three objectives:

1. determine the current implementation of FPHRs by LHDs and MDH;
2. allocate the share of current resources (staffing and operating expenditures) directed to FPHRs; and
3. estimate the resources needed to fully implement FPHRs.

For the purposes of this report, we use the term "agency" to refer to any governmental health department (any of the 74 LHDs and MDH).

Design and Delivery of the Assessment

Staff of the University of Minnesota Center for Public Health Systems (UMN CPHS), under the Leadership of a Joint Leadership Team of the Minnesota Department of Health, Local Public Health Association, and State Community Health Services Advisory Committee, and in collaboration with the Advisory Group, designed the Assessment and tools such as a Qualtrics survey ("the instrument") around the FPHR framework to collect key data from all governmental public health departments, including MDH and all 74 LHDs (in some cases responding on behalf of their CHB). These data were also supplemented by MDH's *Local Public Health Finance and Staffing Survey.*[24] The current time period for the Assessment included data from LHDs' 2021 fiscal year ("FY 2021") and state fiscal year 2022 ("SFY 2022") for MDH, selected due to recency of data from closed fiscal years.

The instrument was made available to all 74 LHDs in late July 2022 and MDH in August 2022 with all agencies completing some data collection by late fall 2022. UMN CPHS staff engaged with local and state participants between summer 2022 and spring 2023 through webinars, office hours, etc. Agencies received their data in a more convenient format and with flags for identified discrepancies (e.g., clear errors, substantial estimation differences) and given the opportunity to revise their data through spring 2023. By late spring 2023, data were agreed upon between UMN CPHS and the agencies.

See **Appendix B** for additional details and links for the data collection.

Cleaning and Adjustment of Data

Data submitted for the Assessment were cleaned and adjusted according to standard practices and where reasonable. Data cleaning included correcting clear errors, removing outliers, and recoding variables into formats more appropriate for analysis. Adjustments were made to certain variables, sets, or types of variables in order to analyze or accurately represent findings. The following adjustments are notable for understanding the results:

- All effort data (i.e., FTEs) collected in the Assessment were normalized to a 40-hour work week (i.e., 2,080 hours per year). The implication of this is that the FTE values in this report can all be described as person-hours.
- All financial data collected in the Assessment (e.g., total expenditures, total revenues, current FPHR expenditures, full implementation expenditures) were adjusted for inflation to 2022 according to each agency's self-reported fiscal period. The implication of this adjustment is that the financial values in this report can all be considered to be in real 2022 dollars.
- Current FPHR expenditures for all agencies' "Respond to incidents" headline responsibility were adjusted to control for the outsized impact of COVID-19.

- Local public health FPHR expenditures for current spending and full implementation were modeled to control for over- and under-estimations of resources and staffing.
- Some LHD data were grouped according to the number of persons their jurisdiction served ("population bands"), decided by the Assessment's Advisory Group:
    - less than 25,000 persons ("<25k");
    - between 25,000 and 49,999 persons ("25–49k");
    - between 50,000 and 99,999 persons ("50–99k"); and
    - greater than 100,000 persons ("100k+").

Contextual Administrative Analysis

Data collected from the "background" section of the Assessment (i.e., high-level administrative data) were analyzed to provide context for the Assessment and allow standardization of data across agencies. Data from the *Local Public Health Finance and Staffing Survey* were used for single-county CHBs for financial and effort data described below and those health departments had an opportunity to verify those data.

Analysis of Occupational and Total Effort

In this assessment, agencies reported total number of staff (whole persons) and number of FTE (actual effort) for specific occupations employed in FY 2021. FTE reported for each fiscal year and per occupation for the current period of Assessment were first standardized. Then, data for number of staff and number of FTE analyzed for each occupation type using descriptive statistics.

Analysis of Total Revenues

Agencies submitted total revenues for their agency and LHDs reported breakdowns of revenues by source (e.g., 145A, local tax, COVID-19 funds). Revenues were first adjusted for inflation and some revenue sources were combined into groups (e.g., "insurance," "fees," "COVID-19," "other"). Total revenues and revenues by source were analyzed using descriptive statistics (e.g., population-weighted means).

Analysis of Total Expenditures

Agencies submitted total expenditures for their agency and LHDs reported breakdowns of expenditures by MDH's set of 6 funding sources ("categories"): "Infrastructure," "Healthy Communities," "Infectious Disease," "Environmental Health," "Disaster Preparedness," and "Health Services.[24]" Expenditures were first adjusted for inflation. Total expenditures and expenditures by category were analyzed using descriptive statistics (e.g., population-weighted means).

Analysis of Qualitative Responses

Agencies were provided several opportunities to give additional context and validation for quantitative instrument responses through free-text responses. Free-text responses from the background and self-assessment sections of the Assessment were analyzed by extracting key themes from participant responses according to deduced ("a priori") coding categories. Datasets created from the coding activities were shared with UMN CPHS staff to provide context and explanations within the body of the report.

Analysis of Self-Assessed Expertise and Capacity

All LHDs and MDH were requested to self-report their "expertise" (i.e., knowledge, skills, and education) and "capacity" (i.e., the staff and/or other labor resources with the ability and associated material and supplies) available to implement the FPHRs **in their communities**. Agencies scored each activity and headline responsibility according to four-item ordinal Likert scales for expertise and capacity (both on a scale from 1 to 4 with 1 being "Absent" and 4 being "Expert") describing FPHR implementation (see **Table 1**).

Table 1. Self-Assessment Rubric

Expertise *Knowledge, skills, education, and experience needed to implement the headline responsibility or activity*		Capacity *Staff and/or other resources with the materials and supplies needed to implement the headline responsibility or activity*
Absent: No or basic awareness of the expertise, but limited ability to apply it.	1	**Absent:** Staff time and other resources are not present or are largely unavailable.
Basic: Knowledge of the expertise and can apply it at basic level.	2	**Minimal:** Some staff time and/or other resources are present to complete basic functions.
Proficient: Expertise is available and can be applied adeptly.	3	**Moderate:** Most staff time and/or other resources are present to partially implement most functions.
Expert: Expertise is routinely applied and those with the expertise can build it within others.	4	**Full:** Sufficient staff time and/or other resources are present to fully implement all functions.
I don't know	**N/A**	**I don't know**

Activity and Headline Responsibility Analyses

The ordinal self-assessment values for expertise and capacity were combined into raw implementation scores for each activity and headline responsibility (i.e., a single measure). This conveys an implicit "level of implementation" for each measure. Scores were normalized to a scale of 1–4 and fell within specific "zones" (see **Figure** 3).

1. **1.0 — Not Implemented.** Combined expertise and capacity for activity or headline responsibility indicate absent expertise and capacity (i.e., 1 x 1). This zone has a relative implementation score of 0% (*but do not extend to 25%*).
2. **1.1–2.0 — Minimally Implemented.** Combined expertise and capacity for activity or headline responsibility indicate low implementation (e.g., 1 x 2, 2 x 2). This zone has a relative implementation score between 25–50%.
3. **2.1–3.0 — Partially Implemented.** Combined expertise and capacity for activity or headline responsibility indicate moderate implementation (e.g., 1 x 4, 2 x 3, 3 x 3). This zone has a relative implementation score between 50–75%.
4. **3.1–4.0 — Substantially Implemented.** Combined expertise and capacity for activity or headline responsibility indicated high implementation (e.g., 3 x 4, 4 x 4). This zone has a relative implementation score between 75–100%.

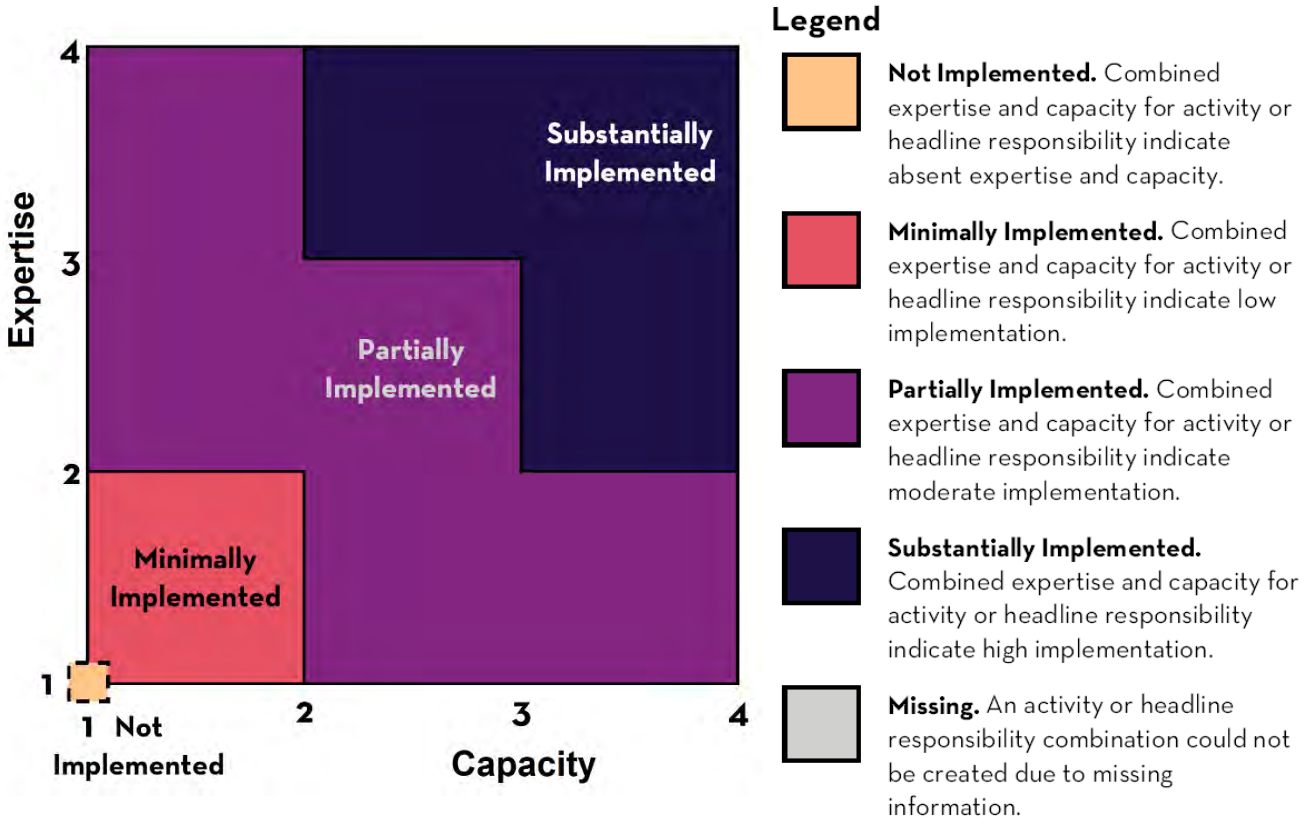
When insufficient self-assessment data were present, that score was classified as "missing." *While the relative implementation percentages are numerically accurate, the percentages may arise from a mix of absent capacity or expertise and full implementation and should be used with caution.*

Each activity and headline responsibility score for each agency were plotted on level of implementation diagrams (see **Figure 3**). Headline responsibility scores were averaged to create scores for each of the population bands (e.g., LHDs serving less than 25,000 persons), for all LHDs, and as statewide scores. Averages were weighted to account for relative contributions of population and expenditures.

Foundational Responsibility Analyses

Headline responsibility scores were averaged to create scores for their respective foundational responsibility and grouped for population bands, for all LHDs, across FCs, across FAs, and as statewide scores. Averages were weighted to account for relative contributions of population and expenditures. When the calculation became zero or an error (e.g., "0/0"), the datapoint was excluded from analysis.

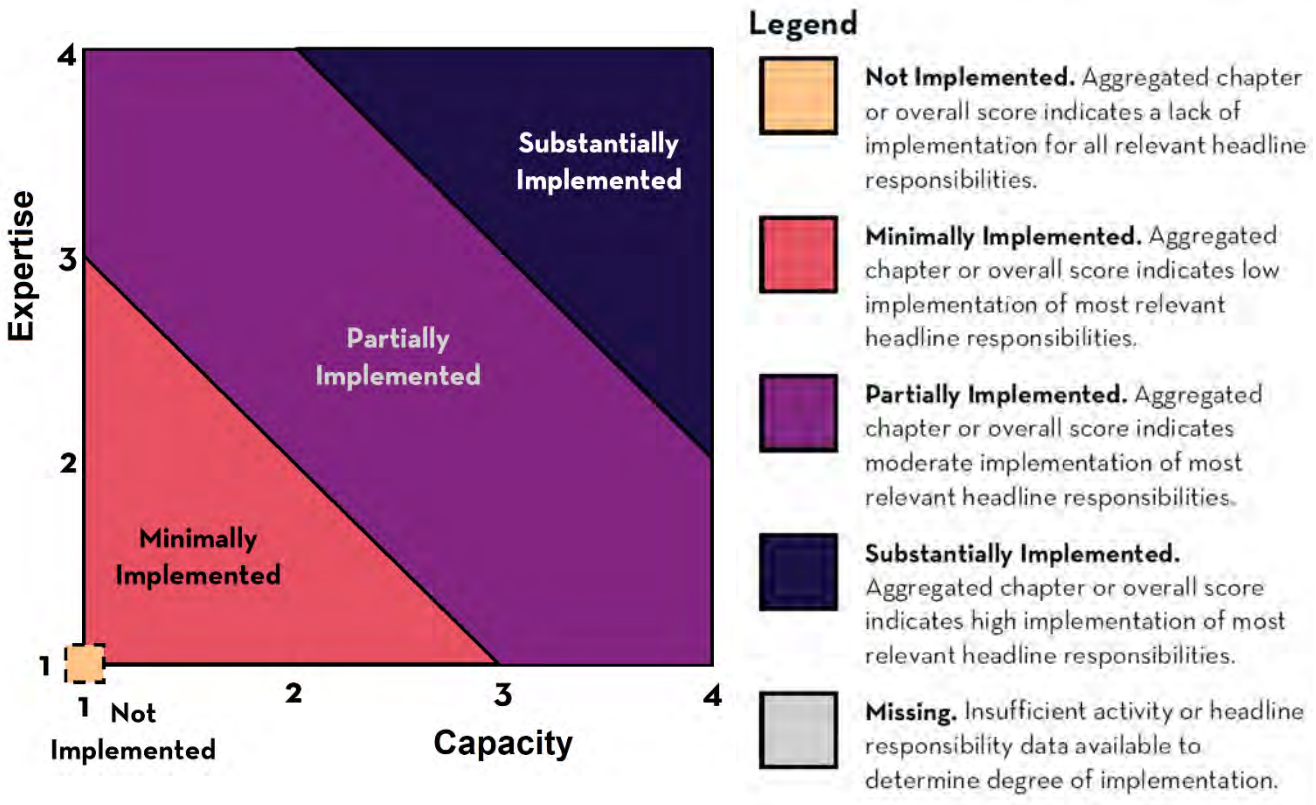
Figure 3. Level of Implementation Diagram



The self-assessment values for all LHDs, across FCs, across FAs, and statewide scores created interval values. These each conveyed implicit "degrees of implementation" for each measure. Scores were normalized to a scale of 1–4 and fell within specific zones with slight differences in meaning for degrees of implementation (see **Figure 4**).

1. **1.0 — Not Implemented.** Aggregated foundational responsibility or overall score indicates a lack of implementation for all relevant headline responsibilities. This special case occurs when all associated capacity and expertise are absent (i.e., 1 for all capacity and expertise). This zone has a relative implementation score of 0% (*but do not extend to 25%*).
2. **1.1–2.0 — Minimally Implemented.** Aggregated foundational responsibility or overall score indicated low implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise distributed around 2). This zone has a relative implementation score between 25–50%.
3. **2.1–3.0 — Partially Implemented.** Aggregated foundational responsibility or overall score indicated moderate implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise distributed around 3). This zone has a relative implementation score between 50–75%.
4. **3.1–4.0 — Substantially Implemented.** Aggregated foundational responsibility or overall score indicated high implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise leaning toward 4). This zone has a relative implementation score between 75–100%.

Figure 4. Degree of Implementation Diagram



Overall Analyses

Foundational responsibility scores were averaged to create statewide scores and grouped for population bands, for all LHDs, across FCs, across FAs, and as statewide scores. Averages were weighted to account for relative contributions of population and expenditures. When the calculation became zero or an error (e.g., "0/0"), the datapoint was excluded from analysis. Each overall score for each agency was plotted on degrees of implementation diagrams (see **Figure 4**). Note that self-assessment findings aggregated for population bands, foundational responsibilities, or statewide overall may arise from a mixture of high and low capacity or expertise. *A majority of high pooled scores may obscure absent expertise and vice versa.*

Analysis of FPHR Spending and Effort Data

Analyses were conducted to estimate (a) the current spending and effort levels for each FC and FA within both MDH and LHDs, (b) full implementation cost and effort for each FC and FA within both MDH and LHDs, and (c) the statewide gap in spending and effort.

Prior to analyses for current spending and full implementation spending, identified outliers, pass-through & transfer expenditures, and capital expenditures were removed from the datasets. Statistical methods were used to identify outliers. Expenses categorized as Pass-Throughs, Transfers, or Capital Expenditures were removed due to perceptions that those expenses are highly unpredictable from year to year, and because Pass-Through expenditures from one governmental health department to another—both MDH to LHD and LHD to LHD pass-throughs—would lead to double-counting in expenditures. By excluding pass-throughs, transfers, and capital expenses, *the Assessment focuses on total operating costs that may be predictable*.

> **Methods Note:** *Pass-throughs, transfers, and capital expenditures were excluded from FPHR expenditure analysis to prevent duplication of expenditures between agencies (pass-throughs and transfers) and focus on predictable operating costs (labor and other direct expenditures).*

Data for current spending, current effort, full implementation spending, and full implementation effort were analyzed as per capita values to allow for relatable comparisons among jurisdictions. Data for each variable set were analyzed per foundational capability and area, summed for all LHD with MDH retained separately, and summed as overall statewide values. Additionally, LHDs were organized according to the population bands described above in the **Adjustments to Select Assessment Data** section.

Estimating Gaps in Spending and FTE

The estimated resource gaps—calculated by subtracting the estimated current effort or estimated spending value from the respective estimated full implementation —were determined for foundational responsibilities, and overall. However, the project aimed to identify estimated resource gaps that also included "contingencies" (avoided underestimations of needed resources); these gaps plus contingencies created "upper bound gaps" for needed resources. Moving forward, we use "gap" to describe estimated/true gaps but "nominal gap" to describe the difference between agency-reported current spending and full implementation estimates.

A power model that regressed the full implementation spending and effort, current spending and effort, as well as the gap in spending and FTE relative to the population served relative to the population served proved the most predictive and performed the best across a variety of model fitting exercises. The power model was constructed with LHD data* to estimate overall full implementation, current spending and the gap in spending and FTE.

* *MDH data were not used to construct the power model but were considered with the model in analysis.*

Per capita gap data for agencies' spending and FTE were plotted separately for analysis, with each plot containing a power curve based on the respective data. The power curve in each plot was considered to be a "floor" for the respective data (gap of spending or FTE). When an agency's calculated per capita gap fell **below** the curve, that gap was replaced with the value estimated by the curve (i.e., point on the curve associated with the agency's population served); otherwise, no change was made to the agency's calculated gap. This approach to replacing below-curve values with curve-estimated values was referred to as adding "contingency," which served to prevent underestimation of resource needs for the statewide estimate.

Network Analysis of the Minnesota Public Health System

Agencies were asked about the ways in which they shared headline responsibilities, with whom that sharing occurs, and the formality of those sharing relationships. Relationships that were identified among LHDs or between LHDs and MDH were extracted for analysis. Though LHDs described sharing relationships with organizations other than LHDs or MDH, those relationships were not analyzed in great depth as the focus was cross-jurisdictional sharing among governmental entities. Summary statistics were developed to assess the interconnectedness of LHDs (including relationships within CHBs) and for sharing between LHDs and MDH to identify the interconnectedness of the state with local public health.

Network maps for the state of Minnesota were constructed as interlocal relationships (relationships among LHDs) overlaid on choropleth maps for degree of implementation findings, with relationships ("connections") represented by lines between individual LHDs ("nodes"). Relationships in which LHDs reported a sharing relationship with a multi-county partially integrated CHB were visualized by connections between those LHDs and all LHDs within that respective CHB. Network maps for headline responsibilities, Foundational Capabilities, Foundational Areas, and statewide overall were all contained within an online *Public Health Cost and Capacity Network Analysis Dashboard* (z.umn.edu/TransformMNPH_Network).

Assessment Results

The present section details the findings of the Minnesota Public Health Cost and Capacity Assessment, including contextual administrative analysis around occupational and total effort, revenues, and expenditures; implementation of foundational public health responsibilities, the public health governance and service delivery network; current resources directed to current implementation of the FPHRs; the resources needed to fully implement the FPHRs; and the implied additional increment of spending on the FPHRs needed to fully implement them. These results were generated through analysis of both primary data collected as part of the Minnesota Public Health System Assessment and supplemented by secondary data, including *Health Department Information* ("Background") data from LHDs (high-level administrative data) were supplemented by data CHBs reported to the *Local Public Health Finance and Staffing Survey*.[24] The analysis that generated these results was previously described in the **Brief Methods** section. Additional detail is available in the **Detailed Methods** (**Appendix B**)**.** This section only details the results of the Assessment and analysis; interpretations of those results may be found in the **Discussion** section.

Overview of Data Analyzed

Data were received from all of Minnesota's 74 LHDs (and their associated 51 CHBs) and MDH. Primary data collected for the Assessment accounted for nearly 2,200 variables and analytical activities produced nearly 1,800 additional variables; this resulted in a total of nearly 4,000 variables per participating agency (74 LHDs and MDH). Every effort was made to collect comprehensive data from all 75 participating agencies. The data collection period was several months long and included comprehensive technical assistance. Following data collection, data collected as rigorously validated to identify and correct many common and substantial errors, inconsistencies, and over- or under-estimations were resolved. Additionally, following the cleaning, standardization, and adjustment activities, data were able to be reasonably analyzed, compared, and combined. However, in some cases reported data was incomplete and some Assessment data points were missing for certain agencies (e.g., self-assessment scores, total financial data). Despite these missing data points as well as subjectivity in certain datasets and other minor issues, Assessment data quality was sufficient to allow for statewide analysis.

> **Methods Note:** *Assessment data were largely self-reported and the collection period was heavily influenced by COVID-19 response. Even with these issues and missing data points, Assessment data quality was sufficient to allow for statewide analysis.*

Public Health Revenues and Expenditures

All 74 LHDs reported their revenues and expenditures, both in detail, by revenue source and expenditure type, and totals, for their most recently completed three fiscal years (FY 2019, FY 2020, FY 2021) at the time of the Assessment. MDH provided expenditures, both detailed transactions and totals, for their most recently completed fiscal year (SFY 2022) at the time of the Assessment. Totals for reported—original totals submitted by each agency—and inflation-adjusted revenues and expenditures are available in **Table 2**. Data show that both revenues and expenditures for LHDs over the past three fiscal years have been relatively flat in real 2022 dollars, with exception of a large increase in FY 2020 (14% increase in revenues and 11% increase in expenditures); both revenues and expenditures fell by approximately 10% from FY 2020 to FY 2021.

Table 2. Agency-reported Revenues and Expenditures with Inflation Adjustments

	Local Health Departments			Minnesota Department of Health
Revenues / Expenditures	FY 2019	FY 2020	FY 2021	SFY 2022
Agency-reported total revenues*	$323,900,000	$378,700,000	$357,900,000	$1,164,300,000
Inflation-adjusted reported revenues^	$383,300,000	$438,000,000	$388,300,000	$1,216,800,000
Agency-reported total expenditures*	$339,100,000	$385,900,000	$372,000,000	$1,164,300,000
Inflation-adjusted reported expenditures^	$401,400,000	$446,700,000	$403,900,000	$1,216,800,000

* "Agency-reported" values were original data submitted by agencies and rounded to the nearest $100,000.
^ Transactions for all agencies were adjusted to represent 2022 real dollars and rounded to the nearest $100,000.

The MDH revenues and expenditures for SFY 2022 were substantially higher than the total amounts for LHDs in a similar period. Of note, a substantial portion of MDH expenditures are federal and state funds passed through to LHDs, which makes establishing a sum total of public health revenues and expenditures challenging.

Public Health Revenues

As seen in **Table 2** above, total local public health revenues ranged from $324–358 million ($383–438 million in 2022 dollars). Total LHD revenues for the current period (FY 2021) of the Assessment were $358 million (**$388 million** in 2022 dollars). Total MDH revenues for the current period (SFY 2022) were $1.16 billion (**$1.22 billion** in 2022 dollars). As LHDs receive substantial aid-to-local awards (e.g., 145A, COVID-19 pass-through funds), MDH and LHD revenues should not be aggregated by readers.[i]

Mean proportional revenues (population-weighted, inflation-adjusted) were calculated for each different revenue source or group of revenues submitted by LHDs in the Assessment. The mean proportional share of each revenue source or group of revenues among LHDs for FY 2021 is described in **Table 3** (from greatest total proportional mean to least). Mean proportional revenues for fiscal years prior to the current period are available in **Appendix C** and any FY 2019 and FY 2020 data referenced in this section may be found in **Table C-2** and **Table C-3**, respectively.

Table 3. LHDs' FY 2021 Proportional Means of Inflation-Adjusted Revenues by Source

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Revenue Sources^					
Local Tax	17%	23%	20%	26%	**24%**
Other Federal Funds	14%	16%	18%	21%	**20%**
COVID-19 Funds	18%	12%	12%	15%	**14%**
Other State Funds	11%	12%	13%	10%	**11%**
Insurance Revenues	20%	19%	17%	4%	**9%**
Local Public Health Grant	9%	8%	10%	8%	**8%**
Fees and Fines	2%	2%	4%	7%	**6%**
Other Local Funds	4%	2%	2%	3%	**3%**
Federal Temporary Assistance for Needy Families (TANF) Funds	2%	2%	2%	2%	**2%**
Federal Title V Funds	2%	2%	2%	2%	**2%**
Other Revenues	0%	1%	0%	1%	**1%**

* Total proportional means are based on all 74 LHDs.

[i] In FPHR expenditure analyses, pass-throughs and transfers were removed from agency expenditures to prevent double-counting of resources (e.g., Local Public Health Act funds passed through MDH conflict with LHD expenditures sourced from those received funds).

^ Revenue sources are ordered according to total proportional means.

The proportional shares of LHDs' mean revenues appear to be generally consistent from year to year with respect to data submitted for the past three fiscal years (with exception of the shifts caused by COVID-19 funding).

Local Revenues

Most LHDs relied heavily on local revenues, which comprised approximately one-third of overall revenues. Local revenues are comprised of local taxes (mean proportions of 17–26%), fees and fines (statewide mean proportions of 5–6%), and other local funds (mean proportions of 2–4%). Agencies serving populations greater than 100,000 persons maintained a higher local fiscal allocation, followed by agencies serving between 25,000 and 50,000 persons.

Federal Revenues

LHDs relied on federal revenues for approximately one-fourth of overall revenues. Other federal funds, including WIC (Women, Infants, and Children Special Supplemental Nutrition Program) and public health preparedness funds, accounted for 20 percent of expenditures while Temporary Assistance for Needy Families (TANF) and Title V (maternal and child health block grant) together accounted for a combined mean proportion of 4%. Federal Medicare and Medicaid receipts are described below. Agencies serving populations greater than 25,000 persons maintained a higher federal fiscal allocation, versus those serving less than 25,000 persons.

State Revenues

LHDs relied on state revenues for approximately one-fifth of overall revenues. State revenues are comprised of other state-appropriated funds (e.g., Statewide Health Improvement Partnership, Family Planning Special Projects) that contribute the highest share (mean proportions of 10–13%) and the Local Public Health Grant (mean proportions of 8–10%). Agencies serving less than 100,000 persons maintained a higher state fiscal allocation, followed by agencies serving greater than 100,000 persons.

Insurance, Fees, and Fines Revenues

Remaining LHD revenues were those received from public insurance (e.g., Medicare, Medicaid), private insurance, and fees and fines—approximately one-sixth of overall revenues—with insurance revenues offering a higher share (mean proportions of 4–20%) and fees and fines offering a lower share (mean proportions of 2–7%). Other LHD revenues contribute a negligible mean proportional share (<1%). Agencies serving less than 100,000 persons maintained a higher state fiscal allocation, followed by agencies serving greater than 100,000 persons.

COVID-19 Revenues

Fiscal years 2020 and 2021 saw an influx of crisis funding to support LHDs' response to COVID-19. This notable increase (statewide mean proportions of 14%) represented one-time, temporary funding that restricted expenditures to narrow purposes related to the pandemic. Of note, these crisis funds represented anywhere from 15–86% of individual LHD budgets. Agencies serving populations less than 25,000 persons or greater than 100,000 persons maintained a higher crisis funding fiscal allocation, followed by agencies serving between 25,000 and 100,000 persons.

Public Health Expenditure

As seen in **Table 2**, above, total local public health expenditures ranged from $339–386 million ($401–447 million in 2022 dollars). Total LHD expenditures for the current period (FY 2021) of the Assessment were $372 million (**$404 million** in 2022 dollars). Total MDH expenditures for the current period (SFY 2022) were $1.16 billion (**$1.22 billion** in 2022 dollars). As LHDs expend funds received from the state (e.g., 145A, COVID-19 pass-through funds), MDH and LHD expenditures should not be aggregated by readers.[ii]

[ii] In FPHR expenditure analyses, pass-throughs and transfers were removed from agency expenditures to prevent double-counting of resources (e.g., Local Public Health Act funds passed through MDH conflict with LHD expenditures sourced from those received funds).

Mean proportional expenditures (population-weighted, inflation-adjusted) were calculated for each different expenditure category outlined by MDH and submitted by LHDs in the Assessment. The mean proportional share of each expenditure category among LHDs for FY 2021 is described in **Table 4** (from greatest total proportional mean to least). Mean proportional expenditures for fiscal years prior to the current period are available in **Appendix C** and any FY 2019 and FY 2020 data referenced in this section may be found in **Table C-4** and **Table C-5**, respectively.

Table 4. LHDs' FY 2021 Proportional Means of Inflation-Adjusted Expenditures by Category

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Expenditure Categories^					
Healthy Communities	38%	41%	43%	41%	**41%**
Health Services	27%	29%	23%	20%	**23%**
Environmental Health	1%	2%	12%	16%	**13%**
Infrastructure	19%	16%	13%	7%	**10%**
Infectious Disease	7%	6%	4%	10%	**9%**
Disaster Preparedness	8%	5%	5%	5%	**5%**

* Total proportional means are based on all 74 LHDs.
^ Expenditure categories are ordered according to total proportional means.

The proportional shares of LHD's mean expenditures appear to be generally consistent from year to year, with each expenditure category contributing the same proportional share each year with respect to data submitted for the past three fiscal.

Healthy Communities

LHDs expended the majority of their mean proportional expenditures on activities within the Healthy Communities category—approximately two-fifths of overall expenditures each year (mean proportions of 38–43%). Those services included promotion of healthy communities and healthy behaviors, addressing issues of health inequity, and promoting other healthy behaviors. Agencies serving populations between 25,000 and 100,000 persons typically expended higher proportions of spending on community health, followed by agencies serving less than 25,000 persons and greater than 100,000 persons.

Health Services

LHDs expended a large share of their mean proportional expenditures on activities within the Health Services category—approximately one-fourth of overall expenditures each year (mean proportions of 20–29%). Those services included addressing availability of health-related services, convening partners to improve community health systems, and addressing community-identified priorities. Agencies serving populations less than 50,000 persons typically expended higher proportions of spending on health services, followed by agencies serving greater than 50,000 persons.

Environmental Health

LHDs expended a minor share of their mean proportional expenditures on activities within the Environmental Health category—approximately one-eighth of overall expenditures each year (mean proportions of 1–16%). Those services included air and water quality monitoring, abatement of nuisances, and identifying and addressing environmental risks. Agencies serving populations greater than 100,000 persons typically expended higher proportions of spending on environmental health, followed by agencies serving between 50,000 and 100,000 persons, then by those serving less than 50,000 persons.

Infrastructure

LHDs expended a minor share of their mean proportional expenditures on activities within the Infrastructure category—approximately one-ninth of overall expenditures each year (statewide mean

proportions of 7–19%). Those services included assurance of foundational capacities (e.g., data analysis, health planning, policy development). Agencies serving populations less than 25,000 persons typically expended higher proportions of spending on infrastructure, followed by agencies serving between 25,000 and 100,000 persons, then by those serving greater than 100,000 persons.

Infectious Disease

LHDs expended a minimal share of their mean proportional expenditures on activities within the Infectious Disease category—approximately one-thirteenth of overall expenditures each year (statewide mean proportions of 4–10%). Those services included prevention of spread of communicable diseases through multiple methods (e.g., detection, mitigation of transmission, implementing control measures). Agencies serving populations less than 25,000 persons and greater than 100,000 persons typically expended higher proportions of spending on infectious disease, followed by agencies serving between 25,000 and 100,000 persons.

Disaster Preparedness

LHDs expended a minimal share of their mean proportional expenditures on activities within the Disaster Preparedness category—approximately one-twentieth of overall expenditures each year (statewide mean proportions of 5–8%). Those services included activities for health departments to prepare for or respond to disasters (e.g., leading preparedness, developing and exercising response plans). Agencies from each of the bands of population expended similar proportions on disaster preparedness across years with those serving less than 25,000 expending a slightly higher proportion in FY 2020 and FY 2021 and those serving greater than 100,000 persons expending a slightly higher proportion in FY 2020.

Discrepancies Between Revenues and Expenditures

Many LHDs provided qualitative responses regarding expenditure and revenue discrepancies (i.e., expenditures that were more or less than revenues). Position vacancy was the most common reason LHDs gave for expenditure and revenue discrepancies, though some LHDs stated that vacant positions increased their expenditures due to costs associated with hiring and training new employees, and some stated that it decreased their expenditures due to lower salary costs. As expected, COVID-19 dollars contributed significantly to those discrepancies in 2020 and 2021 as well as other grants (e.g., LPH, federal, state grants). A few LHDs also stated that fluctuations in received levy dollars created discrepancies within their financial reporting. Still others indicated discrepancies related to receipt of COVID-19 funds or expenses associated with COVID-19 response. Only two LHDs described having revenue or expenditure timing mismatches (e.g., a cost occurred at the end of a fiscal year that was not reimbursed until the beginning of the following fiscal year). Lastly, only one LHD mentioned a private donation in 2021 having a large impact on their revenue for that fiscal year.

Public Health Staffing and Effort

Although only 9 of 74 LHDs defined annual full-time equivalents with less than 2,080 hours per year; all FTEs described in this report are standardized to 2,080 hours per year. All 74 LHDs reported effort by occupation and number of staff by occupation for agencies' most recent fiscal years (FY 2021) and reported total effort for all three fiscal years (FYs 2019–2021). MDH submitted total effort for the most recent fiscal year (SFY 2022). LHD's FY 2021 standardized FTEs by occupation and population grouping are available in **Table 5**.

Data show that effort reported by LHDs for the past three fiscal years have been sustained, all things considered, with negligible growth seen from FY 2019 to FY 2021 (27 FTEs or 1%). Total local public health effort ranged from 2,555–2,585 FTEs. Total LHD effort for the current period (FY 2021) of the Assessment was **2,585 FTEs**. Total MDH effort for the current period (SFY 2022) was **1,770 FTEs**. The combined statewide effort for the current period was **4,355 FTEs**. However, LHDs also submitted FTEs by occupation for FY 2021, and summing those occupational FTEs led to a total LHD FTE of *2,610 FTEs*. This difference in FTE (2,585 vs 2,610) was unable to be reconciled. The agency effort totals that summed to 4,355 FTEs (MDH and LHDs) were used as comparators for data in the Assessment

(e.g., denominators for FPHR effort proportions) and the FTEs by occupation were only used for reporting the following results in this section.

Table 5. LHDs' FY 2021 Total Standardized FTE by Occupation

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total FTEs
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Occupations*					
Public Health Nurse	81.6	196.8	109.1	248.7	**636.2**
Administrative Support	31.0	75.4	42.3	147.3	**296.1**
Other Nurse	45.2	59.5	52.2	100.7	**257.5**
Medical and Public Health Social Worker	10.9	47.1	17.2	75.6	**150.9**
Administrative / Business Professional	16.7	27.0	18.1	77.2	**138.9**
Paraprofessional	18.2	17.8	17.1	80.5	**133.6**
Environmental Scientist and Specialist	4.2	6.9	21.7	98.6	**131.3**
Public Health Educator	19.4	35.1	20.2	55.4	**130.1**
Health Administrator	21.1	30.5	14.1	61.9	**127.7**
Public Health Nutritionist	4.5	14.5	22.5	81.2	**122.7**
Health Planner / Researcher / Analyst	1.9	4.0	5.2	75.0	**86.1**
Public Health Program Specialist	0.0	0.0	11.0	68.4	**79.4**
Community Health Worker	5.0	3.0	1.5	68.0	**77.5**
Other Public Health Professional	5.5	13.8	2.8	51.1	**73.3**
Licensure / Inspection / Regulatory Specialist	0.0	2.0	4.5	40.0	**46.5**
Technician	0.0	1.5	9.4	19.5	**30.4**
Epidemiologist	0.0	0.8	0.0	29.0	**29.8**
Mental Health Counselor	0.0	0.0	0.0	18.5	**18.5**
Other	6.7	3.0	2.0	4.1	**15.8**
Service / Maintenance	0.0	1.2	0.0	9.5	**10.7**
Public Health Informatician	0.0	2.0	0.0	6.9	**8.9**
Interpreter	0.1	1.1	1.4	0.5	**3.0**
Communications / Public Information Officer	0.2	1.0	0.0	0.0	**1.2**
Public Health Physician	0.0	0.1	0.0	1.0	**1.1**
Occupation Safety and Health Specialist	0.0	1.0	0.0	0.0	**1.0**
Public Health Physical Therapist	0.0	0.1	0.0	0.0	**0.1**
Total FTEs	**272.2**	**545.2**	**372.2**	**1,418.8**	**2,608.4**

* Occupations are ordered according to total full-time equivalents (FTEs).

Notes: All full-time equivalents (FTEs) were standardized to 2,080 annual hours but unrounded. These data (Q19) were submitted separately from total FTEs (Q14) and the FY 2021 FTEs by FPHR and numbers may differ.

Nurses made up most of LHD staffing in FY 2021—approximately one-third of all staff (895 FTEs) and ranged from 125 FTEs (total serving less than 25,000 in their jurisdictions) to 350 FTE (total serving greater than 100,000 in their jurisdictions). Though a higher number of nurses were employed within all LHDs serving greater than 100,000 persons, nurses made up a higher proportion of all staff for those LHDs serving less than 50,000 persons (47% within each population band) than LHDs serving 50,000–99,999 persons (43%) and greater than 100,000 persons (25%).

Administrative support staff made up the second-highest occupation within LHDs in FY 2021—approximately one-tenth of all staff (295 FTEs) and ranged from 30 FTEs (total serving less than 25,000 in their jurisdictions) to 145 FTEs (total serving greater than 100,000 in their jurisdictions). Each population band employed a similar proportion of administrative support staff (10%–14%).

A variety of specialists each contributed approximately one-twentieth of the statewide effort: social workers (150 FTEs or 6%), business professionals (140 FTEs or 5%), paraprofessionals (135 FTEs or 5%), environmental health specialists (131 FTEs or 5%), public health educators (130 FTEs or 5%), health administrators (125 FTEs or 5%), and nutritionists (122 FTEs or 5%). Each occupation represents a similar proportion of staff within their population band, with few exceptions. Social workers made up a higher proportion of staffing for LHDs serving 25,000–99,999 persons (50 FTEs or 10%),

double that of other population bands. There were also higher proportions of environmental health specialists and nutritionists with LHDs representing greater than 50,000 persons whereas there were higher proportions of public health educators and health administrators with LHDs representing fewer than 50,000 persons.

The remaining specialists and public health professionals represented much less of the proportional statewide effort, each, but together contributed the final one-fifth of staffing. Highly specialized positions (e.g., epidemiologists, analysts, community health workers) represented between 30–85 FTEs (1% and 3% of the state's FTEs). Other specialized positions (e.g., mental health counselors, informaticians, physicians) contributed less than one percent, each, with many contributing essentially 0%.

Implementation of Foundational Public Health Responsibilities

Leveraging self-assessed expertise and capacity scores from agencies, composites were created for activities, and composites and aggregations were created for headline responsibilities.

Implementation Composites by Level of Abstraction (*from most granular to most aggregated*)

1. **Activity** (340 sets of composite scores);
2. **Headline Responsibility** (52 sets of composite scores);
3. **Foundational Capabilities** (9 sets of composite scores) | **Foundational Areas** (4 sets of composite scores);
4. **All Foundational Capabilities** (1 set of composite scores) | **All Foundational Areas** (1 set of composite scores); and
5. **Overall FPHRs** (1 set of composite scores).

Level of Implementation

These composites assorted agencies' inferred levels of implementation according to where expertise and capacity values intersected. The composites were each plotted on Level of Implementation charts and examples of such charts (described in *Brief Methods*)—showing the Health Equity foundational responsibility and its two headline responsibilities—are illustrated by **Figure 6**. All Level of Implementation charts are available in the *Public Health Cost and Capacity Foundational Dashboards* (z.umn.edu/TransformMNPH_Dashboard). The dashboard is filterable by foundational responsibility, headline responsibility, and comparator (LPHA regions or population bands).

Each Level of Implementation plot situated LHD composite scores at clearly defined intersections of expertise and capacity responses ("vertex" or "vertices"). As there are 74 LHDs + MDH, a crowding effect was observed where more than one agency's implementation scores aligned with a vertex. In order to convey crowding, a "jitter" function (toggle) is present in the dashboard that subtly moves LHD vertices away from other scores. Within the dashboard, a hover function allows visualization of additional details for each datapoint (e.g., expertise and capacity scores) and allows for differential comparisons by population grouping (4 population groups plus MDH and statewide) or LPHA regions (7 regions plus MDH and statewide). The data are not identifiable to LHDs so no further inspection is available.

Activity-Level Self-Assessment Findings

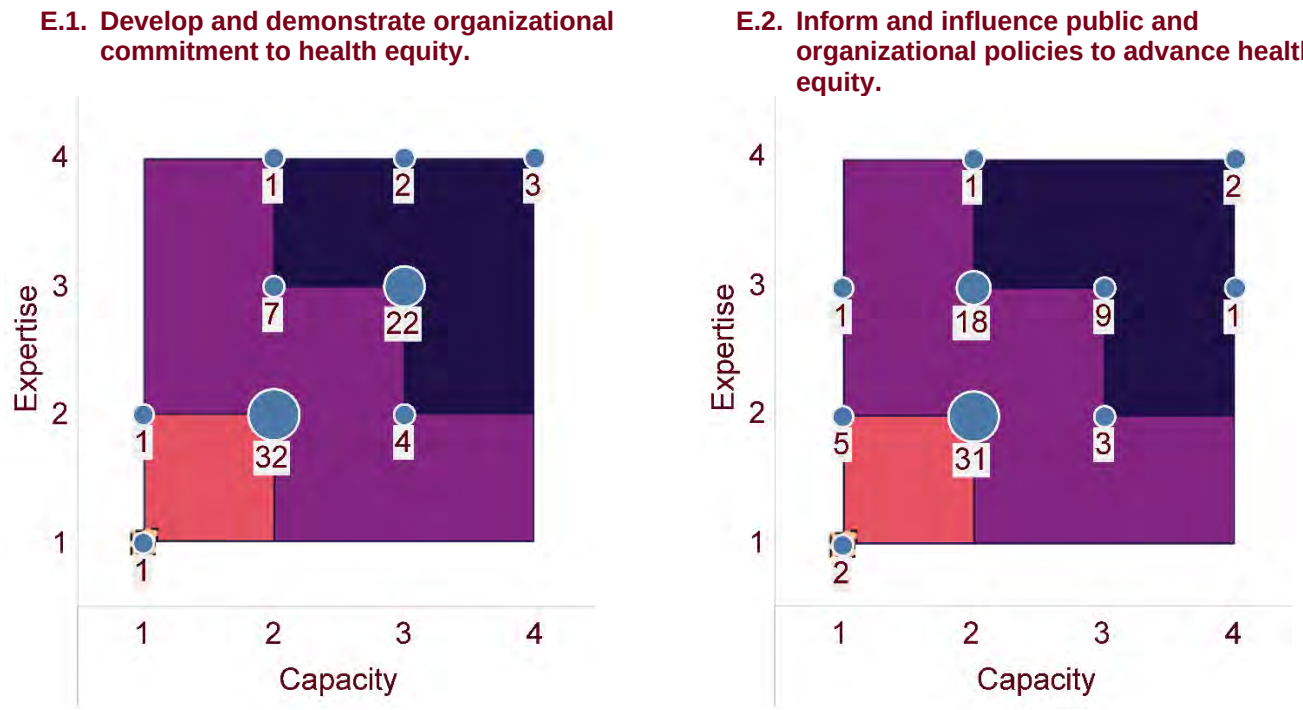
Activity-level charts varied widely in implementation vertices and few substantial trends were identified for specific activities or population groupings. Notably, most agencies' scores tended to intersect with the middle of the chart (i.e., partially implemented; combinations of "2's" and "3's"); see **Figure** 5 below which is an example of this effect from the dashboard showing the two health equity HRs. Scores for given activities and given population bands often displayed a variety of implementation scores across the chart, whereas the statewide aggregate across all population bands generally showed a higher density of agencies falling within that middle, partially implemented range. There were no discernible associations between LPHA region and implementation scores (average or otherwise) and additional analysis would be necessary to identify any statistically significant relationships.

Given that the time period of self-assessment was FY 2021/SFY 2022, it was expected that capacity or expertise scores may have skewed toward many of the activities associated with COVID-19 response.

However, activities falling within associated foundational responsibilities or headline responsibilities (e.g., Data and Epidemiology foundational responsibility) indicated large disparities among agencies in both capacity and expertise. However, of note was that both capacity and expertise for the *Preparedness and Response* foundational responsibility showed implementation scores trending much lower for LHDs serving smaller populations and trending much higher for LHDs serving larger populations, though, overall scores again showed higher overall densities within the middle, partially implemented range.

Key Finding: *There were no discernible associations between geographic region and implementation scores but there were associations between size of population served by agency for many components of the FPHR framework. COVID-19, or response to the pandemic, may have influenced scores.*

Figure 5. Example Level of Implementation Plots (*Health Equity* foundational responsibility)



Notes: The size of each dot corresponds with the number of LHDs sharing that score. Numeric callouts below each dot provide the count of LHDs sharing that score.

For some of the activities, participants were also asked to briefly describe related trainings, strategies, and/or initiatives. In regard to trainings, most were through partners, MDH, online webinars/modules, or delivered through the LHD. Many LHDs described not being able to provide trainings due to COVID-19 response, though some stated that a few employees (often a single supervisor or other leadership level employee) were still able to attend one or more trainings. This limited ability to develop, provide, or send employees to trainings may have affected LHDs' self-assessments. For example, if they were asked about their capacity and expertise in 2019 (pre-COVID-19) or in 2024 (at least 6 months after the official end of COVID-19 on May 11, 2023), their self-assessment scores might have been higher, since they would have had a greater ability to focus on services other than COVID-19 response activities. Similarly, at least one LHD mentioned COVID-19 in response to describing prioritized strategies or initiatives within their agency, which may have also lowered self-assessment scores.

Level of Implementation charts for all activities (*n* = 340) are available on the *Public Health Cost and Capacity Foundational Dashboards* in the first tab titled "Activities" (z.umn.edu/TransformMNPH_Dashboard).

Headline Responsibility-Level Self-Assessment Findings

As agencies self-assessed each HR separate from its respective activities, HR composites also represented ordinal data and were plotted similarly to activities; **Figure** 5, above, shows a representation of this.

Scores were well-distributed across expertise and capacity axes but skewed downward; particularly striking was the number of LHDs that indicated absent expertise and capacity (i.e., 1 x 1) in their community with respect to maintaining infrastructure and capabilities for public health laboratory services from the *Data and Epidemiology* foundational responsibility. Also notable was how LHDs regarded their community as possessing low capacity or expertise to deliver regulatory services for *Access to Health Services* headline responsibilities (e.g., assured health care compliance, health care monitoring, assured newborn screenings and follow-ups), whereas MDH reported moderate to high implementation scores (i.e., 3 x 3 averages and higher). These low scores were most likely due to the fact that MDH is the primary agency responsible for public health laboratory services and regulatory health care activities and may simply be areas where LHD respondents had little insight into the capacity and expertise provided by MDH (though "I don't know" was not selected). However, these headline responsibilities were among the most likely to be shared with MDH, according to the network analysis. Alternatively, these may be areas where LHDs feel that greater capacity and expertise within the agency would better serve the community; whether there is actually a true dearth of capacity or expertise in the community is a matter for further discussion and investigation.

Level of Implementation charts for all HRs (*n* = 52) are available in the *Public Health Cost and Capacity Foundational Dashboards* in the second tab titled "Headline Responsibilities (HRs)" (z.umn.edu/TransformMNPH_Dashboard).

Visualization of Headline Responsibility Implementation Scores

Headline responsibility composites were also organized in a tabular ("checkerboard") format, displaying each HR (*n* = 52) across the y-axis and each LHD by size band (*n* = 74) and MDH across the x-axis (see **Table 6**, representing the same figure, broken across pages). The raw implementation score composites were then weighted according to methods described in *Brief Methods* and also **Appendix B**. The entire set of values for all LHDs and MDH—representing the statewide level of implementation for headline responsibilities—are visualized in **Table 6**.

As visualized in the checkerboard, there were several notable disparities in scores across the state. For LHDs, there was an apparent trend in which general HR composites were lower for LHDs serving less than 25,000 persons (a higher proportion of tan "1" and rose "2" values). The data also showed a progressive increase in implementation scores (related to perceived expertise and/or capacity) as the population served increased. There was a similar trend in which general HR composites were higher for LHDs serving greater than 100,000 persons (a higher proportion of light purple "3" and dark purple "4" values). These findings make sense, given that there is certainly a strong association between amount of resources (both human and financial) and capacity or expertise to deliver services.

Certain headline responsibilities indicated high statewide implementation, such as developing and maintaining partnerships (C.1), *Financial Management* (G.4), and maintaining immunization programs (J.7). However, other headline responsibilities were observed to have substantial gaps, such as infrastructure and capabilities for public health laboratory services (D.3), development of environmental health plans (K.2), and ensuring health care facility and provider compliance (M.5). As noted above, these substantial gaps likely relate to MDH being the primary agency responsible for laboratory and regulatory services in most jurisdictions.

Table 6. Current Level of Implementation of Headline Responsibilities by Agency

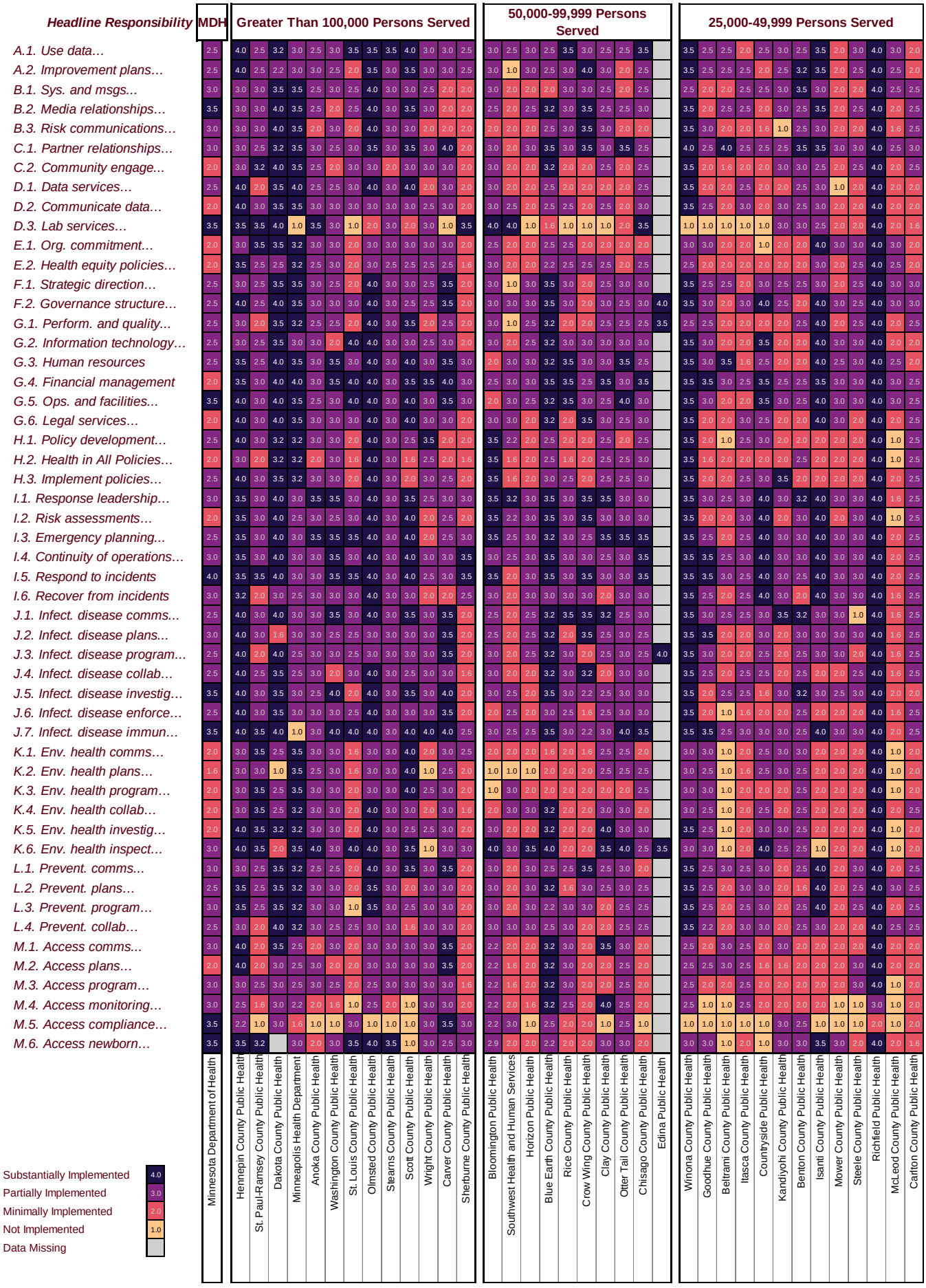
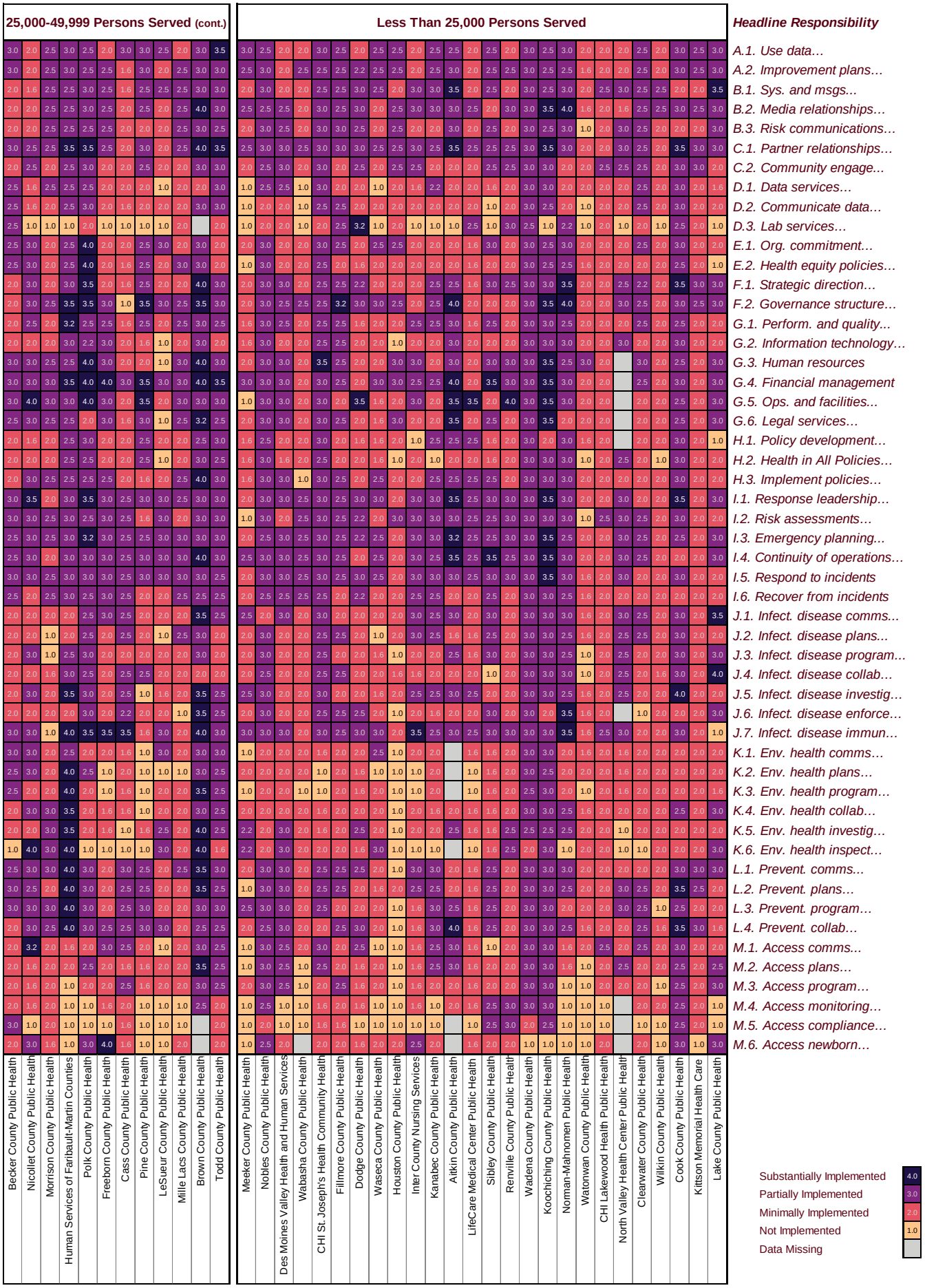


Table 6. Current Level of Implementation of Headline Responsibilities by Agency (cont.)



There were some notable trends in how specific agencies self-assessed their expertise and capacity. For example, the three agencies representing the highly interdependent cities of Bloomington, Edina, and Richfield reported substantially different capacity and expertise available in their communities (a key aspect of the self-assessment question), even though the City of Bloomington primarily delivered or assured services across all three cities. Self-assessment data for the City of Edina, however, was too incomplete to calculate overall agency scores. MDH displayed some of the highest performance in the state with some gaps; notably, *Health Equity* and *Environmental Health*.

Ultimately smaller health departments (or those jurisdictions serving fewer persons) were much more likely to report substantial barriers to implementation due to low capacity or lack of expertise, whereas larger health departments (or those jurisdictions serving many persons) were much more likely to report adequate staffing and expertise. Though the data illustrate how levels of implementation often differ greatly both between FPHRs but within specific capabilities and areas, most health departments felt most responsibilities were minimally to partially implemented.

Finally, HR scores were aggregated together to provide overall scores per HR with respect to population group, for all LHDs statewide, and with MDH's prior composite values retained. The widely distributed data became much more uniform and trended toward midpoints on the scale (see **Table 7**). The majority of headline responsibilities delivered by LHDs serving greater than 100,000 persons were nearly fully implemented, whereas LHDs serving less than 25,000 persons had several areas of minimal implementation within foundational responsibilities (e.g., *Data and Epidemiology*, *Environmental Public Health*, *Access to Health Services*). As discussed previously, there is a notable increase in perceived level of implementation as the total amount of population served is increased. Certain headline responsibilities fared better than others, such as those related to responding to incidents (a "catch-all" category for COVID-19 activities) or maintaining an immunization program (similarly linked to COVID-19). Others fared poorly, such as environmental health prevention planning and activities associated with environmental health, access to health services, and data services.

Foundational Responsibility Analyses

Headline responsibility scores at the agency-level were weighted according to FPHR expenditures for respective HRs and then population-weighted according to the agency, then averaged together to develop overall scores for each FC (n = 9) and FA (n = 4). Those foundational responsibility scores were then represented as averages within agencies' respective population bands, averaged for all LHDs, and all LHDs plus MDH.

Table 7. Current Level of Implementation of Headline Responsibilities by Group

Headline Responsibility	Greater Than 100,000 Persons Served	50,000-99,999 Persons Served	25,000-49,999 Persons Served	Less Than 25,000 Persons Served	All Local Health Departments	Minnesota Department of Health	**Minnesota Public Health System**
A.1. Use data…	3.2	2.9	2.7	2.4	3.0	2.5	2.9
A.2. Improvement plans…	3.0	2.7	2.7	2.5	2.9	2.5	2.6
B.1. Sys. and msgs...	3.1	2.2	2.5	2.5	2.8	3.0	2.9
B.2. Media relationships…	3.1	2.6	2.6	2.6	2.9	3.5	3.0
B.3. Risk communications…	3.0	2.2	2.4	2.4	2.8	3.0	2.9
C.1. Partner relationships…	3.1	2.7	3.0	2.8	3.0	3.0	3.0
C.2. Community engage...	3.0	2.2	2.5	2.4	2.8	2.0	2.8
D.1. Data services…	3.2	2.1	2.3	2.0	2.8	2.5	2.7
D.2. Communicate data…	3.3	2.2	2.5	2.0	2.9	2.0	2.5
D.3. Lab services…	2.9	2.2	1.7	1.7	2.5	3.5	3.4
E.1. Org. commitment…	3.1	2.0	2.6	2.3	2.8	2.0	2.5
E.2. Health equity policies…	2.8	2.1	2.4	2.0	2.6	2.0	2.3
F.1. Strategic direction…	3.0	2.4	2.7	2.5	2.8	2.5	2.6
F.2. Governance structure…	3.3	2.9	3.0	2.7	3.2	2.5	2.9
G.1. Perform. and quality...	2.8	2.4	2.5	2.3	2.7	2.5	2.7
G.2. Information technology…	3.0	2.5	2.5	2.2	2.8	2.5	2.9
G.3. Human resources	3.4	2.7	2.8	2.6	3.1	2.5	2.9
G.4. Financial management	3.5	3.1	3.2	2.7	3.4	2.0	2.8
G.5. Ops. and facilities...	3.5	2.7	3.0	2.5	3.2	3.5	3.5
G.6. Legal services…	3.5	2.5	2.6	2.4	3.1	2.0	2.4
H.1. Policy development...	3.2	2.2	2.3	2.1	2.8	2.5	2.7
H.2. Health in All Policies…	2.6	2.3	2.2	2.0	2.5	2.0	2.3
H.3. Implement policies…	3.2	2.3	2.5	2.3	2.9	2.5	2.9
I.1. Response leadership…	3.4	3.0	3.0	2.8	3.2	3.0	3.1
I.2. Risk assessments…	3.2	2.7	2.7	2.5	3.0	2.0	2.6
I.3. Emergency planning...	3.4	2.9	3.0	2.6	3.2	2.5	2.7
I.4. Continuity of operations…	3.3	3.1	3.1	2.7	3.2	3.0	3.1
I.5. Respond to incidents	3.4	3.2	3.0	2.7	3.3	4.0	3.1
I.6. Recover from incidents	2.8	2.6	2.7	2.3	2.7	3.0	2.6
J.1. Infect. disease comms...	3.4	2.6	2.6	2.4	3.1	2.5	2.9
J.2. Infect. disease plans...	3.0	2.4	2.5	2.2	2.8	3.0	2.9
J.3. Infect. disease program...	3.1	2.7	2.4	2.2	2.9	2.5	3.0
J.4. Infect. disease collab…	3.1	2.5	2.4	2.1	2.8	2.5	3.2
J.5. Infect. disease investig…	3.3	2.5	2.6	2.4	3.0	3.5	2.8
J.6. Infect. disease enforce…	3.3	2.2	2.2	2.1	2.9	2.5	3.3
J.7. Infect. disease immun…	3.4	2.8	3.0	2.7	3.2	3.5	2.3
K.1. Env. health comms…	3.0	1.9	2.4	1.9	2.7	2.0	1.9
K.2. Env. health plans…	2.6	1.7	2.2	1.8	2.4	1.6	2.8
K.3. Env. health program…	3.1	1.9	2.2	1.6	2.7	2.0	2.2
K.4. Env. health collab…	3.0	2.3	2.3	2.0	2.7	2.0	2.5
K.5. Env. health investig…	3.3	2.4	2.3	2.1	2.9	2.0	3.2
K.6. Env. health inspect…	3.4	3.2	2.3	1.9	3.1	3.0	2.9
L.1. Prevent. comms...	3.0	2.4	2.8	2.4	2.8	3.0	2.9
L.2. Prevent. plans…	3.0	2.4	2.7	2.3	2.9	2.5	3.0
L.3. Prevent. program…	3.0	2.3	2.8	2.3	2.8	3.0	2.7
L.4. Prevent. collab…	2.9	2.6	2.7	2.3	2.8	2.5	2.9
M.1. Access comms...	2.9	2.3	2.3	2.1	2.7	3.0	3.3
M.2. Access plans…	2.9	2.1	2.3	2.0	2.6	2.0	2.8
M.3. Access program…	2.8	2.0	2.1	2.0	2.5	3.0	2.9
M.4. Access monitoring…	2.2	2.2	1.7	1.6	2.1	3.0	3.5
M.5. Access compliance…	1.8	2.0	1.4	1.4	1.7	3.5	3.5
M.6. Access newborn…	3.0	2.3	2.2	1.7	2.7	3.5	3.7

Table 8. Weighted Foundational Responsibility Averages by Agency

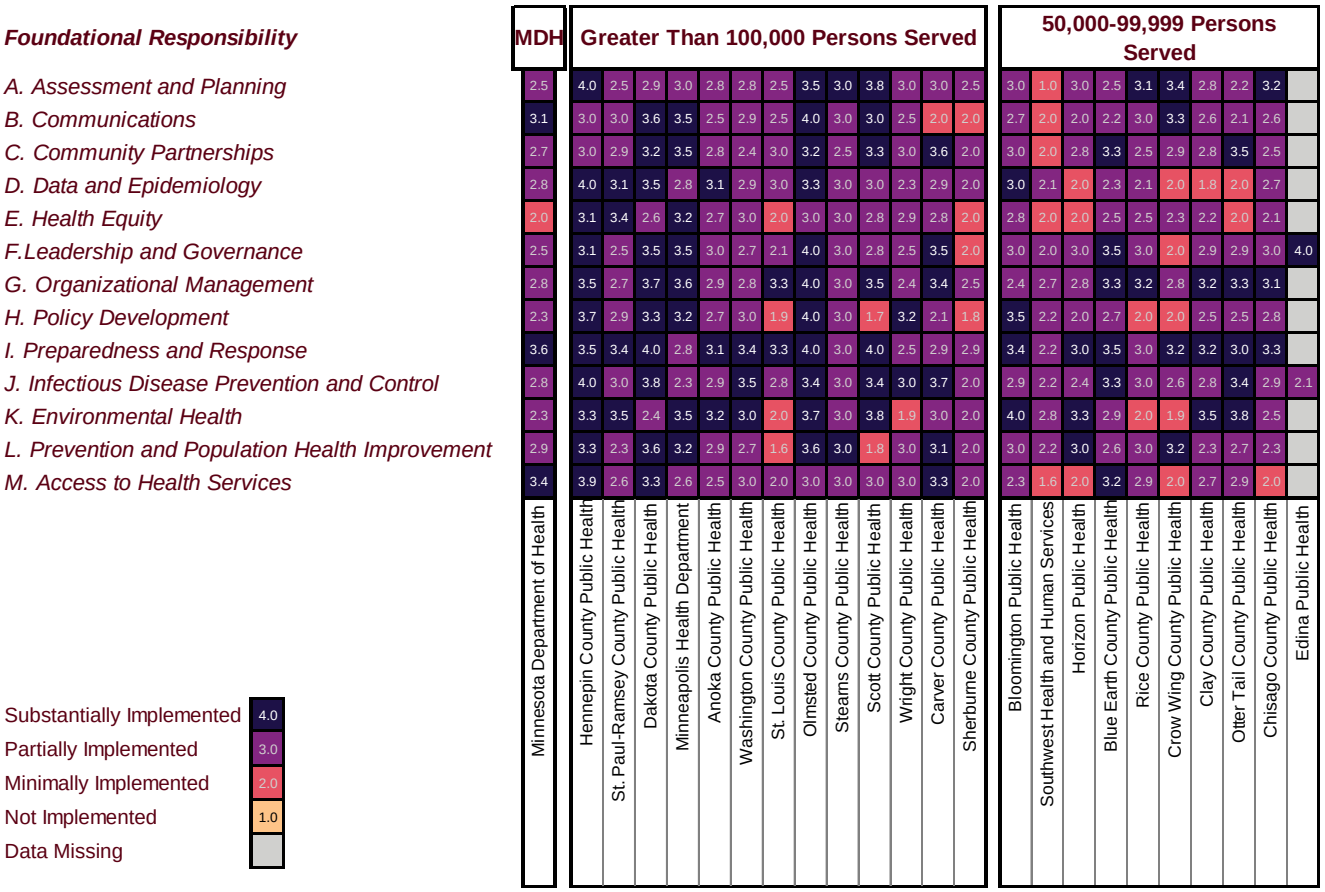


Table 8. Weighted Foundational Responsibility Averages by Agency (cont.)

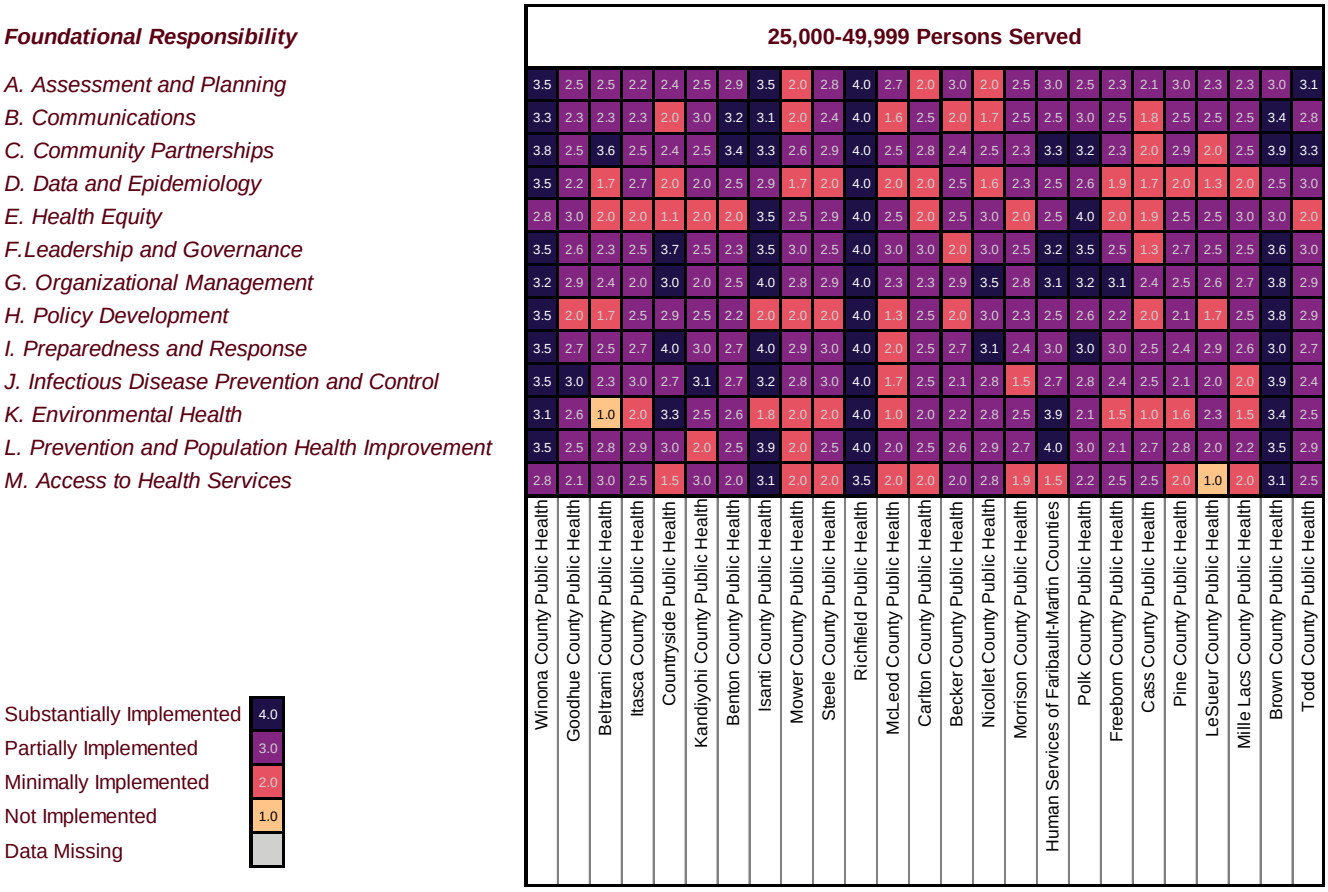
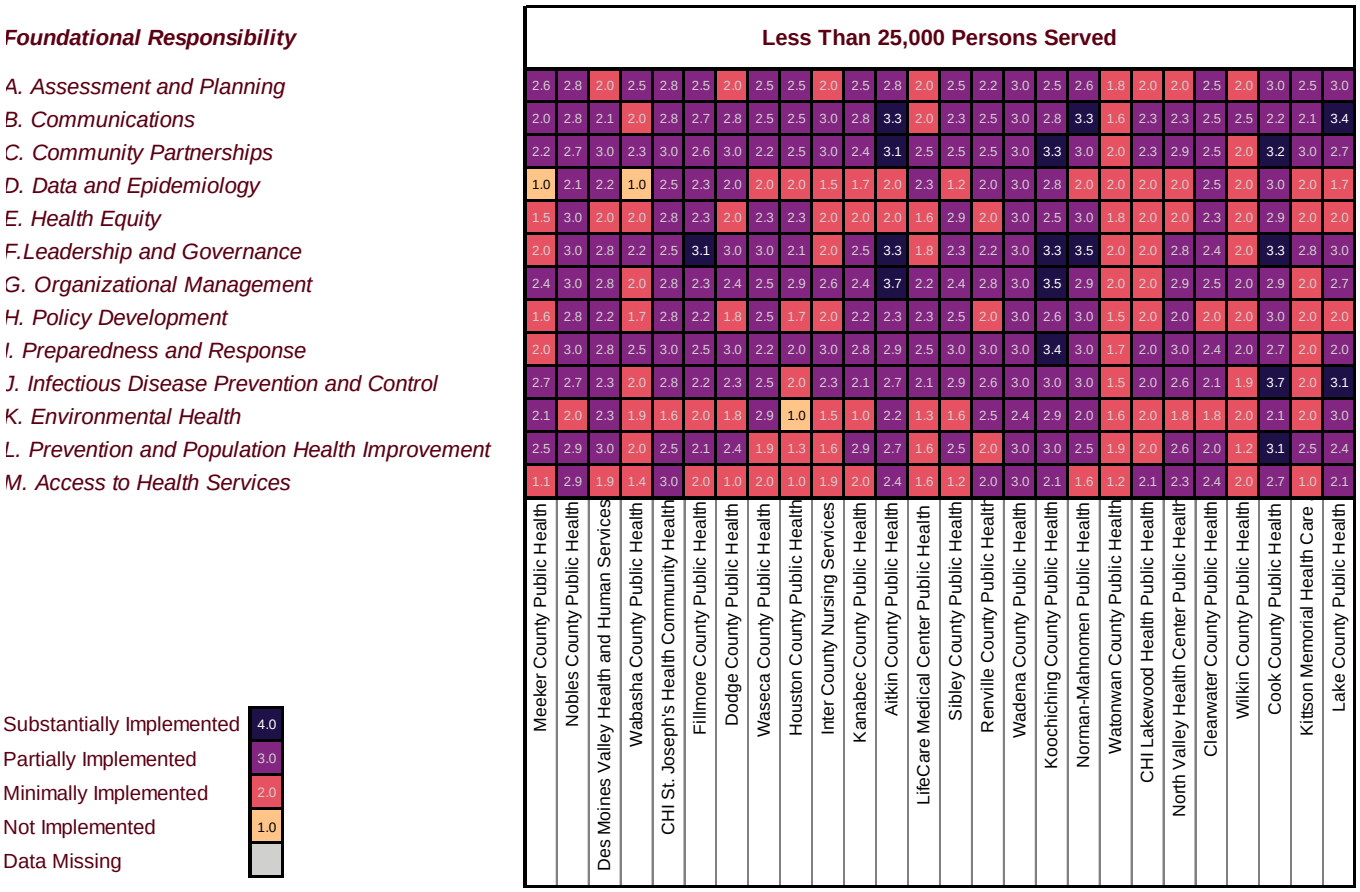


Table 8. Weighted Foundational Responsibility Averages by Agency (cont.)



Visualization of Weighted Foundational Responsibility Scores

The population-weighted foundational capabilities and areas delivered by agencies were included in checkerboard format, as above, to represent the aggregated foundational responsibility data. The checkerboard displayed each weighted foundational responsibility (*n* = 13) across the y-axis and each LHD by size band (*n* = 74) and MDH across the x-axis (see **Table 8**, representing the same figure, broken across pages).

There were several notable disparities in scores across the state. Whereas prior ordinal charts (including the prior checkerboard, **Table 6**) had widespread patches of minimal implementation, these figures mostly depicted partially implemented scores. For LHDs, there remained a trend in which general foundational responsibility composites were slightly lower for LHDs serving less than 25,000 persons (a small yet higher proportion of tan “1” and rose “2” values). The data still showed a progressive increase in implementation scores (related to perceived expertise and/or capacity) for every Foundational Responsibility as the population served increased. Ultimately, smaller health departments (or those jurisdictions serving fewer persons) were much more likely to report substantial barriers to implementation due to low capacity or lack of expertise, whereas larger health departments (or those jurisdictions serving many persons) were much more likely to report adequate staffing and expertise.

There were some notable trends in how weighted foundational responsibility averages conveyed general tendencies of the health departments. Similar to above, the three agencies representing the highly interdependent cities of Bloomington, Edina, and Richfield (especially Edina and Richfield) indicated places where certain foundational responsibilities were delivered substantially, though others were mainly absent. Multiple agencies (e.g., Hennepin, Olmsted, Winona, Isanti, and Brown) stood apart as having self-reported substantial implementation.

DEGREE OF IMPLEMENTATION

Composite interval scores for Foundational Responsibilities (*n* = 13), all FCs (*n* = 1), all FAs (*n* = 1), and overall FPHR framework (*n* = 1) each inferred a continuous degree of implementation from the discrete level of implementation measures. These composites were each tabulated on a checkerboard table and plotted on Degree of Implementation charts (described in **Brief Methods**).

Degrees of implementation by group are shown in **Table 9**. Data show that LHDs and MDH show higher overall levels of implementation of the FPHRs. Strengths in implementation were shown for LHDs serving greater than 100,000 persons. LHDs statewide shared strengths for capabilities of *Organizational Management* and *Preparedness and Response* as well as the area of *Infectious Disease Prevention and Control*. Clear weaknesses are present for the capabilities of *Health Equity* (including by MDH) and *Assessment and Planning* and the area of *Prevention and Population Health Improvement*.

Figure 6 shows each agency's implementation score by the 13 population-weighted foundational responsibilities. The Foundational Capabilities displaying the highest overall degrees of implementation were *Organizational Management, Community Partnerships*, and *Preparedness and Response*. Capabilities displaying the lowest overall degrees of implementation were *Policy Development*, *Data and Epidemiology*, and *Health Equity*. The Foundational Areas of *Infectious Disease Prevention and Control* displayed the highest overall degree of implementation, whereas the other three areas displayed lower implementation, particularly *Access to Health Services*.

Charts are also available to display degrees of implementation for agencies across all Foundational Capabilities (see **Figure 7**) and Foundational Areas (see **Figure 8**). These figures illustrate weighted agency level estimates and offer visualizations of the distribution of public health agencies across the degrees of implementation. LHDs were shown to be stronger, overall, in the Foundational Capabilities than the Foundational Areas. While only one agency fell within the minimal implementation zone for capabilities, nearly ten fell within this zone for areas.

All Degree of Implementation charts are available in the *Public Health Cost and Capacity Foundational Dashboards*

Table 9. Degree of Implementation for Foundational Responsibilities by Group

Foundational Responsibility	Greater Than 100,000 Persons Served	50,000-99,999 Persons Served	25,000-49,999 Persons Served	Less Than 25,000 Persons Served	All Local Health Departments	Minnesota Department of Health	**Minnesota Public Health System**
A. Assessment and Planning	2.5	2.5	2.7	2.4	2.9	2.5	2.6
B. Communications	3.0	2.3	2.6	2.5	2.8	3.1	2.9
C. Community Partnerships	3.0	2.5	2.9	2.7	2.9	2.7	3.0
D. Data and Epidemiology	3.2	2.1	2.3	2.0	2.8	2.8	2.9
E. Health Equity	2.9	2.1	2.5	2.2	2.7	2.0	2.5
F.Leadership and Governance	3.0	2.8	2.8	2.6	2.9	2.5	2.7
G. Organizational Management	3.2	2.7	2.9	2.6	3.1	2.8	3.0
H. Policy Development	3.0	2.2	2.4	2.2	2.8	2.3	2.7
I. Preparedness and Response	3.4	2.9	2.9	2.6	3.2	3.6	3.4
J. Infectious Disease Prevention and Control	3.3	2.7	2.7	2.4	3.0	2.8	3.0
K. Environmental Health	3.1	2.7	2.3	1.9	2.8	2.3	2.7
L. Prevention and Population Health Improvement	2.9	2.4	2.8	2.3	2.8	2.9	3.0
M. Access to Health Services	3.0	2.2	2.3	1.9	2.7	3.4	3.3

Substantially Implemented 4.0
Partially Implemented 3.0
Minimally Implemented 2.0
Not Implemented 1.0
Data Missing

(z.umn.edu/TransformMNPH_Dashboard). The dashboard is filterable by HR (weighted and unweighted), and FC and FA (unweighted only). Given that jurisdiction sizes vary, we also added population weighting, an additional level of weighting when geographic aggregation occurs.

Figure 6. Degree of Implementation Charts for Foundational Responsibilities

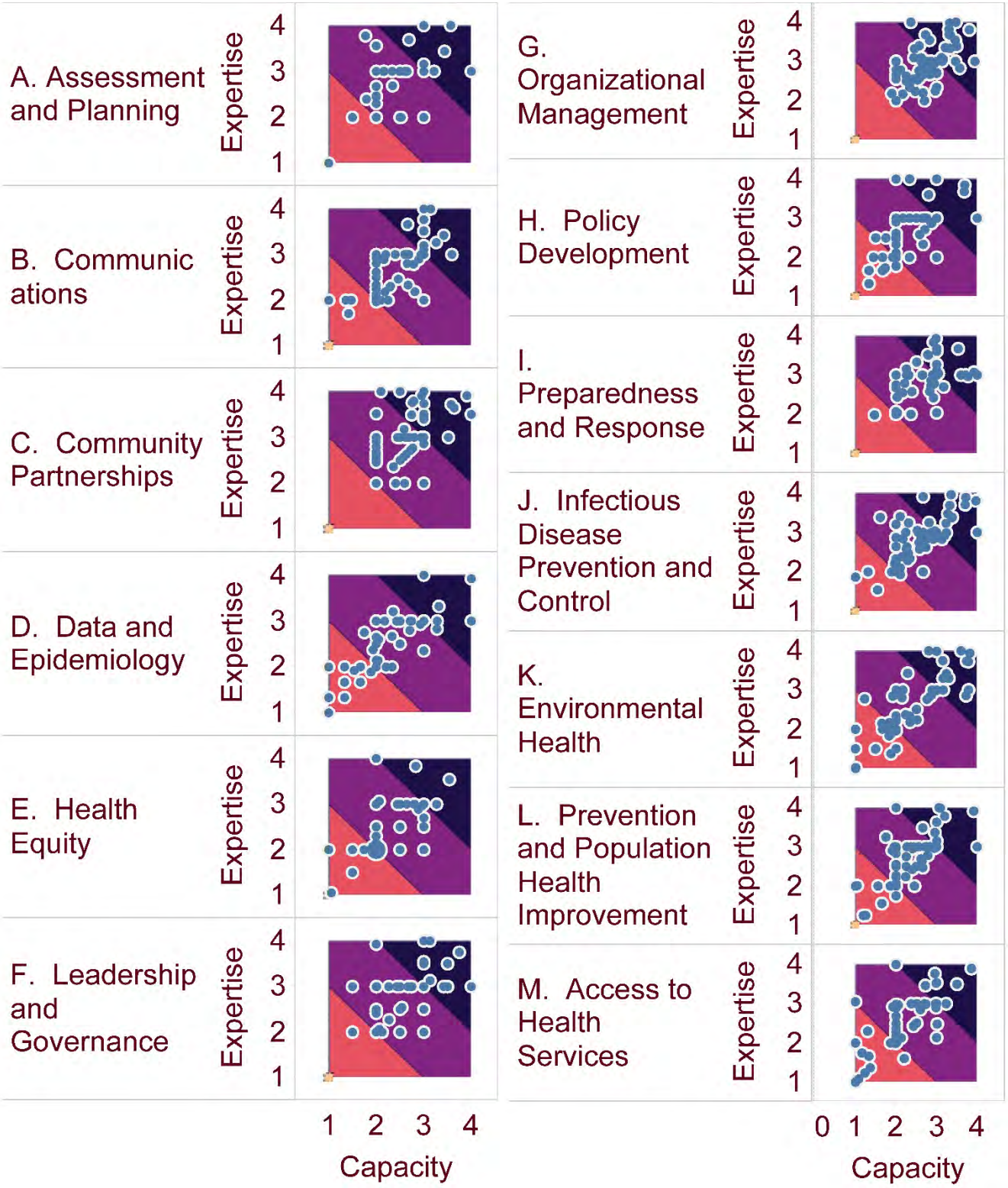


Figure 7. All Foundational Capabilities Plotted as Degree of Implementation

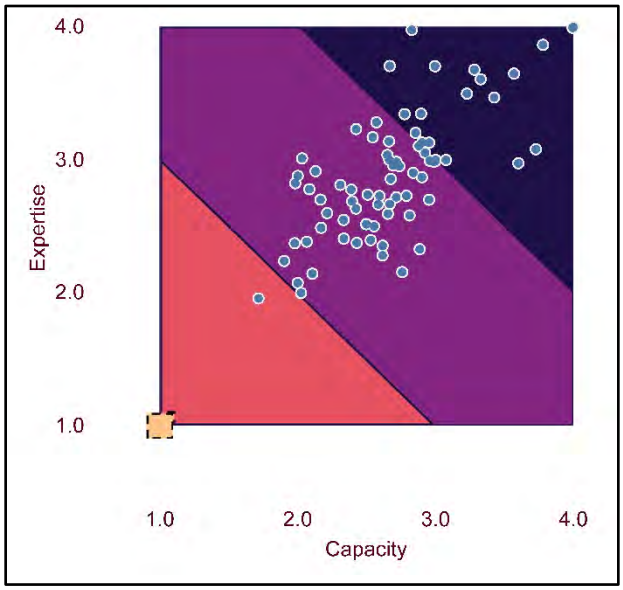
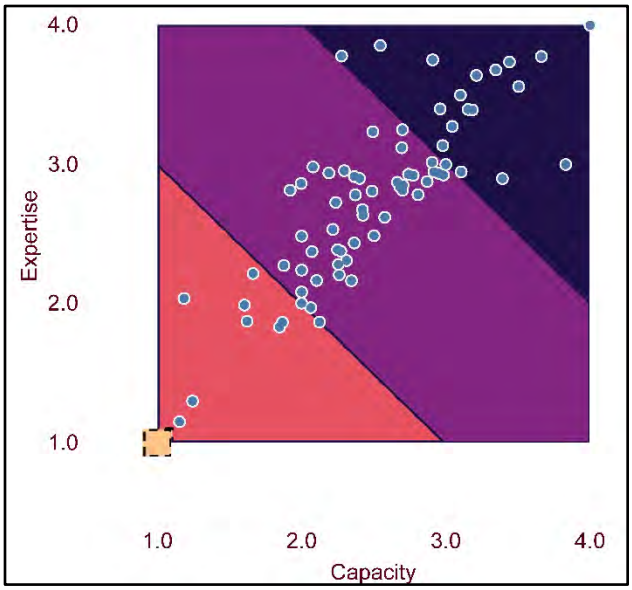


Figure 8. All Foundational Areas Plotted as Degree of Implementation



Analyses of Self-Assessment Data Across All Levels of the Assessment

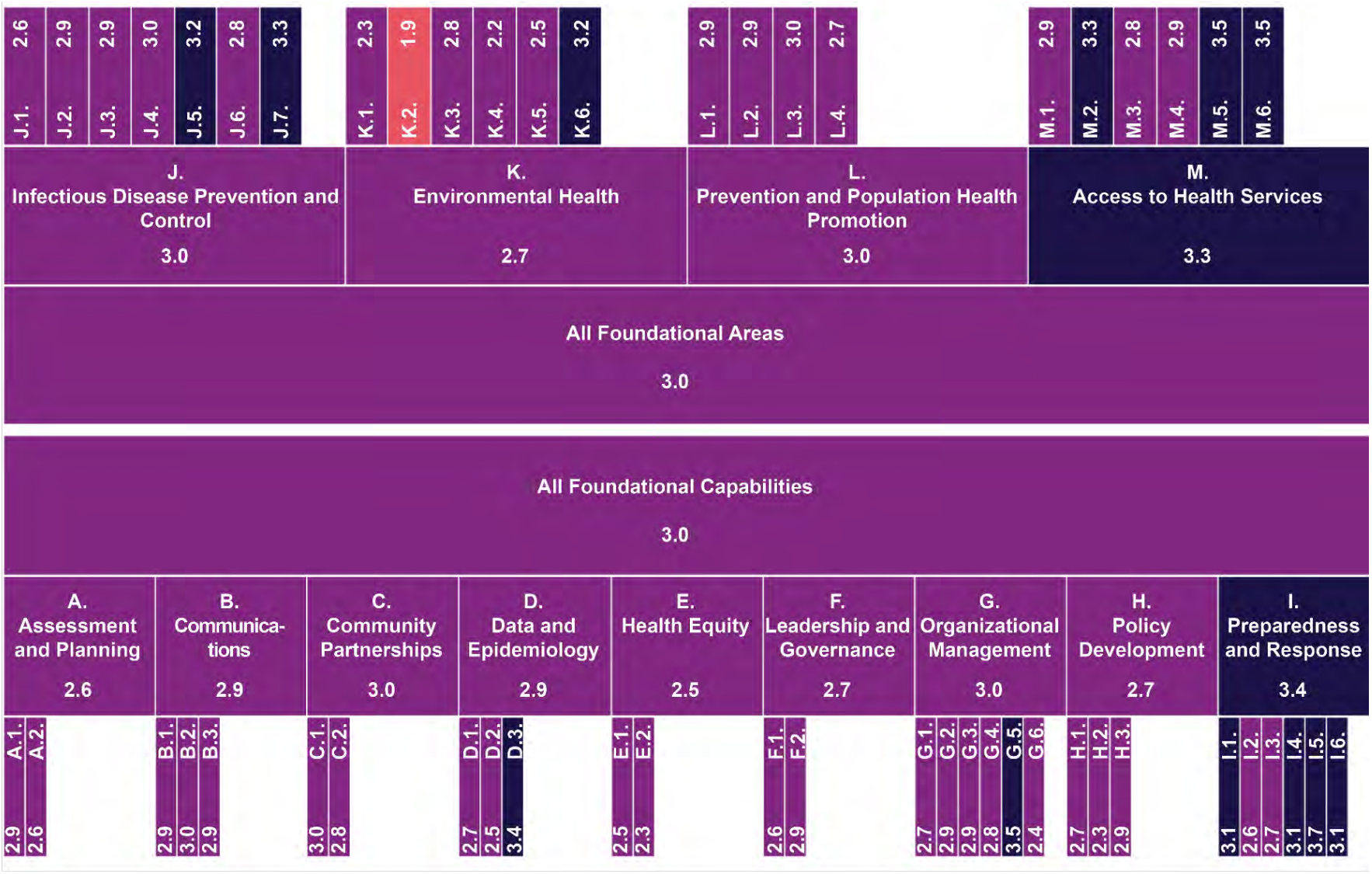
Overall Implementation of the FPHRs

Self-assessment scores were appraised across the entire FPHR framework (**Figure 9**). This 'icicle chart' displays scores for all FPHRs in one visualization; this is done in a cascading fashion from each Foundational Area or Capability to its respective headline responsibilities. Each element includes a label (all Foundational Areas and all Foundational Capabilities) or tag (foundational responsibilities and headline responsibilities) and with scores representing weighted averages for each element within their box following the label or tag and shading with respect to the scores. This is presented across three different versions: Statewide Implementation (**Figure 9**), for MDH alone (**Figure 10**), and for all LHDs Statewide (**Figure 11**). Icicle charts are also available for all LHDs and within individual agencies in the *Public Health Cost and Capacity Foundational Dashboards* (z.umn.edu/TransformMNPH_Dashboard).

Figure 9 shows partial implementation across the areas and capabilities, as well as most headline responsibilities. One headline responsibility, K.2. "Develop an environmental health prevention plan, as well asl plans for specific environmental health threats" was reported as minimally implemented. Both the capability *Preparedness and Response* and the area *Access to Health Services* were reported as substantially implemented. The former is unsurprising given the timing of the Assessment during the COVID-19 pandemic. However, the latter is more surprising given that both MDH and local health departments reported some of headline responsibilities in *Access to Health Services* as minimally implemented. Beyond the capability and area that were reported as substantially implemented, there were some individual headline responsibilities that were reported as substantially implemented; these included:

- **D.3.** Maintain infrastructure and capabilities for delivering public health laboratory services.
- **G.5.** Operations and Facilities.
- **J.5.** Conduct disease investigations and respond to infectious disease outbreaks.
- **J.7.** Maintain a statewide immunization program and assure availability of immunizations to the public.
- **K.6.** Conduct mandated environmental public health inspections and oversight to protect the public from hazards, in accordance with federal, state, and local laws and regulations.

Figure 9. Statewide Implementation of the FPHR Framework

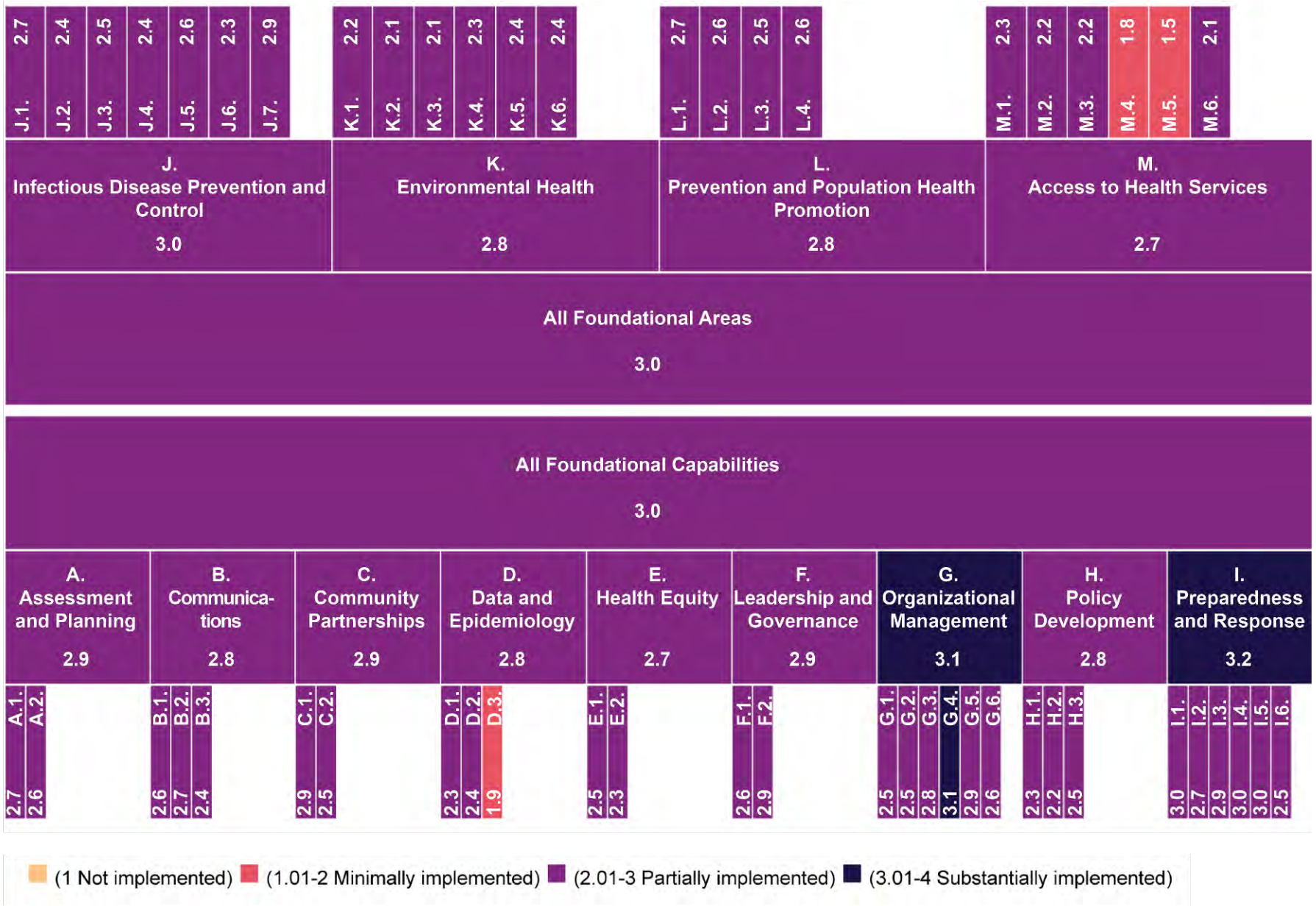


Note: Refer the section on **Minnesota's Foundational Public Health Responsibilities** as the key to this figure.

Figure 10. MDH Implementation of the FPHR Framework

Note: Refer the section on **Minnesota's Foundational Public Health Responsibilities** as the key to this figure.

Figure 11. All LHD Implementation of the FPHR Framework



Note: Refer the section on **Minnesota's Foundational Public Health Responsibilities** as the key to this figure.

Figure 10 shows these same results, but for only the state public health agency, MDH. MDH reports that the capability *Health Equity* is minimally implemented. MDH also reports several headline responsibilities beyond that capability, as minimally implemented, including:

- **C.2.** Engage the community, including those most impacted by health inequities, around public health priorities.
- **D.2.** Effectively communicate data and its analysis, including through responding to data requests.
- **G.4.** Financial Management
- **G.6.** Legal Services and Analysis
- **H.2.** Inform and influence policies being considered by others that affect public health (Health in All Policies).
- **I.2.** Conduct or participate in risk assessments.
- **K.1.** Provide timely, scientifically accurate, and locally relevant information on the environment and environmental threats and their control.
- **K.2.** Develop an environmental health prevention plan, as well as plans for specific environmental health threats.
- **K.3.** Implement population-based environmental health programs and strategies.
- **K.4.** Inform, communicate, work cooperatively with, and influence others who impact environmental health.
- **M.2.** Develop a plan to address gaps and barriers and assure access to clinical care services.

MDH also reported the capabilities *Communication* and *Preparedness and Response* and the area *Access to Health Services* as substantially implemented. Beyond the headline responsibilities in those foundational capabilities and areas, MDH also reported a few additional headline responsibilities as substantially implemented, including:

- **D.3.** Maintain infrastructure and capabilities for delivering public health laboratory services.
- **G.5.** Operations and Facilities
- **J.5.** Conduct disease investigations and respond to infectious disease outbreaks.
- **J.7.** Maintain a statewide immunization program and assure availability of immunizations to the public.

It is unsurprising that *Preparedness and Response* was reported as substantially implemented given the timing of the Assessment during the COVID-19 pandemic.

Figure 11 shows these same results, but for LHDs statewide. Overall, LHDs report the majority of FPHRs as partially implemented. This is unsurprising given the degree of variation in implementation in the FPHRs across the 74 LHDs. LHDs did collectively report three headline responsibilities as only minimally implemented, these headline responsibilities include:

- **D.3.** Maintain infrastructure and capabilities for delivering public health laboratory services.
- **M.4.** Examine and monitor health care quality, effectiveness, and cost-efficiency.
- **M.5.** Ensure licensed health care facilities and providers comply with laws and rules.

It is notable that both D.3. and M.4. are largely headline responsibilities that are delivered by the MHD. As such, it is likely that LHDs familiarity with and perception of this work may influence their self-assessment of its implementation in their jurisdiction.

LHDs did report both the foundational capabilities of *Organizational Management* and Preparedness and Response as substantially implemented. Substantial implementation of these two foundational capabilities is unsurprising given two separate reasons. As discussed previously, it is unsurprising that Preparedness and Response was reported as substantially implemented given the timing of the Assessment during the COVID-19 pandemic. For LHDs, it is unsurprising that Organizational Management was reported as substantially implemented, as it includes the "infrastructure" activities that LHDs need to simply exist. That is, without these activities (particularly, G.4. "Financial Management," which was also reported as substantially implemented) LHDs would not even be able to exist as government departments and standalone government agencies.

Key Finding: *FPHRs were found to be partially implemented overall by all LHDs and MDH with large variation in HR implementation observed for LHDs across the state. Discrepancies in self-reported implementation exist between LHDs and MDH for regulatory and compliance responsibilities.*

Mapping Implementation of the FPHRs

Choropleth maps were created using the discussed HR composites (52 maps), weighted foundational responsibility scores (13 maps), all FCs (1 map, seen in **Figure 12)**, all FAs (1 map, seen in **Figure 13**), and overall FPHRs (1 map, see **Figure 14** in the **Description of Minnesota's Public Health Network** section). All choropleth maps are available in the *Public Health Cost and Capacity Network Analysis Dashboard* (z.umn.edu/TransformMNPH_Network). The dashboard has three tabs: Headline Responsibilities (filterable by HR), Foundational Responsibilities (filterable by individual Foundational Capability or Area), and Overall Maps (contains the maps seen in **Figure 10**, **Figure 11**, and **Figure 12**). All tabs include a toggle to display or hide network relationships. For the latter two tabs, the thickness of the network relationship line indicates the number of headline responsibilities for which a sharing relationship was identified.

Figure 12 highlights regional variation in overall implementation of the Foundational Capabilities. Many LHDs in the Metro report, in aggregate, high levels of implementation for Foundational Capabilities, compared to South Central, Southwest, and Northwest Minnesota, where relatively more LHDs report Partially Implemented scores overall for Foundational Capabilities. Notably, however, the vast majority of agencies report high levels of implementation for Foundational Capabilities overall.

Unlike the uniformly high Foundational Capabilities, Foundational Areas (seen in **Figure 13**) vary widely through the state. While the Metro region generally reports substantial implementation of the Foundational Areas, minimal to partial implementation is observed in the regions outside the metro.

This space intentionally left blank

Figure 12. Local Health Department Degree of Implementation for Foundational Capabilities

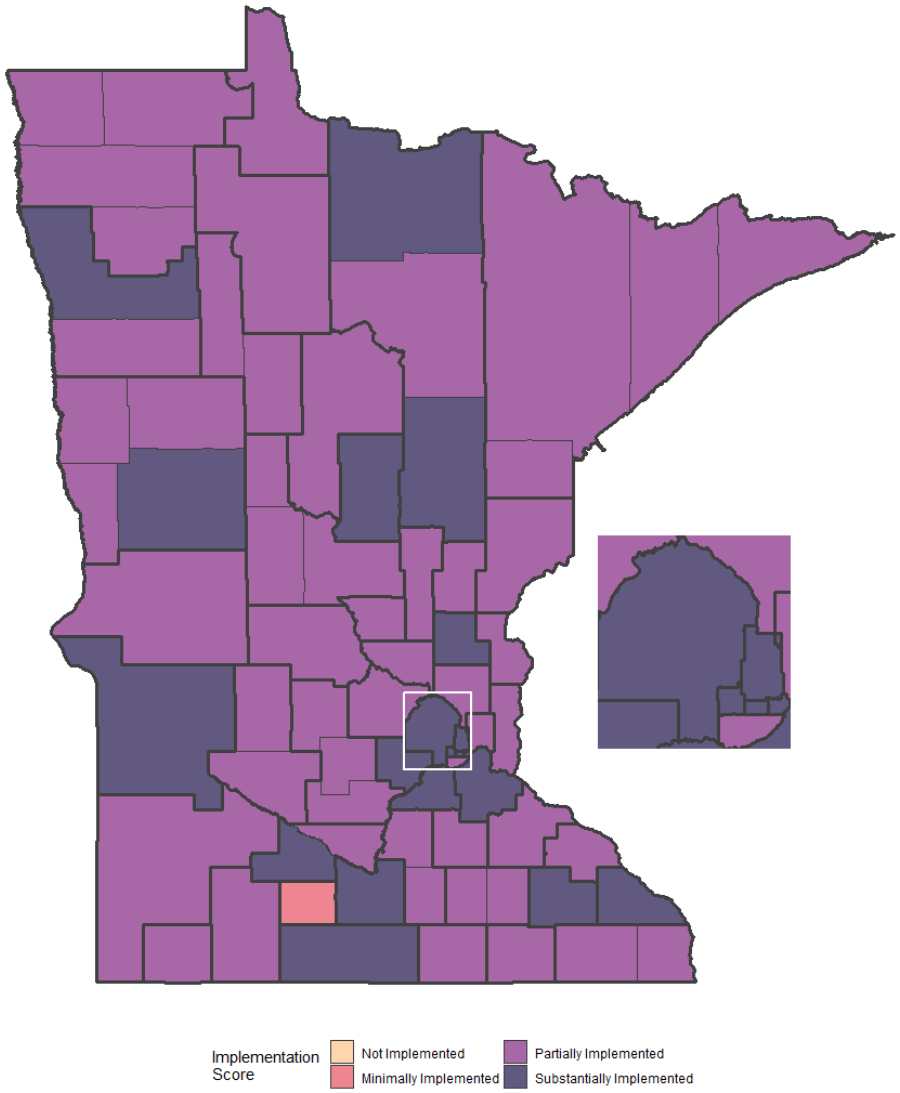
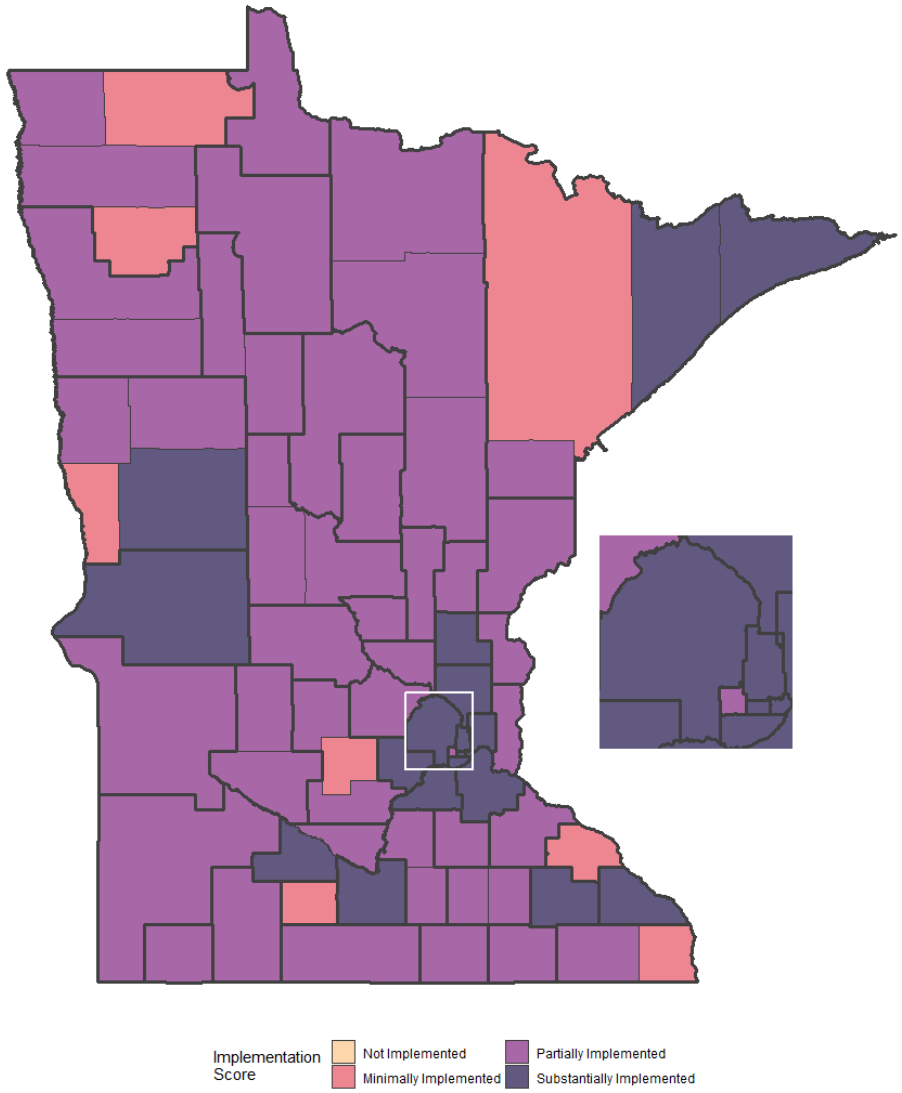


Figure 13. Local Health Department Degree of Implementation for Foundational Areas



Description of Minnesota's Public Health Network

As discussed previously, the FPHRs are the role and responsibility of the governmental public health system, including both MDH and LHDs (and their CHBs). The FPHR operational definitions are agnostic to whether state or LHDs deliver them, with the majority but not all FPHR activities either being delivered centrally by MDH or in a decentralized manner by CHBs and LHDs for their own service areas. However, the options for governance and service delivery for individual FPHR activities are much broader and complex, with a plethora of different types of sharing relationships and interlocal agreements. To understand the paradigms for service delivery in the state, all 74 LHDs and MDH submitted data that described resource and service sharing relationships for their agency for each HR. Of primary interest for the network analysis were sharing arrangements in place between CHBs and their LHDs. These public-public sharing arrangements are described as "cross-jurisdictional sharing," which is defined as "the deliberate exercise of public authority to enable collaboration across jurisdictional boundaries to deliver public health services and solve problems that cannot be easily solved by single organizations or jurisdictions.[25]" As part of the network analysis, the cross-jurisdictional sharing of services was characterized and mapped; summative sharing relationships were overlayed on a statewide map that displays overall FPHR implementation are seen in **Figure 14**. Choropleth and network maps for each HR, foundational responsibility, and overall implementation are available at z.umn.edu/TransformMNPH_Network.

Interlocal Relationships

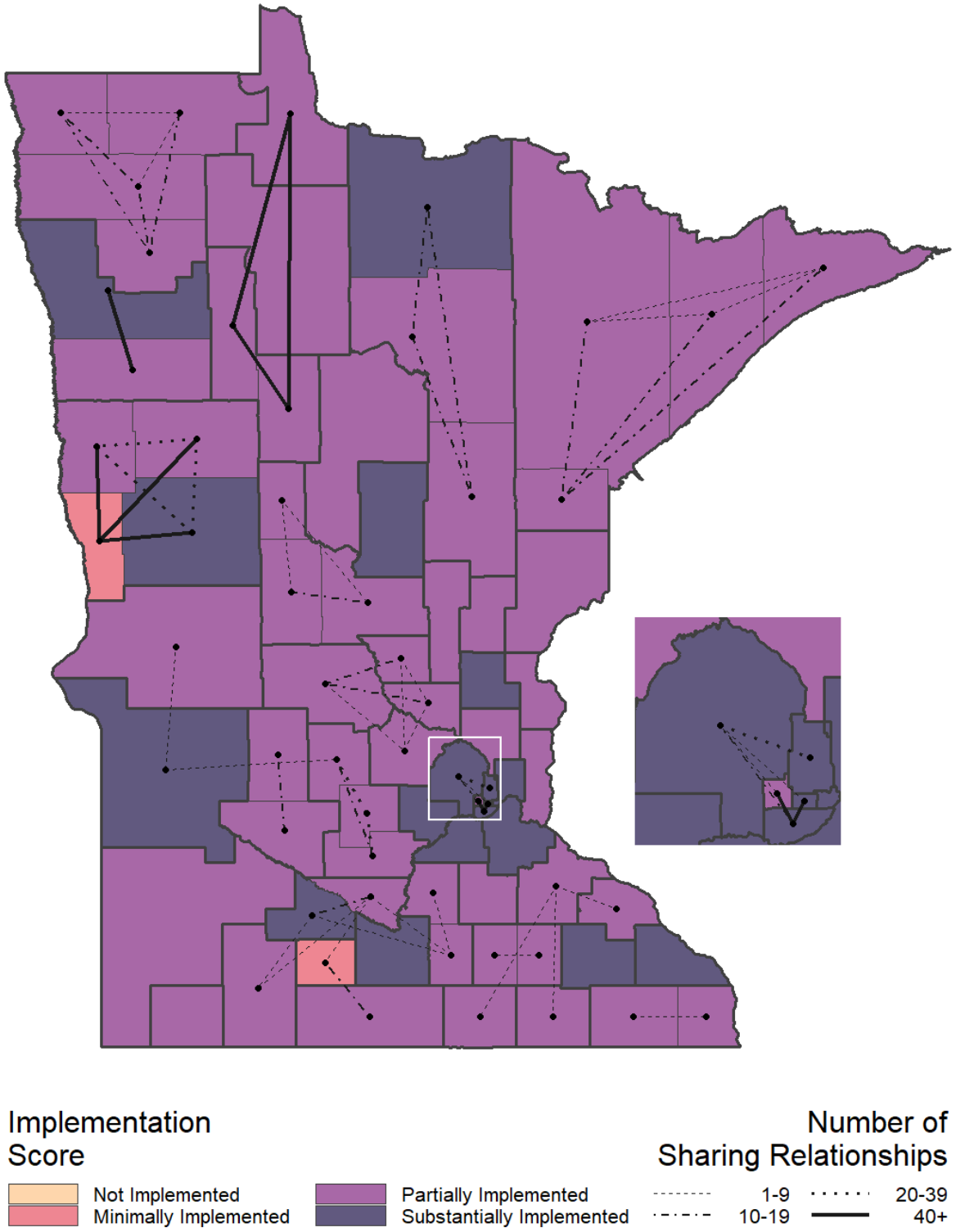
Most health departments reported some sort of inter-local sharing arrangement for at least one HR. The average number of interlocal connections between LHDs across HRs was 17 (i.e., LHDs partnered to deliver or assure 17 of the 52 HRs). The largest number of interlocal connections was present in the HR "*Develop, monitor, track, and update health improvement plans*" (*n* = 38) and the smallest number of connections was present for the HR "*Ensure licensed health care facilities and providers comply with laws and rules*" (*n* = 2). The foundational responsibilities with the highest density and distribution of sharing arrangements across Minnesota were *Assessment and Planning* and *Leadership and Governance*, followed by *Prevention and Population Health Improvement*. The foundational responsibilities with the lowest density and distribution of sharing arrangements were *Access to Health Services*, *Data and Epidemiology*, and *Infectious Disease Prevention and Control*.

Though many relationships were observed amongst LHDs, higher densities of connections were between members within partially integrated CHBs, such as Partnership 4 Health and North Country. Notably, the CHBs for the cities of Bloomington, Richfield, and Edina were also substantially interconnected (see inset of **Figure 14**). Most sharing reported by LHDs in the northern parts of Minnesota were between LHDs within their CHBs, whereas LHDs in the southern parts of Minnesota included many instances of sharing between CHBs and across regions. Overall, sharing relationships were indicative of existing governances (i.e., CHBs) and other natural sharing partnerships.

State-Local Relationships

Overall, 59 of Minnesota's 74 LHDs indicated that they share at least one HR with MDH. Among those 59 LHDs, an average of 17 HRs were shared with MDH. The headline responsibilities that were most frequently shared were those within *Data and Epidemiology*, and those within *Infectious Disease Prevention and Control*, *Environmental Health*, and *Access to Health Services*; notably, these headline responsibilities were those with strong regulatory or regional components. Regarding specific written documents and organizational policies, LHDs were generally unlikely to partner with MDH in devising plans and policies. Of LHDs who did indicate such a partnership (*n* = 21), most indicated partnering on written plans and documents for infectious disease prevention and control (*n* = 7), policies for issuing and enforcing state and local emergency health orders (*n* = 7), and policies for rapidly responding to emerging public health issues (*n* = 6). It is likely that many health departments underreported sharing relationships with MDH, particularly for headline responsibilities in which there is a strong regulatory or compliance role performed by the state.

Figure 14. Summative Sharing Relationships Overlayed on Overall FPHR implementation



OTHER NETWORK FINDINGS

Within the open-ended responses corresponding to collaboration, some LHDs indicated sharing relationships including with private partners (e.g., health systems, hospitals, non-profits/community organizations) and other unrelated organizations such as law enforcement agencies, county attorneys, local zoning and parks departments, local or regional Medical Reserve Corps (MRC), and also with federal agencies such as Health Resources and Services Administration (HRSA), Centers for Disease

Control and Prevention (CDC), and Food and Drug Administration (FDA). As these non-governmental public health partners could not be mapped and many do not fall within Minnesota's governmental public health system (and therefore were not themselves participants in this Assessment), additional network analyses were not performed for these organizations.

> **Key Finding:** *Sharing relationships were indicative of existing governance structures, such as within multi-county community health boards and other natural sharing partnerships. Relationships were likely underreported.*

Estimates of Resources Needed to Implement the FPHRs

Current Spending and Effort Estimates

Governmental public health departments in Minnesota expend significant resources to achieve their current implementation of the FPHRs. As part of the Assessment, MDH, CHBs, and LHDs allocated their FY 2021 spending divided by the FPHR HRs, to understand how much they spent on each HR and the FPHRs overall. As a reminder, the FPHRs are the subset of governmental public health services "needed everywhere to work anywhere" so these totals only represent a fractional share of the governmental public health system's spending in FY 2021.

The total estimated spending by a governmental public health department on the FPHRs can be interpreted as the level of spending required to achieve the implementation levels achieved in 2021 and shown in previous exhibits. This should not be confused with the amount of revenue needed to achieve this level of implementation. The inflexibility, unpredictability, and insecurity of governmental public health revenues in Minnesota is such that the amount of revenue needed to achieve this spending is likely greater than the spending itself. As noted in **Brief Methods** and **Detailed Methods** (**Appendix B**), few modifications were made to the data, excepting inflation adjustments and standardizing FTEs to a 2,080-hour work year. There was one notable exception, which is explicated—decrementing or "backing out" COVID-19 related spending and FTEs to allow the gap for incident response to be in line, proportionately, with other areas to allow for generating a post-pandemic 'gap.' Given FY 2021 and SFY 2022 included substantial pandemic response, this does represent important modifications to the data, which are transparently detailed in the methods and appendices.

Detailed effort and spending analyses are available for all LHDs in FY 2021, MDH in SFY 2022, and for statewide estimates in the 2021 local and state periods; all data were adjusted to reflect real 2022 dollars. **Table 10** shows the adjusted total "current spending" on FPHRs by all LHDs amounted to just over **$194 million**, total spending on FPHRs by MDH was just over **$199 million**, with the combined spending on FPHRs by both LHDs and MDH exceeded **$393 million**. This estimate does not include pass-through or capital expenditures as estimates were intended to focus on reliable operational expenditures on the FPHRs (including pass-throughs for MDH would lead to double counting with LHD expenditures). The LHD and MDH columns of **Table 10** show, respectively, the distribution of MDH and LHD's current spending on foundational responsibilities. The distribution of spending across foundational responsibilities differed considerably between LHD and MDH, highlighting a degree of variation in their financial allocation strategies.

Table 10. Current Spending and Effort on FPHRs

Foundational Responsibilities	Minnesota Department of Health Spending (2022 $)		Minnesota Department of Health FTEs (2080hrs)	All Local Health Departments Spending (2022 $)		All Local Health Departments FTEs (2080hrs)	Statewide Public Health System Spending (2022 $)		Statewide Public Health System FTEs (2080hrs)
Foundational Capabilities	**$69,200,000**	***per capita***	**475**	**$96,900,000**	***per capita***	**635**	**$166,000,000**	***per capita***	**1100**
Assessment and Planning	$1,100,000	*$0.20*	10	$3,600,000	*$0.65*	30	$4,700,000	*$0.80*	35
Communications	$3,100,000	*$0.55*	30	$4,300,000	*$0.75*	30	$7,400,000	*$1.30*	60
Community Partnerships	$2,100,000	*$0.35*	25	$14,200,000	*$2.50*	80	$16,200,000	*$2.85*	105
Data and Epidemiology	$12,200,000	*$2.15*	75	$4,900,000	*$0.85*	35	$17,100,000	*$3.00*	110
Health Equity	$1,800,000	*$0.30*	20	$3,700,000	*$0.65*	25	$5,600,000	*$0.95*	45
Leadership and Governance	$4,800,000	*$0.85*	30	$4,500,000	*$0.80*	25	$9,300,000	*$1.60*	60
Organizational Management	$27,700,000	*$4.85*	185	$38,600,000	*$6.75*	225	$66,200,000	*$11.60*	410
Policy Development	$1,300,000	*$0.25*	10	$3,300,000	*$0.55*	25	$4,600,000	*$0.80*	30
Preparedness and Response	$15,100,000	*$2.65*	90	$19,800,000	*$3.45*	160	$34,900,000	*$6.10*	245
Foundational Areas	**$129,900,000**		**1100**	**$97,400,000**		**590**	**$227,100,000**		**1680**
Infectious Disease Prevention and Control	$16,400,000	*$2.85*	150	$18,900,000	*$3.30*	105	$35,300,000	*$6.20*	255
Environmental Health	$34,400,000	*$6.05*	340	$23,600,000	*$4.15*	165	$58,000,000	*$10.15*	500
Prevention and Population Health Improvement	$28,900,000	*$5.05*	245	$46,300,000	*$8.10*	245	$75,100,000	*$13.15*	490
Access to Health Services	$50,200,000	*$8.80*	365	$8,600,000	*$1.50*	75	$58,700,000	*$10.30*	435
Total	**$199,100,000**	***$34.90***	**1575**	**$194,300,000**	***$34.00***	**1225**	**$393,100,000**	***$68.80***	**2780**

The current allocation of FPHR spending was heavily concentrated in two foundational capabilities: *Organizational Management* (accounting for 16.84% of the current spending statewide) and *Preparedness and Response* (accounting for 8.88% of the current spending statewide) and the foundational areas, accounting for 8.98% (*Infectious Disease Prevention and Control*) to 19.10% (*Prevention and Health Improvement*) of current spending statewide. *Policy development, Assessment and Planning*, as well as *Health Equity*, constitute the capabilities with the least current spending pattern, accounting for 1.17%, 1.20%, and 1.42% respectively. These percentages correspond largely with self-evaluated scores, revealing explicit shortcomings in the degree of implementation in these areas.

Estimates of Resources Needed for Full Implementation

The previous analysis of the current implementation of the FPHRs showed that Minnesota's governmental public health system was not able to fully implement the FPHRs in FY 2021 with the resources available. This implies that additional resources will be needed to achieve full implementation and the amount can be described as the additional increment of spending to achieve full implementation (the "additional increment").

The additional increment is the additional governmental public health system spending that would be needed to generate the incremental increase in capacity and expertise to achieve full implementation statewide. As part of the Assessment, MDH, CHBs, and LHDs estimated the total cost of fully implementing the FPHRs for their jurisdictions based on the current governance and service delivery paradigm.

As noted in **Brief Methods** and **Detailed Methods** (**Appendix B**), for LHDs this data was refined using a power model to ensure the full implementation estimate and gap were truly sufficient to achieve full implementation. Using the LHD's FTE curve (**Figure 15**) and spending curve (**Figure 16**), ranges for full implementation FTE and spending estimates were determined. In **Figure 15**, the left chart shows the results of an exercise in which 69 participating LHDs reported on how many FTEs they would need to conduct various FPHRs. On the right the arrows visualize bringing those agencies below the 'floor' established by the statistical model, as well as the 'upper bound' of need associated with what agencies say they need, beyond what the model fit suggests overall, statewide. **Figure 16** illustrates how our model establishes a floor based on peer estimates for delivery of the FPHS.

Figure 15. Modeling the Gap in FTEs Needed by LHDs (FTEs per 100,000 people served)

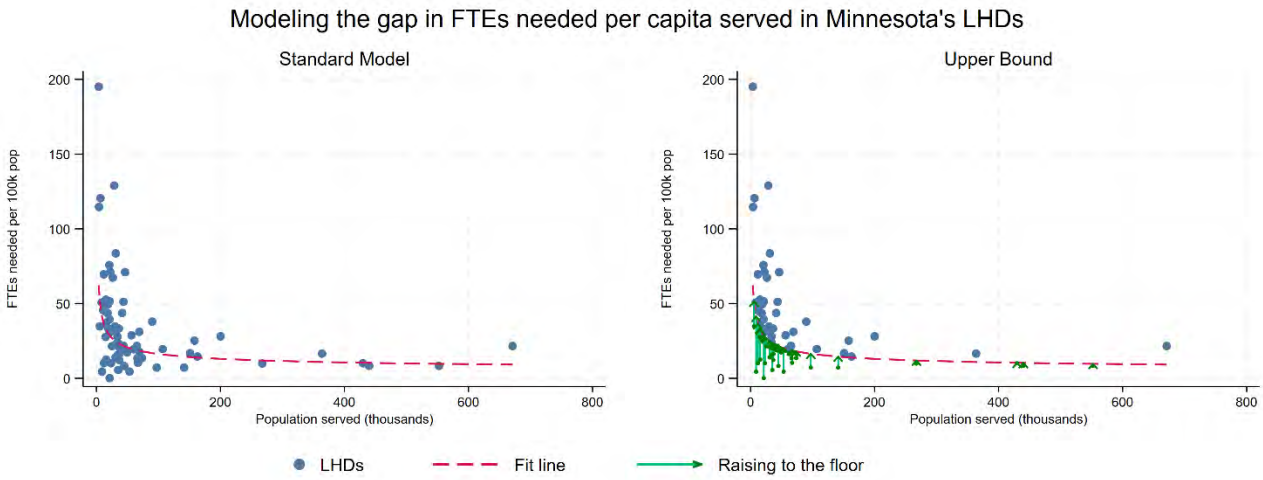
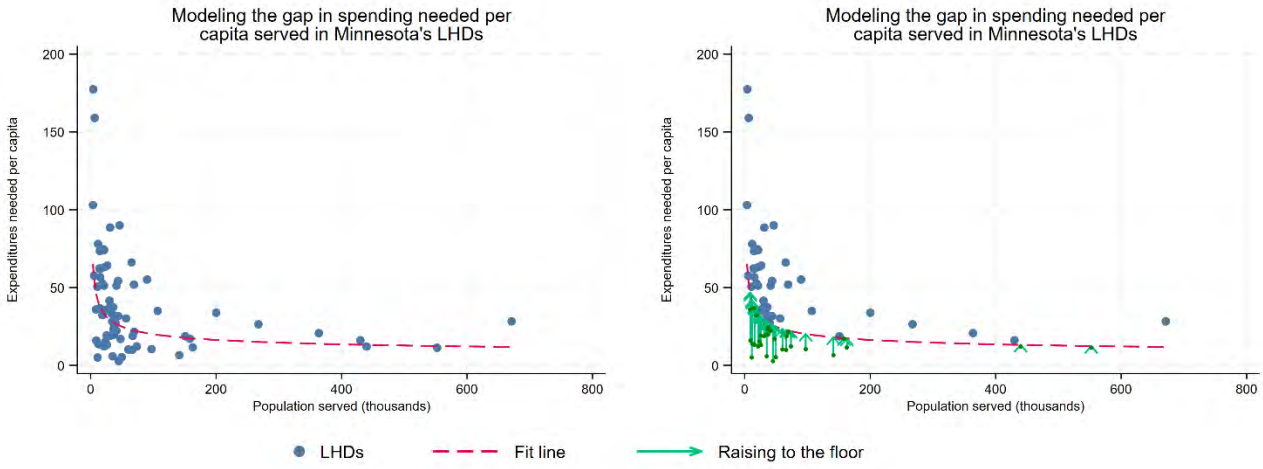


Figure 16. Modeling the Gap in Spending Needed by LHDs (2022 $ per 100,000 people served)



The results of this analysis, the estimated costs of fully implementing FPHRs statewide and for MHD and LHDs separately, are summarized in **Table 12**. As reported in this table the estimated annual cost of providing fully implemented FPHR for all LHD and MDH would be **$950 million.** MDH's activities are approximately two-thirds of this full implementation estimate, while all LHDs are the other third.

Table 11. Spending and Effort Needed to Fully Implement FPHRs

	Minnesota Department of Health			All Local Health Departments			Statewide Public Helath System		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$164,600,000**	***per capita***	**740**	**$161,100,000**	***per capita***	**1190**	**$325,700,000**	***per capita***	**1930**
Assessment and Planning	$3,700,000	*$0.65*	25	$8,600,000	*$1.50*	70	$12,300,000	*$2.15*	95
Communications	$10,200,000	*$1.80*	60	$9,800,000	*$1.70*	80	$20,000,000	*$3.50*	140
Community Partnerships	$12,500,000	*$2.20*	35	$19,700,000	*$3.45*	140	$32,200,000	*$5.65*	175
Data and Epidemiology	$21,400,000	*$3.75*	120	$10,900,000	*$1.90*	95	$32,300,000	*$5.65*	215
Health Equity	$8,200,000	*$1.45*	30	$8,800,000	*$1.55*	70	$17,000,000	*$3.00*	100
Leadership and Governance	$5,800,000	*$1.00*	40	$8,500,000	*$1.50*	55	$14,400,000	*$2.50*	95
Organizational Management	$52,800,000	*$9.25*	190	$53,300,000	*$9.35*	360	$106,000,000	*$18.60*	550
Policy Development	$3,100,000	*$0.55*	20	$7,700,000	*$1.35*	60	$10,800,000	*$1.90*	80
Preparedness and Response	$46,800,000	*$8.20*	225	$33,800,000	*$5.95*	265	$80,600,000	*$14.15*	485
Foundational Capabilities	**$452,900,000**	*$0.00*	**1855**	**$171,400,000**		**1140**	**$624,300,000**	*$0.00*	**2990**
Infectious Disease Prevention and Control	$50,500,000	*$8.85*	245	$30,400,000	*$5.35*	205	$80,900,000	*$14.15*	450
Environmental Health	$120,100,000	*$21.05*	650	$36,400,000	*$6.40*	260	$156,500,000	*$27.40*	910
Prevention and Population Health Improvement	$106,900,000	*$18.75*	510	$78,600,000	*$13.80*	515	$185,500,000	*$32.50*	1025
Access to Health Services	$175,400,000	*$30.75*	450	$26,000,000	*$4.55*	160	$201,400,000	*$35.30*	615
Total	**$617,400,000**	***$108.20***	**2595**	**$332,500,000**	***$58.25***	**2330**	**$950,000,000**	***$166.45***	**4920**

These totals were then used to impute the additional increment between full implementation and current spending. The *full* gap is estimated at approximately $556.8 million, as shown in **Table 12**. The

overall annual gap in spending among LHDs is estimated at approximately **$138 million** (range $91–$155 million), with a corresponding FTE gap of **1,110 FTEs**. For MDH, the annual gap in spending is estimated at **$418 million** with a corresponding FTE gap of **1,020 FTEs**. Spending and FTE needs are not equally distributed across foundational capabilities and areas. Among LHDs, *Prevention and Population Health Improvement* is the largest area of full implementation spending at approximately $79 million ($14 per capita), followed by *Organizational Management* ($9 per capita), *Environmental Health* ($6 per capita), and *Preparedness and Response* ($6 per capita). Statewide, at least 510 FTE are needed in *Prevention and Population Health Improvement*, 260 FTE in *Environmental Health*, and 265 FTE in *Preparedness and Response*. Additional detail on full implementation and current spending and staffing is available at z.umn.edu/TransformMNPH_Network.

Table 12. Gap in Spending and Effort on FPHRs

	Minnesota Department of Health			All Local Health Departments			Statewide Public Health System		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$95,400,000**	***per capita***	**265**	**$64,200,000**	***per capita***	**560**	**$159,600,000**	***per capita***	**835**
Assessment and Planning	$2,700,000	*$0.45*	15	$4,900,000	*$0.85*	45	$7,600,000	*$1.35*	60
Communications	$7,100,000	*$1.25*	30	$5,500,000	*$0.95*	50	$12,600,000	*$2.20*	80
Community Partnerships	$10,400,000	*$1.85*	10	$5,500,000	*$0.95*	60	$15,900,000	*$2.80*	70
Data and Epidemiology	$9,200,000	*$1.60*	40	$6,000,000	*$1.05*	60	$15,200,000	*$2.65*	105
Health Equity	$6,400,000	*$1.10*	10	$5,100,000	*$0.90*	45	$11,500,000	*$2.00*	55
Leadership and Governance	$1,100,000	*$0.20*	10	$4,000,000	*$0.70*	30	$5,100,000	*$0.90*	35
Organizational Management	$25,100,000	*$4.40*	5	$14,700,000	*$2.60*	130	$39,800,000	*$6.95*	140
Policy Development	$1,700,000	*$0.30*	10	$4,500,000	*$0.80*	35	$6,200,000	*$1.10*	50
Preparedness and Response	$31,700,000	*$5.55*	135	$14,000,000	*$2.45*	105	$45,700,000	*$8.00*	240
Foundational Areas	**$323,000,000**	*$0.00*	**755**	**$74,100,000**	*$0.00*	**550**	**$397,200,000**	*$0.00*	**1300**
Infectious Disease Prevention and Control	$34,100,000	*$5.95*	90	$11,500,000	*$2.00*	100	$45,600,000	*$8.00*	190
Environmental Health	$85,700,000	*$15.00*	310	$12,800,000	*$2.25*	95	$98,500,000	*$17.25*	405
Prevention and Population Health Improvement	$78,000,000	*$13.65*	265	$32,400,000	*$5.65*	265	$110,400,000	*$19.35*	530
Access to Health Services	$125,200,000	*$21.95*	90	$17,400,000	*$3.05*	90	$142,700,000	*$25.00*	175
Total	**$418,400,000**	***$73.25***	**1020**	**$138,300,000**	***$24.20***	**1110**	**$556,800,000**	***$97.55***	**2135**

MDH's gap ($418 million) is quite large and includes a gap of $136 million in labor costs and $282 million in other operating expenditures, including direct contracts in support of public health activities (**Table 13**). The gap in other operating expenditures is particularly large because a large amount of the other operating activities in FY 2021 were expended on activities related to the COVID-19 pandemic which, as discussed previously were decremented to allow the gap for incident response to be in line, proportionately, with other areas to allow for generating a post-pandemic 'gap.' It is likely that had the COVID-19 pandemic not occurred or if data collection had been done for a period that did not include the COVID-19 pandemic, then more current operating expenditures would have been reported and this gap would be much smaller.

Table 13. Minnesota Department of Health Labor and Non-Labor Spending and Effort on FPHRs

Foundational Responsibilities	Labor Expenditures (2022 $)	Other Operating Expenditures (2022 $)	Total Expenditures (2022 $)	FTEs (2080hrs)
		Current Implementation		
Foundational Capabilities	**$46,900,000**	**$22,100,000**	**$69,200,000**	**475**
Assessment and Planning	$1,100,000	$00,000	$1,100,000	10
Communications	$2,900,000	$200,000	$3,100,000	30
Community Partnerships	$2,100,000	$00,000	$2,100,000	25
Data and Epidemiology	$8,400,000	$3,800,000	$12,200,000	75
Health Equity	$1,700,000	$100,000	$1,800,000	20
Leadership and Governance	$4,100,000	$600,000	$4,800,000	30
Organizational Management	$17,800,000	$9,800,000	$27,700,000	185
Policy Development	$1,300,000	$00,000	$1,300,000	10
Preparedness and Response	$7,500,000	$7,600,000	$15,100,000	90
Foundational Areas	**$120,100,000**	**$9,800,000**	**$129,900,000**	**1100**
Infectious Disease Prevention and Control	$15,200,000	$1,200,000	$16,400,000	150
Environmental Health	$34,200,000	$200,000	$34,400,000	340
Prevention and Population Health Improvement	$27,500,000	$1,400,000	$28,900,000	245
Access to Health Services	$43,200,000	$7,000,000	$50,200,000	365
Total	**$167,000,000**	**$31,900,000**	**$199,100,000**	**1575**
		Full Implementation		
Foundational Capabilities	**$80,300,000**	**$84,300,000**	**$164,500,000**	**745**
Assessment and Planning	$2,900,000	$900,000	$3,700,000	25
Communications	$6,200,000	$4,000,000	$10,200,000	60
Community Partnerships	$3,700,000	$8,800,000	$12,500,000	35
Data and Epidemiology	$12,200,000	$9,200,000	$21,400,000	120
Health Equity	$3,100,000	$5,100,000	$8,200,000	30
Leadership and Governance	$5,100,000	$700,000	$5,800,000	40
Organizational Management	$20,200,000	$32,600,000	$52,800,000	190
Policy Development	$2,800,000	$300,000	$3,100,000	20
Preparedness and Response	$24,100,000	$22,700,000	$46,800,000	225
Foundational Areas	**$223,200,000**	**$229,800,000**	**$452,900,000**	**1855**
Infectious Disease Prevention and Control	$25,700,000	$24,800,000	$50,500,000	245
Environmental Health	$84,000,000	$36,100,000	$120,100,000	650
Prevention and Population Health Improvement	$54,100,000	$52,800,000	$106,900,000	510
Access to Health Services	$59,400,000	$116,100,000	$175,400,000	450
Total	**$303,500,000**	**$314,100,000**	**$617,400,000**	**2600**
		Gap		
Foundational Capabilities	**$33,300,000**	**$62,100,000**	**$95,400,000**	**265**
Assessment and Planning	$1,800,000	$900,000	$2,700,000	15
Communications	$3,300,000	$3,800,000	$7,100,000	30
Community Partnerships	$1,600,000	$8,800,000	$10,400,000	10
Data and Epidemiology	$3,800,000	$5,400,000	$9,200,000	40
Health Equity	$1,400,000	$5,000,000	$6,400,000	10
Leadership and Governance	$1,000,000	$100,000	$1,100,000	10
Organizational Management	$2,400,000	$22,700,000	$25,100,000	5
Policy Development	$1,400,000	$300,000	$1,700,000	10
Preparedness and Response	$16,600,000	$15,100,000	$31,700,000	135
Foundational Areas	**$103,100,000**	**$220,000,000**	**$323,000,000**	**755**
Infectious Disease Prevention and Control	$10,500,000	$23,600,000	$34,100,000	90
Environmental Health	$49,800,000	$35,900,000	$85,700,000	310
Prevention and Population Health Improvement	$26,600,000	$51,400,000	$78,000,000	265
Access to Health Services	$16,200,000	$109,100,000	$125,200,000	90
Total	**$136,400,000**	**$282,100,000**	**$418,400,000**	**1020**

As discussed previously, the additional increment is a measurement of spending and effort may be less than the additional revenues needed to fully implement the FPHRs, as that value will also be dependent on the alignment of funding responsibilities and the security, predictability, and flexibility of existing and additional revenues. Further, the incremental amount perspective belies the potentially transformative nature of fully implementing the FPHRs such that full implementation spending and effort may not simply include those currently expended plus those resources represented by the additional increment (that is, as part of full implementation governmental public health agencies may choose to "buy" a different mix of labor and non-labor resources than what they are currently buying as part of their strategy to fully implement FPHRs).

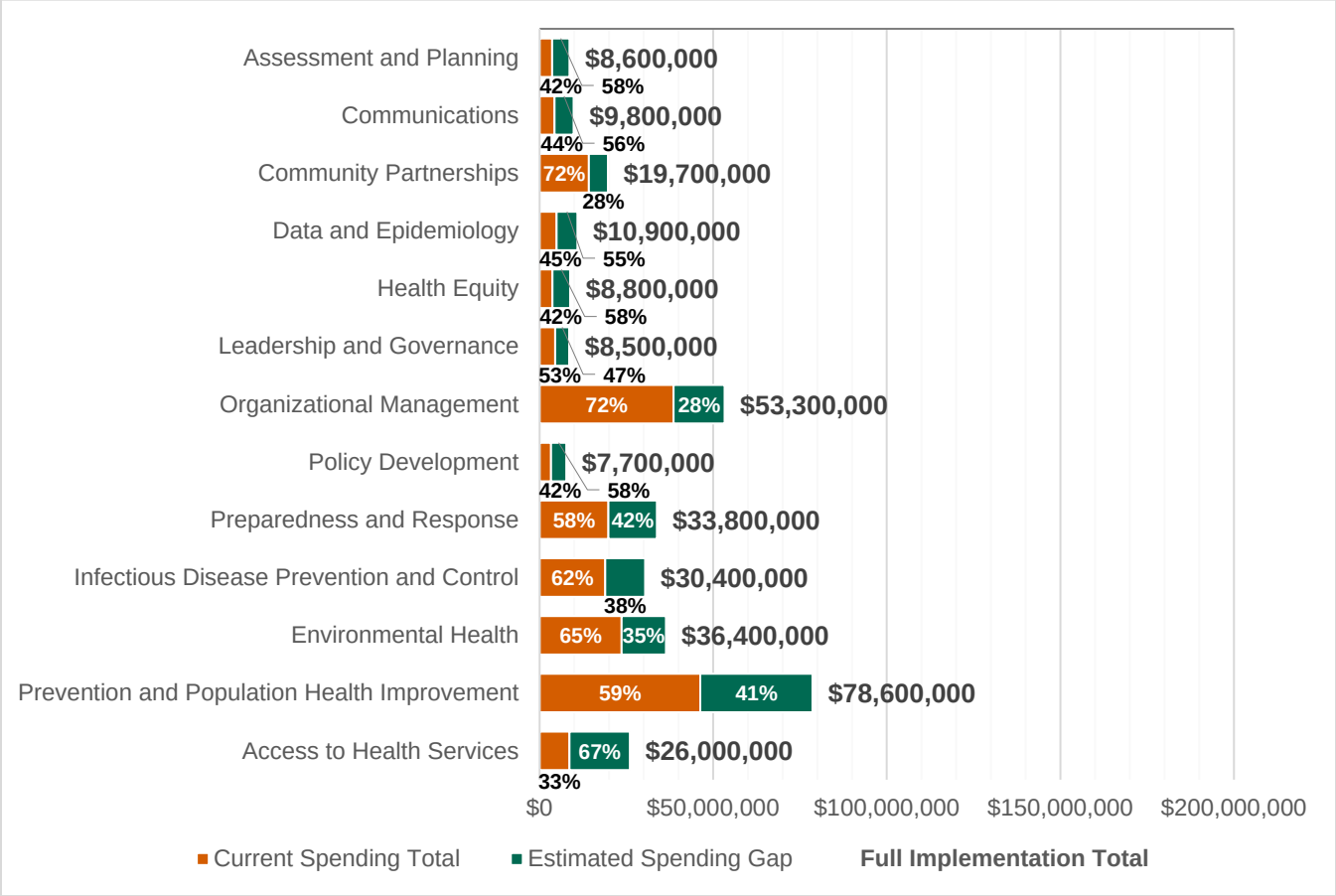
Like the FY 2021 current spending allocations, the full implementation cost estimate and imputed additional increment are point-in-time, planning-level estimates of the regular, annual costs to the governmental public health system for just the FPHRs, which are only a subset of public health services. These costs do not include capital expenditures, nor one-time costs or optimization expenses that may be associated with increasing scale or improving efficiency and effectiveness as a part of full implementation. These estimates also do not consider how costs may change due to the constantly evolving nature of public health work. More information about the limitations of these estimates is available in the section below.

Distributions of current spending and gap estimates, which summed together equal full implementation estimates, are available for all LHDs (**Figure 17**), MDH (**Figure 18**), and for statewide estimates (**Figure 19**). Each table further illustrates distribution of full implementation spending, a larger proportion of upstream activities—predominantly consisting of services such as overhead and infrastructure —are executed more comprehensively relative to certain downstream initiatives which are fundamentally targeted at amplifying public health outcomes and span a range of population-based actions.

As shown in **Figure 17** LHDs' largest spending gaps, in terms of the additional dollars needed to achieve full implementation, are in *Prevention and Health Promotion* ($32.4 million in additional spending needed to achieve full implementation), *Access to Health Services* ($17.4 million in additional spending needed to achieve full implementation), *Organizational Management* ($14.7 million in additional spending needed to achieve full implementation), and *Preparedness and Response* ($14 million in additional spending needed to achieve full implementation). However, when considering the size of the gap relative to the full implementation cost, several areas have gaps that are greater than 50% of full implementation cost. These areas include:

- *Access to Health Services* (with a gap of 67% of full implementation cost),
- *Policy Development* (with a gap of 58% of full implementation cost),
- *Health Equity* (with a gap of 58% of full implementation cost),
- *Assessment and Planning* (with a gap of 57% of full implementation cost),
- *Communications* (with a gap of 56% of full implementation cost), and
- *Data and Epidemiology* (with a gap of 55% of full implementation cost).

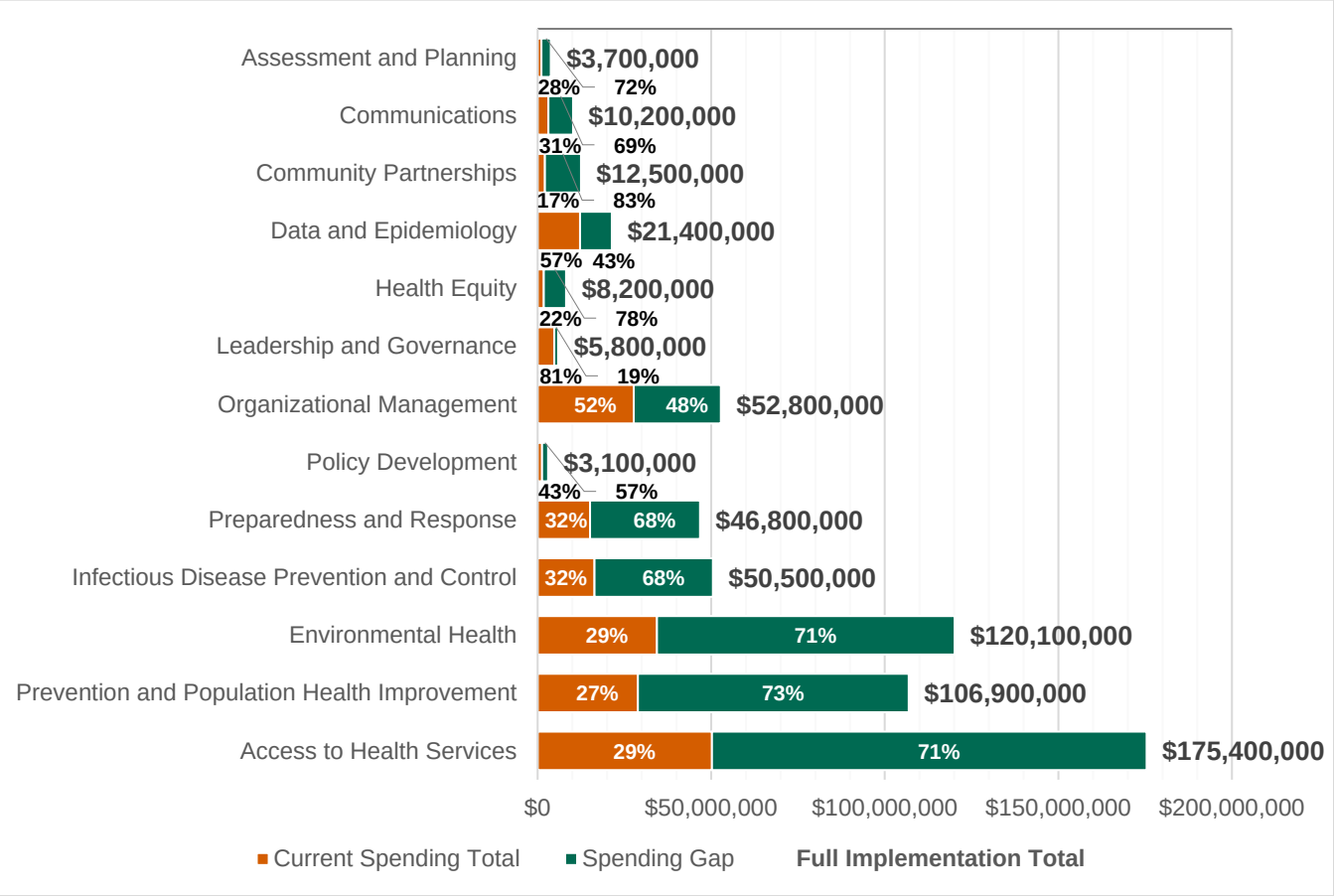
Figure 17. Distribution of Full Implementation Cost for LHDs



As shown in **Figure 18** MDH's largest spending gaps, in terms of the additional dollars needed to achieve full implementation, are in the *Access to Health Services* ($142.7 million in additional spending needed to achieve full implementation), *Prevention and Population Health Improvement* ($110.4 million in additional spending needed to achieve full implementation), and *Environmental Health* ($98.5 million in additional spending needed to achieve full implementation). However, when considering the size of the gap relative to the full implementation cost, several areas have gaps that are greater than 50% of full implementation cost. These foundational capabilities and areas include:

- *Access to Health Services* (with a gap of 71% of full implementation cost),
- *Health Equity* (with a gap of 67% of full implementation cost),
- *Communications* (with a gap of 63% of full implementation cost),
- *Environmental Health* (with a gap of 63% of full implementation cost),
- *Assessment and Planning* (with a gap of 62% of full implementation cost),
- *Access to Health Services* (with a gap of 60% of full implementation cost),
- *Policy Development* (with a gap of 57% of full implementation cost),
- *Preparedness and Response* (with a gap of 57% of full implementation cost), and
- *Infectious Disease Prevention and Control* (with a gap of 56% of full implementation cost).

Figure 18. Distribution of Full Implementation Cost for MDH



Overall, most Foundational Capabilities, other than *Organizational Management*, may only need modest investments (to increase already modest spending), while the Foundational Areas require a much larger additional increment of spending to be fully implemented. Areas with small gaps in terms of the additional spending needed to achieve full implementation, but large gaps in terms of their share of full implementation costs, may be areas where the relatively smaller amounts of additional spending can yield significant increases in implementation.

Figure 19. Distribution of Full Implementation Cost for Statewide Estimate

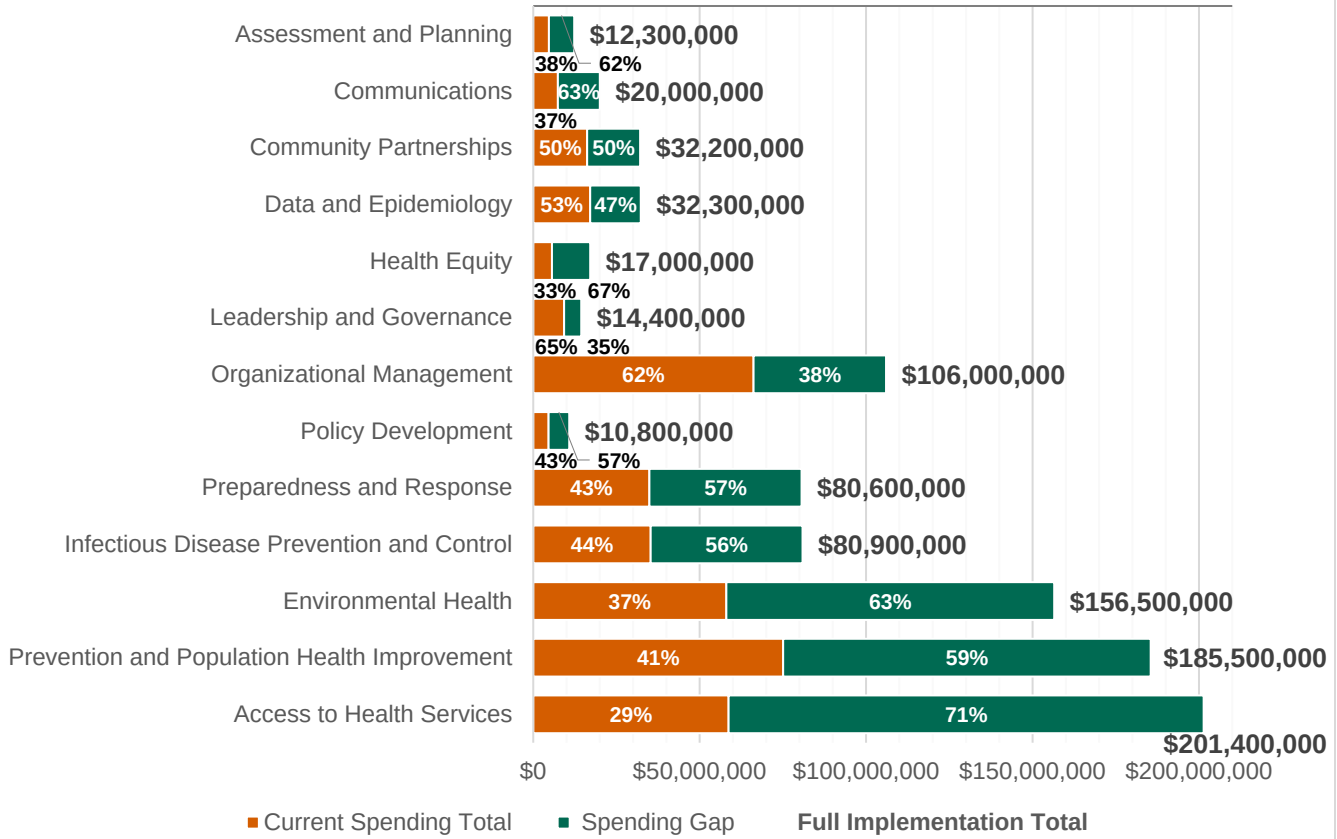


Table 14 summarizes the final statewide public health system estimate of the current spending on the FPHRs, the cost of full implementing them, and the additional increment of spending needed to achieve full implementation.

Table 14. Statewide Public Health System Spending and Effort on FPHRs

	Current Implementation			Full Implementation			Gap		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$166,000,000**	***per capita***	**1100**	**$325,600,000**	***per capita***	**1935**	**$159,600,000**	***per capita***	**835**
Assessment and Planning	$4,700,000	*$0.80*	35	$12,300,000	*$2.15*	95	$7,600,000	*$1.35*	60
Communications	$7,400,000	*$1.30*	60	$20,000,000	*$3.50*	140	$12,600,000	*$2.20*	80
Community Partnerships	$16,200,000	*$2.85*	105	$32,200,000	*$5.65*	175	$15,900,000	*$2.80*	70
Data and Epidemiology	$17,100,000	*$3.00*	110	$32,300,000	*$5.65*	215	$15,200,000	*$2.65*	105
Health Equity	$5,600,000	*$0.95*	45	$17,000,000	*$3.00*	100	$11,500,000	*$2.00*	55
Leadership and Governance	$9,300,000	*$1.60*	60	$14,400,000	*$2.50*	95	$5,100,000	*$0.90*	35
Organizational Management	$66,200,000	*$11.60*	410	$106,000,000	*$18.60*	550	$39,800,000	*$6.95*	140
Policy Development	$4,600,000	*$0.80*	30	$10,800,000	*$1.90*	80	$6,200,000	*$1.10*	50
Preparedness and Response	$34,900,000	*$6.10*	245	$80,600,000	*$14.15*	485	$45,700,000	*$8.00*	240
Foundational Areas	**$227,100,000**		**1680**	**$624,300,000**		**3000**	**$397,200,000**		**1300**
Infectious Disease Prevention and Control	$35,300,000	*$6.20*	255	$80,900,000	*$14.15*	450	$45,600,000	*$8.00*	190
Environmental Health	$58,000,000	*$10.15*	500	$156,500,000	*$27.40*	910	$98,500,000	*$17.25*	405
Prevention and Population Health Improvement	$75,100,000	*$13.15*	490	$185,500,000	*$32.50*	1025	$110,400,000	*$19.35*	530
Access to Health Services	$58,700,000	*$10.30*	435	$201,400,000	*$35.30*	615	$142,700,000	*$25.00*	175
Total	**$393,100,000**	***$68.80***	**2780**	**$949,900,000**	***$166.45***	**4935**	**$556,800,000**	***$97.55***	**2135**

Key Finding: *The estimated gaps in annual investments statewide were **2,140 full-time equivalents** and **$557 million**, needed annually in addition the current resourcing of 2,780 full-time equivalents and $393 million.*

Discussion

The Minnesota Public Health Cost and Capacity Assessment was administered to identify shortcomings in delivery of necessary services in the state of Minnesota. The FPHRs are a state-specific version of the Foundational Public Health Services (FPHS), a national framework that describes the infrastructure and programs that no health department should be without.[26] Like the FPHS, the FPHRs represent "the public health services needed everywhere to work anywhere."[26] Recognizing that these services are not currently available everywhere in Minnesota, the state engaged UMN CPHS to complete an Assessment to assess its current implementation of, its current spending on, and the cost of fully implementing the FPHRs. The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.

The Assessment generated a point-in-time snapshot of Minnesota's governmental public health system, at the agency-level and statewide, including its public health network, expertise, capacity, revenues, and expenditures. Outputs of the assessment led to discovery of key insights about Minnesota's governmental public health system, including the extent of gaps to delivery of the FPHRs statewide and estimated needs for financial and human resources to achieve full implementation. The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.

Reflections on Results and Identification of Key Findings

The Impact of COVID-19 on This Assessment

COVID-19 strongly impacted the design and data limitations of this Assessment. Financial data were collected for LHDs for FY 2021 and MDH for SFY 2022. While adjustments were made to remove the additional resources related to COVID-19, the financial and staffing impact of COVID-19 on Minnesota's public health system certainly remains. Revenue for COVID-19 response was used to support general operations of health departments, so project staff could not simply excise COVID-19 revenue. Similarly, staff that were redeployed or hired for COVID-19 were asked to contemplate a post-COVID-19 landscape, which is no small task. What becomes clear is that, as public health system modernization is contemplated, COVID-19 response demonstrated substantial practical and technical gaps in our public health protections that need mending. Practically, COVID-19 staff will need to transition to new kinds of positions so as to not be lost from the field. And without accounting for the need to 'de-escalate' funding and staffing, it would at first appear that the 'gap' between what Minnesota public health has and needs is net negative, a reality not born out by granular data or sentiment in the state. After these adjustments are applied, clear gaps emerge between what is needed to respond to the next incident, or extended disaster, as well as other, more mundane, public health protections.

Reflections on the Current Implementation of the Foundational Public Health Responsibilities

LHD statewide implementation of the FPHR framework shows that the majority of the FPHRs are partially implemented. What is notable, then, are the areas that are less implemented (minimally implemented) and more implemented (substantially implemented). Low implementation scores may lead to adverse impacts such as reducing the number of persons served by the agency or poorer population health outcomes versus other jurisdictions.

Three HRs are partially implemented; they are D.3. "Maintain infrastructure and capabilities for delivering public health laboratory services," M.4. "Examine and monitor health care quality, effectiveness, and cost-efficiency," and M.5. "Ensure licensed health care facilities and providers comply with laws and rules." Both D.3. and M.5. are currently largely delivered centrally by MDH. When reviewing the current level of implementation of these HRs by individual LHD, one observation is that many LHDs assessed these two HRs as not implemented. Given that MDH delivers this service statewide, this likely means that those LHDs either are not aware of MDH's delivery of that service or mistakenly assessed only their implementation of those FPHRs, rather than the implementation of them

in their community overall. If the former, it belies a significant need for MDH to communicate its statewide activities to LHDs.

Two foundational responsibilities and one HR were assessed to be substantially implemented; the foundational responsibilities being *Organizational Management* and *Preparedness and Response*, and the HR G.4. "Financial Management". It is unsurprising to see that *Organizational Management* is considered substantially implemented for two main reasons: 1.) Organizational management is the infrastructure without which LHDs (or any governmental agency) cannot do their jobs. It includes critical roles like human resources, financial management, and operations and facilities that are necessary for agency operation; 2.) In Minnesota, LHDs are often subordinate to broader, county governments. In many cases, these county governments may be delivering these FPHRs on the LHDs' behalf. This may or may not be compensated (that is, LHDs may pay for this county support or they may receive it in-kind) and if it is compensated, that compensation may be direct (that is, the LHD pays for the direct service it is receiving from the county government) or more likely, may be indirect (that is, the LHD pays an indirect or overhead allocation to the county to indirectly compensate for these services). The value of any in-kind services LHDs receive from their counties is not quantified as part of this Assessment. If the governmental public health system receives additional resources to support full implementation of the FPHRs, it is possible that counties might increase LHDs responsibility for compensating counties for their services, such that new funding would supplant county support without increasing implementation. If new funding is allowed to supplant current county investment, it could increase the cost of full implementation beyond what was estimated in this Assessment.

The Assessment identifies the relative implementation of the FPHRs statewide and on an agency basis, as well as the cost of fully implementing those activities (and the relative implementation from a financial perspective; that is, the share of the full implementation cost that is currently being spent on the FPHRs). Importantly, it does not identify the non-financial barriers to implementing the FPHRs, nor does it identify the gaps representing the most acute needs for the Minnesota governmental public health system and Minnesotans. Doing so will likely require the expertise of governmental public health workers delivering each FPHR, who will need to consider the detailed results of this Assessment in the context of their own work. Some questions they might consider include:

- What are the non-financial barriers to implementing this foundational responsibility, its headline responsibilities, and its activities?
- Is this foundational responsibility, its headline responsibilities, and its activities dependent on implementation of any other FPHR foundational responsibility, its headline responsibilities, and its activities?
- How should implementing the headline responsibilities and activities be prioritized in implementing the foundational responsibility overall?
- What is the role of state governmental public health (MDH) in delivering this foundational responsibility, its headline responsibilities, and its activities? What is the role of local governmental public health?
- Are there patterns to implementation of this foundational responsibility, its headline responsibilities, and its activities based on LHD size or other LHD characteristics; or geography, service area population, or other service area characteristics?

However, while LHD statewide implementation of the FPHRs is largely partially implemented, the same is not true for individual LHD implementation of the FPHRs. As discussed in **Level of Implementation**, while all LHDs have varied implementation of the headline responsibilities, smaller health departments reported lower implementation across the headline responsibilities than larger ones. While this may be directly correlated to the current spending on the FPHRs relative to the full cost of implementing them, it may also mean that smaller LHDs face non-financial barriers to full implementation. It may also suggest that there are some services that might more appropriately be delivered at a larger scale; that is, where cross jurisdictional delivery may improve delivery of the headline responsibility. Since individual governmental public health agency implementation of the FPHRs varies widely and because LHDs have both a desire for and right to local control of their own activities, it will be necessary for agencies

to review and assess implementation of the FPHRs in their community and for their agency. MDH and LHDs will need to consider the detailed results of this Assessment in the context of their own work. Some-questions they might consider include:

- What are the non-financial barriers to implementing the FPHRs in my jurisdiction?
- Is implementation of the FPHRs in my community dependent on governmental public health agencies beyond my LHD? If so, by whom and for what FPHRs?
- Are there currently FPHRs being delivered by others in my jurisdiction that my LHD should be delivering?
- Based on current implementation of the FPHRs, what are my LHD's strengths? Would my LHD be willing to deliver any of these services on behalf of other LHDs through a cross jurisdictional sharing relationship?
- Based on current implementation of the FPHRs, what are my LHD's weaknesses? Would my LHD be willing to enter into a cross jurisdictional sharing relationship with another agency to deliver these services in my jurisdiction?
- How should implementing the foundational responsibilities, headline responsibilities, and activities be prioritized in implementing the FPHRs overall?
- How will implementation of FPHRs impact delivery of local priorities and services in my community?

Discussion: *While the process was carefully designed and efforts were made to assure consistency (technical assistance available, suggestions for participants to collaborate), the Assessment relied upon self-reported data from a largely decentralized process. Findings, however, are believed to be of sufficient quality for statewide planning-level estimates.*

Reflections on Resources Currently Directed Toward the FPHRs

Current spending data offer valuable insights into the operations of governmental public health in Minnesota. It shows that high spending on *Organizational Management* translates logically into a higher degree of implementation, a trend that is also evident in the areas of *Preparedness and Response*, and *Infectious Disease Prevention and Control*. The significant spending in *Preparedness and Response* can be attributed to the critical imperative of tackling the multifaceted challenges brought about by the COVID-19 pandemic, even after decrementing from the total associated with active COVID-19 response (see **Detailed Methods** for more on this adjustment). The COVID-19 pandemic has also impacted the distribution of resources, with many health departments having to redeploy their resources, particularly from *Prevention and Population Health* work, towards *Infectious Disease Prevention and Control*. Yet, the correlation between high spending and high implementation is not universally applicable. This discrepancy can be seen in *Prevention and Population Health Improvement*, which, despite receiving a considerable 19% of current spending, demonstrates a low level of implementation.

This raises a question about the relationship between expenditure and successful implementation. While one might reasonably conclude that more resources should lead to better implementation, the situation is not always so straightforward. Several factors could account for this apparent inconsistency. All the data we have is self-reported and while the quality is generally good, there might be some discrepancies. Different activities and areas within the LHDs might require varying levels of resources. For instance, maintaining a high-quality *Communications* capability might not require as much financial or human resources as the resource-intensive work of promoting and protecting health. Moreover, some areas within the framework are older and more developed, such as *Organizational Management*. These have historically required high standards of financial management and operational excellence, leading to their high implementation scores. Another important point is that more spending does not

necessarily equate to better capacity or expertise. A jurisdiction might allocate a significant part of its funding to a particular area but might still struggle to build the capacity or expertise needed for efficient delivery. Furthermore, there is the issue of ineffective spending. A stronger correlation might be expected between labor expenditures and implementation scores, as capacity and expertise are related to personnel. However, the correlation between other types of expenditures and implementation might not be as strong.

In summary, while it is generally reasonable to expect a positive correlation between expenditures and implementation scores, the strength of this correlation might vary across different areas. This should be kept in mind when considering the effective allocation of resources to LHDs.

> **Discussion:** *Correlations have been demonstrated between supply of resources (financial and non-financial) and achievement of objectives. Future correlations between assessed resources and level of implementation may be possible, but it may not be feasible to establish correlations for some aspects of the FPHR framework.*

Reflections on Resource Needs

The assessment found that approximately **2,130** additional FTEs are needed statewide and that an additional **$557 million** of spending is needed to achieve full implementation. This requires sustained annual investments and not one-time spending. Those totals equate to annual investment needs of approximately $166.45 per capita. These estimates are intended to represent point-in-time, "planning-level estimates."

Analyses found that an additional **$138 million** and **1,110 full-time equivalents** are needed to fully implement the FPHRs at the local level, *$136 million* at the state agency level on labor, and *$282 million* at the state agency on other areas of spending, such as for contracts. These distinct needs within the state-local public health system in Minnesota are important to consider. COVID-19 has drawn into focus that local, state, and non-governmental partners funded through state contracts are all critical parts of the public health system, and each have an important role to play in public health modernization. The substantial need identified by MDH outside of labor – largely in the space of direct contracts – suggests unmet need in the governmental system apart from that being served by LHDs directly.

It is also important to acknowledge factors that lead to the expansion or reduction in the perceived gap in spending from current resources to needed resources. For the gap estimates in this Assessment, it is extremely likely that controlling for COVID-19 led to an expansion of the gap, given that funding were taken away from only one side of the equation (current spending estimates) and not the other (full implementation estimates). This modification was necessary to avoid a large negative gap by having hundreds of millions of crisis funding in current spending versus estimates not considering expense of crisis funds. Whereas, current spending estimates for a "more typical" year would likely involve distribution of resources across the FPHRs. Health departments may have also underestimated their full implementation needs, which may have been obscured by the lower than typical current spending due to COVID-19 response.

As a point of comparison, similar cost assessments have been conducted by other states in recent years that may place these investment needs in context. The following financial data are reported in real (2022) dollars.

- **Oregon (2016)**. The Oregon governmental public health system estimated annual investment needs of approximately $136 million ($31.97 per capita).[1]
- **Ohio (2018–2019)**. The Ohio governmental public health system estimated annual investment needs (for only local public health) of approximately $112 million ($9.55 per capita) and made

subsequent revisions in 2019 for annual investment estimates of $144 million ($12.23 per capita).[1]

- **Washington (2018)**. The Washington governmental public health system estimated annual investment needs of approximately $272 million ($34.55 per capita).[1]
- **Colorado (2020).** The Colorado governmental public health system estimated annual investment needs of approximately $194 million ($33.27 per capita).[2]

> **Discussion:** *The statewide gap in resources from current investments to estimated resource needs was calculated to be sizeable and influenced by myriad factors. COVID-19 was the strongest factor and the impacts of such a substantial response (e.g., redeployment of resources for routine work toward crisis response) and adjustments applied to the current resource estimates (e.g., removal of crisis response spending and FTE) each contributed to the size of the resource gaps.*

Minnesota's Financial Context

Annually, MDH asks LHDs to report within the *)* their expenditures for a certain set of activities (including infrastructure, healthy communities, infectious disease, environmental health, disaster preparedness, and health services).[24] This list of activities, while broad, does not comprehensively describe all LHD activities and requisite expenditures. Spending is also tied to received revenues; many governmental public health revenues are categorical, meaning they are limited to a particular use. LHDs have varying levels of revenue diversification and reliance on different revenue sources (e.g., LHDs serving less than 50,000 rely upon insurance and other clinical revenues). This, paired with the Assessment's findings on spending and needs, presents an opportunity for governmental public health moving forward.

There is no comprehensive statewide data on Minnesota's governmental public health system revenues over time (the *Local Public Health Finance and Staffing Survey* collects expenditure data by funding source).[24] This means that information about the overall funding for governmental public, as well as the flexibility, security, and predictability of those resources, is limited. However, understanding Minnesota's current governmental public health funding paradigm is critical to understanding the current implementation of FPHRs and the resources directed to them. It is likely that these limitations influence implementation and spending on FPHRs. Governmental resource allocations for the FPHRs may be a function of the revenues available to fund them, rather than acuity of need or priority.

Reflections on Minnesota's Current Public Health System Service Delivery Network

The network analysis defined and illustrated Minnesota's current governance and services delivery paradigm and revealed the extensive cross-jurisdictional sharing that exists across Minnesota. Partially integrated CHBs have resulted in significant sharing among the LHDs which comprise them, especially compared to sharing *between* CHBs. North Country, Polk-Norman-Mahnomen, and Partnership 4 Health indicated significant (i.e., more than 40 HRs) sharing among LHDs. However, a limitation of the data is that we interpreted an indicated sharing relationship with a partially integrated CHB as equivalent to indicating a relationship with the devolved LHDs within the CHB. For example, if Itasca Public Health indicated sharing with Aitkin-Itasca-Koochiching CHB, we interpreted that relationship in the network maps as Itasca Public Health sharing with Aitkin County Public Health and Koochiching Public Health.

A second key takeaway is that partnerships are regional; LHDs almost never share with counties they do not adjoin, except when they have CHB relationships. For example, Minneapolis Health Department (a single-City CHB) has significant relationships with Hennepin County CHB but has no relationships with other single-city CHBs. The other three single-city CHBs (Bloomington, Richfield, and Edina) are significantly related, with Bloomington seeming to serve as the "seat" of what resembles a partially

integrated CHB comprising those three city LHDs (i.e., Bloomington Public Health, Richfield Public Health, and Edina Public Health). Each of those cities (Bloomington, Richfield, and Edina; all of which are located geographically within Hennepin County) have some sharing with Hennepin County Public Health as well.

Much of the findings from the network analysis reinforced notions of existing CHB relationships (e.g., sharing between LHDs in partially integrated CHBs) and sharing paradigms. The Assessment relied upon self-reported sharing arrangements, and it is very likely that service and resource sharing was underreported. MDH's role with LHDs was not especially clear within the network analysis, though some relationships were found. Specifically, LHDs are more likely to share with MDH in implementing FAs than in FCs, which is intuitive, given FAs have a focus on services to community and FCs focus more on internal structural stability.

Key Takeaways and Implications

Takeaways for Minnesota's Governmental Public Health System

It is not the case that all activities or headline responsibilities or foundational responsibilities are staffed or contribute equally to an agency's overall level of expertise or capability, but it may be the case that during an extraordinary event like a pandemic that weighted approaches give substantial significance and may skew a systems level picture of where the governmental public health system is, and where improvements are needed. The patterns displayed by the checkerboards (**Table 6**, **Table 7**, **Table 8**, and **Table 9**) indicate that there are no FPHR headline responsibilities that have been fully implemented across the entire Minnesota governmental public health system. Instead, there are gaps present in different parts of the system, and these gaps differ from one LHD to another. The checkerboards do show that overall, larger LHDs have fewer gaps in implementation than smaller LHDs. Furthermore, the checkerboards also imply that overall scores showed higher densities within the middle, partially implemented range and there are certain specific activities with a higher concentration of services that are implemented to a menial or limited extent. Some agencies provided brief descriptions of how COVID-19 response limited their ability to provide trainings to staff. This may explain why LHDs self-reported lower than expected non-COVID (i.e., environmental health prevention planning and activities associated with environmental health, access to health services, and data services) capacity and expertise headline responsibilities).

It is important to note that, beyond the subjective nature of the self-assessment activity, it is extremely likely that a community could be perceived to be substantially under-resourced (even if receiving contractual services) or substantially over-resourced (due to receiving contractual services).

Takeaways for Specific Agencies

The degree of implementation for headline responsibilities varied by LHD. Patterns in variation also differed depending on the specific headline responsibility. For example, the responsibility "Use data to identify health priorities and share results" was *substantially implemented* in St. Louis County and *partially implemented* in Southwest Health and Human Services' jurisdiction; meanwhile, the responsibility "Develop, implement, monitor, track, and update health improvement plans" was *minimally implemented* in St. Louis County and *not implemented* in Southwest Health and Human Services' jurisdiction.

In general, the Metro region consistently scored *substantially implemented* regarding headline responsibilities and foundational responsibilities. The counties with the highest overall implementation levels were the Metro counties as well as Blue Earth, Brown, Chisago, Countryside, Crow Wing, Isanti, Koochiching, Olmsted, Otter Tail, Polk, and Winona Counties. Watonwan and Wilkin Counties had the lowest overall implementation levels.

Takeaways for Communities and Partners

There is substantial sharing between communities and partners, though there are many additional opportunities. For example, for many of the foundational responsibilities, there are multiple sharing relationships between Clearwater, Hubbard, and Lake of the Woods Counties, which comprise the

North Country CHB. There are also many sharing networks between Becker, Clay, Otter Tail, and Wilkin Counties (which comprise the Partnership 4 Health CHB) for foundational responsibilities. There are opportunities to expand upon the networks already established; in addition, communities and partners may focus on building sharing relationships for foundational responsibilities in areas where they are not so strongly established, such as in the Southwest and Northeast regions of the state. Another opportunity for sharing is for providing trainings, which are important for a strong public health workforce. Many communities and partners have expertise and capacity in providing trainings within the FPHRs and could potentially share these with LHDs who may have fewer resources.

Reflections on Methods and Limitations

Though this report is comprehensive and provides detailed findings on LHDs within Minnesota and MDH's expertise and capacity of FPHRs, current and full FPHR implementation estimates, and a network analysis of LHDs, CHBs, and MDH, there are some limitations. First, during the Assessment, we encountered missing data and data quality issues, which is unsurprising given the Assessment's size. In Questions 4 and 5 instead of stating the additional resources that are specific to CHBs, some departments have reported total resources available to CHBs or total resources available to their departments. Thus, some of the revenue statistics may be slightly off, though it is not possible to determine if this is the case. Additionally, self-assessments of capacity and expertise within agencies are typically higher than objective ones (a common bias). To compensate for the likely skew, we employed analytical methods to reduce bias, excluded clear errors, and adjusted as appropriate. There were also other data quality issues typical of all surveys, of which we applied standard data quality assurance procedures and validation as well as reasonable adjustments and acknowledged areas where data were adjusted. Lastly, within the network analysis, a data quality issue we encountered was that only one sharing relationship type could be indicated in the Assessment, but in many cases, agencies identified more than one sharing partner. This limitation made it difficult to determine when the given sharing relationship type was appropriate to attribute it to a given identified partner. Additionally, given that agencies often reported more than one sharing partner for a given headline responsibility it is likely that more "collaborative" sharing agreements were reported than actually exist. This data limitation was an indicated sharing relationship with a partially integrated CHB as equivalent to indicating a relationship with the devolved LHDs within the CHB. Lastly, validation of sharing relationships was not possible. We did not cross-validate sharing relationships - if one agency indicated a relationship with other partners, that was treated as true, even if the other partner did not indicate a relationship in their own assessment.

Furthermore, there are limitations within the data itself. For example, Minnesota administrative data do not align with FPHRs and we allocated and cross-walked the two frameworks as best possible. Secondly, we did our best effort to deliver accurate results, though true or high-quality data may have been inaccessible - such as collecting data over a time period that included COVID-19 and response. We did our due diligence in identifying and isolating these "off" data in an attempt to capture true FPHR capacity and expertise and facilitate accurate accounts for full implementation.

Another limitation of the data is the extent of interpretations and conclusions. The intended use of this report is for state-wide purposes rather than for an individual agency. These data also represent a point-in-time perspective, thus current data may vary from those provided here. Like the FY 2021 current spending allocations, the full implementation cost estimate and imputed additional increment are point-in-time, planning-level estimates of the regular, annual costs to the governmental public health system for just the FPHRs, which are only a subset of public health services. These costs do not include pass-throughs, transfers, or capital expenditures, nor do they consider how the governmental public health system might be optimized to increase its efficiency and effectiveness as part of full implementation nor how costs may change due to the constantly evolving nature of public health work. A related consideration concerns weighted estimates of the implementation data. A primary advantage of this approach is that activities contribute differentially to a health department's capacity and expertise by virtue of resource allocation (staffing and spending). However, during periods of remarkable growth or austerity, weighted estimates may give skewed pictures of an agency's overall capacity - a pandemic may be one such period. As such, unweighted averages are available in **Figure C-1** of **Appendix C**.

It is important to remember that the FPHR framework is not static because of the evolving nature of public health work, which will need to be reflected in future updates to the FPHR framework and operational definitions and may impact these estimates. Further, these results are based on the current service delivery paradigm, which may be optimized to increase efficiency and effectiveness as part of the broader public health system transformation effort. When considering these results in the future, adjustments should be made to ensure that they are comparable with current assumptions and purchasing power. These data could be collected through a "needs assessment," which is an early step in an evolving public health system transformation effort. It is likely that these cost estimates will continue to be refined as implementation progresses.

Finally, expenditures did not include potential one-time costs associated with implementation. The total resources that may be required to move from current implementation of FPHR to full implementation may include things like the cost of hiring beyond normal annual hiring, ergonomic or other facility assessments to support housing of additional staff, organizational development and change management, and the policy work needed to support the FPHR initiative overall. It is expected that these costs will be material. However, governmental public health agencies communicated that these costs would be highly dependent on how full implementation of FPHR was phased, and so they could not be accurately estimated.

Reflections on the Appropriateness of Assessment Methods

Collecting accurate and reliable self-reported data is challenging for such a large Assessment. UMN CPHS staff engaged with local and state participants to review and validate data to the extent feasible. Secondary data (e.g., *Local Public Health Act Finance and Staffing Survey*) were also leveraged to assure reasonableness of data. Further, data submitted in different portions of the survey were analyzed together and used to "cross-validate" data (e.g., self-assessment scores analyzed alongside effort and spending on the same headline responsibilities in the same period). Lastly, clear errors, outliers, and other outsized influences within data (e.g., COVID-19 expenditures and staffing) were addressed and controlled, to the extent possible, such that the aggregated and statewide estimates maintain appropriate levels of robustness. UMN CPHS staff stand behind the Assessment's methods and findings as reasonable point-in-time, planning-level estimates.

Both the "levels of implementation" and "degrees of implementation" described and illustrated in the report refer to the extent different functions are put into practice within the jurisdiction of each LHD. This was determined by the LHD's self-reported capacity and expertise in delivering the activities, irrespective of which entity (e.g., that jurisdiction's LHD, another LHD, MDH) was responsible for delivering it. The level of implementation scores should not be used for evaluation purposes, rather, they are intended to convey the extent to which FPHR activities can be implemented with existing resources. Composite scores, themselves, may not adequately inform agency- or system-level needs for full implementation. Thus, scores may fail to clearly detect specific gaps. Composite scores, however, are useful as they allow simple determinations such as inferring full implementation gaps from the degree of implementation (i.e., assessing the proximity to full implementation). Additionally, composite scores may also provide valuable agency- and system-level metrics for observing long-term implementation progress.

There remains an open question about how best to visualize state and local systems—weighted or unweighted—and so the dashboards described in the report offer both to an interested reader. In constructing statewide analysis, the project team employed both population weighting (to account for differential jurisdictional sizes) and analytic weights relative to current expenditures on headline responsibilities. This helps to account for differential contributions to overall agency capacity and expertise by outsized factors (e.g., population size, expenditures). When comparing weighted and unweighted estimates, a number of substantial differences may be noted between agencies and as a statewide grouping. Notably, weighted estimates of foundational capabilities tended to be higher than unweighted estimates, partly due to high self-assessment scores paired with substantial expenditures. Conversely, a number of foundational areas were self-rated rather poorly by comparison and not funded particularly well.

Key Considerations and Questions for the Future

Defining Level of Service Standards

The FPHR operational definitions describe the activities needed to fully implement the FPHRs but do not include minimum standards for delivering these services. As such, it is expected that there may be significant variation in these services by service provider. In order to ensure that the FPHRs (again, the "services needed everywhere to work anywhere") are delivered consistently statewide, the governmental public health system may want to consider developing minimum standards for the FPHRs.

It is assumed that the governmental public health system may have already started to coalesce around these minimum standards as part of this Assessment. These minimum standards should be carefully articulated and can be an important part of the discussion around what implementation of the FPHRs "buys" to help communicate what is necessary to the public, policymakers, and potential funders.

Identifying and Addressing Non-Financial Barriers to Implementation

The results of this Assessment indicate that there are significant additional resource needs to achieve full implementation. In most cases, implementation will not increase without additional resources. However, there may also be non-financial barriers to implementing FPHRs. Identifying and addressing these barriers may support increased implementation of the FPHRs before additional resources for implementation are even available. This Assessment did not identify specific non-financial barriers to implementation. Minnesota's governmental public health system should identify these non-financial barriers to implementation and address them as part of defining their strategy and workplan for implementing the FPHRs.

Interdependencies

The FPHR framework and operational definitions make no attempt to define the relationships among FPHR activities. This is a challenge because we know that many of these activities are interdependent; that is, you cannot implement one FPHR activity without first implementing another. Similarly, Minnesota's decentralized governance and service delivery system may also create interdependencies among governmental public health departments where one department is reliant on the work of another to accomplish a specific FPHR activity.

Both these activity- and relationship-specific interdependencies in delivery of the FPHRs can be barriers to—or at least create inefficiencies in—their implementation. As part of identifying and addressing non-financial barriers to implementation, Minnesota's governmental public health system may need to define the relationship among the FPHR activities and service providers delivering those activities to help identify these specific non-financial barriers to implementation.

Optimizing the Efficiency and Effectiveness of the Service Delivery System

As discussed previously, the FPHRs are the role and responsibility of the governmental public health system, including both MDH and CHBs. The FPHR operational definitions are agnostic to whether state or LHDs deliver services, with the majority but not all FPHR activities either being delivered centrally by MDH or in a decentralized manner by CHBs and LHDs. However, the options for governance and service delivery for individual FPHR activities are much broader than that and, as the Network Analysis earlier in this report demonstrated, governmental public health departments have already implemented a significant number of cross jurisdictional delivery models and relationships in Minnesota. The governance and service delivery models currently implemented in Minnesota are likely not inclusive of all potential cross jurisdictional delivery models.

Which governmental public health department is governing and delivering an FPHR activity for a given jurisdiction and its service population has a significant impact on the efficiency and effectiveness with which the service is delivered. This Assessment did not analyze the efficiency and effectiveness of

given cross jurisdictional delivery models, relationships, and specific arrangements, and is, rather, based on the existing governance and service delivery paradigm in Minnesota.

As one of the steps in considering how to implement the results of this Assessment, the Minnesota Governmental Public Health system should explore opportunities to optimize the efficiency and effectiveness of its service delivery system through cross jurisdictional delivery. Doing so may require additional analysis to define the existing cross jurisdictional delivery models for delivery of FPHRs in Minnesota as well as to identify those FPHRs that could be delivered more efficiently or effectively through an alternate cross-jurisdictional delivery model.

Like LHDs in many states with decentralized governmental public health systems, Minnesota's LHDs have both a desire for and right to local control of some activities. Local control can create tension in decision making around cross jurisdictional delivery. Best practice dictates that governmental public health agencies should have autonomy in identifying the services they'd like to share and who they'd like to share with. The Assessment did ask whether LHDs would be willing to share specific FPHR headline responsibilities in the future. This data can support future conversations about alternative cross jurisdictional delivery relationships for services in specific jurisdictions.

Discussion: *The Minnesota governmental public health system should explore opportunities to optimize the efficiency and effectiveness of its service delivery system, including through partnerships with public and private partners.*

Tribal Participation in the Service Delivery System

Federally recognized Tribes are also a vital part of the governmental public health system. Tribes have concurrent jurisdiction with federal, state, and local governments (that is, Tribal members living in Minnesota are also residents of Minnesota and the county in which they reside, conferring the same benefits of any other Minnesotan) in Indian Country, and Tribes are the governmental public health providers for their members there. This means that Tribes have implicit relationships with state and local governments and their governmental public health providers. They may also choose to have formal, explicit relationships with these governments; however, as sovereign nations, they are more analogous to the federal government than to state or local governments.

In many cases, Tribal public health may be the best provider of culturally appropriate governmental public health service for their members and residents, who have historically experienced and continue to experience inequitable health outcomes.

However, Tribes, as sovereign nations, define their own service populations and are not obligated by state statute, or otherwise, to provide public health services. Further, tribal membership and representation are not limited by residency (that is, Tribes may have members who live all over the world, such that it would be prohibitive to deliver public health services to all of them).

There are eleven federally recognized Tribes in Minnesota, including:

- Boise Forte Band of Chippewa,
- Fond Du Lac Reservation,
- Gichi-Onigaming / Grand Portage Band of Lake Superior Chippewa,
- Leech Lake Reservation,
- Lower Sioux Indian Community,
- Mille Lacs Band of Ojibwe,
- Prairie Island Indian Community,

- Red Lake Band of Chippewa Indians,
- Shakopee Mdewakanton Sioux (Dakota) Community,
- Upper Sioux Indian Reservation, and
- White Earth Reservation.

Each of these Tribes delivers its own unique blend of clinical health care and public health services based on the needs of their members and others they serve. In some cases, there may be overlap between these services and those delivered by state and local governmental public health providers. Because Tribal services may be delivered on a membership basis, rather than a geographic basis, some of this overlap is likely necessary; however, it may make sense to consider opportunities to prevent unnecessary duplication of service and ensure the most culturally appropriate provider is delivering services, where possible.

The Minnesota governmental public health system needs to consider how to collaborate with Tribes in decision-making around optimizing the governmental public health system and in the optimization itself.

Ensuring Adequate Workforce to Fully Implement the FPHRs

Full implementation of the FPHRs is expected to greatly increase demand for a trained, experienced governmental public health workforce. This workforce is already strained by recruitment and retention challenges which were exacerbated by the COVID-19 pandemic. The current public health workforce included approximately 2,585 local FTEs (FY 2021) and 1,770 state FTEs (SFY 2022). As documented in **Table 10**, The current FPHR public health workforce included approximately 1,225 local FTEs (FY 2021) and 1,575 state FTEs (SFY 2022); around 50 percent of local staff and 90 percent of state staff, respectively. Statewide there are approximately 2,780 FTE FPHR in the public health workforce. And, as documented in **Table 11**, the full implementation FPHR public health workforce was estimated to include approximately 2,320 local FTEs and 2,595 state FTEs; around 90 percent increase of local staff and 65 percent increase of state staff. Statewide a total of 4,920 FTE are needed to fully implement the FPHRs. These results suggest that approximately 2,135 additional FTEs needed to fully implement the FPHRs in Minnesota.

Assuming no commensurate increase in the governmental public health workforce implementing activities other than the FPHRs (local priorities and services), this would represent an almost 50% increase in the governmental public health workforce in Minnesota overall. This does not include any potential staffing needs related to growth in demand for FPHRs over time, nor does it include any staffing needs, local priorities, and services that are not FPHRs; these potential staffing needs would further increase the additional FTE governmental public health workforce FTE needed in Minnesota.

It is likely that the current workforce eligible to support governmental public health in Minnesota is not sufficient to address such a significant increase in governmental public health workforce. As such, to achieve this increase in FTE, the system will need to consider strategies to increase the size of that workforce. This may mean competing for FTE with other industries (for example, non-governmental public health and clinical health care) and/or increasing the supply of eligible workers through training and retraining programs and/or drawing workforce from outside of the State of Minnesota. These strategies may have cost ramifications or other externalities to the governmental public health system.

Assessing Sufficiency of Worker Supply

Minnesota has a robust post-secondary education landscape, with over 180,000 degrees conferred in 2021 across 84 institutions, approximately 33,000 at the associate's level, 85,000 at the bachelor's level, 53,000 at the master's, and 13,000 at the doctoral level.[27] Approximately 1,000 of the degrees awarded in 2021 were for public health at any level from 14 universities or colleges.
Public health degrees awarded in 2021 (any level)[27]:

- Anoka-Ramsey Community College – 4,

- Bemidji State University – 5,
- Capella University [online] – 209,
- Concordia University-Saint Paul – 8,
- Minnesota State University-Mankato – 3,
- Saint Cloud State University – 17,
- Saint Mary's University of Minnesota – 9,
- Saint Paul College – 4,
- St Catherine University – 76,
- University of Minnesota-Duluth – 22,
- University of Minnesota-Twin Cities – 256,
- University of St Thomas – 20,
- Walden University [online] – 327, and
- Winona State University – 26.

Source: National Center for Education Statistics

A separate matter is whether there exists a sufficient pathway between post-secondary institutions and agencies to replace and grow the governmental public health workforce. Data from the Public Health Workforce Interests and Needs Survey (PH WINS), a large-scale survey of the field, shows over 40% of the workforce is planning to retire or considering leaving within five years. Coupled with a striking reality, that approximately 14% of staff nationally (17% statewide in Minnesota) have formal public health training of any kind, an interesting push-pull has come to exist around schools and programs of public health nationally that also exists within Minnesota. Most graduates of public health schools do not work in governmental public health, and most staff in governmental public health departments do not have formal public health training. From a recruitment perspective, there is a substantial raw supply, but a need remains to solidify strong pathways from academia into practice such as the recent MN Prepared program with UMN, HRSA-funded practice-oriented scholarships with St. Catherine University and UMN, or the MDH-led Community Health Worker Training Program (CHWTP).

An additional consideration is the competitiveness with public sector and private sector employers. Research has shown governmental public health has historically lagged in pay and benefits compared to the health care sector, and even some public sector competitors. In Minnesota's competitive health care and biotech environment, this is a particularly challenging reality. Hiring practices, policies, and mores at the state and local levels have served to make labor market competition from the private sector more problematic during the COVID-19 pandemic.

Establishing an Implementation Strategy and Workplan

The results of this Assessment indicate that there are significant additional resources needed to achieve full implementation. Based on the magnitude of these resource needs, it can be assumed that full implementation of the FPHRs will take time. As such, Minnesota's governmental public health system will need to develop a strategy and multi-year work plan for implementing the FPHRs. This work plan will likely phase implementation of the FPHRs over time.
There are many things the Minnesota governmental public health system might consider in this strategy and workplan, including:

- political will and policymaker priorities,
- the availability and timing of funding and resources,
- distribution of funding and resources among governmental public health departments,
- service equity,

- health equity,
- speed and efficiency in implementation,
- effectiveness of implementation, and
- flexibility for individual governmental public health agencies in implementation.

Based on the variation in current implementation of the FPHRs across Minnesota's governmental public health system, significant work will be needed to achieve consensus on a strategy and workplan for implementation.

Discussion: *Minnesota's governmental public health system will need to develop a strategy and multi-year work plan for implementing the FPHRs.*

Change Management

Implementing this workplan and achieving full implementation of the FPHRs will require significant systemic change. While the implementation strategy and workplan should guide systemic and individual government public health department decisions, it will also be important to respect local control and allow some flexibility for individual government public health departments. Given the expected complexity of this workplan, it should be implemented with complementary change management support.

Next Steps

The purpose of the Assessment was not to evaluate the efficiency, effectiveness, or full scope of services provided by the Minnesota public health system but to illustrate strengths and weaknesses in resourcing and delivering foundational services.

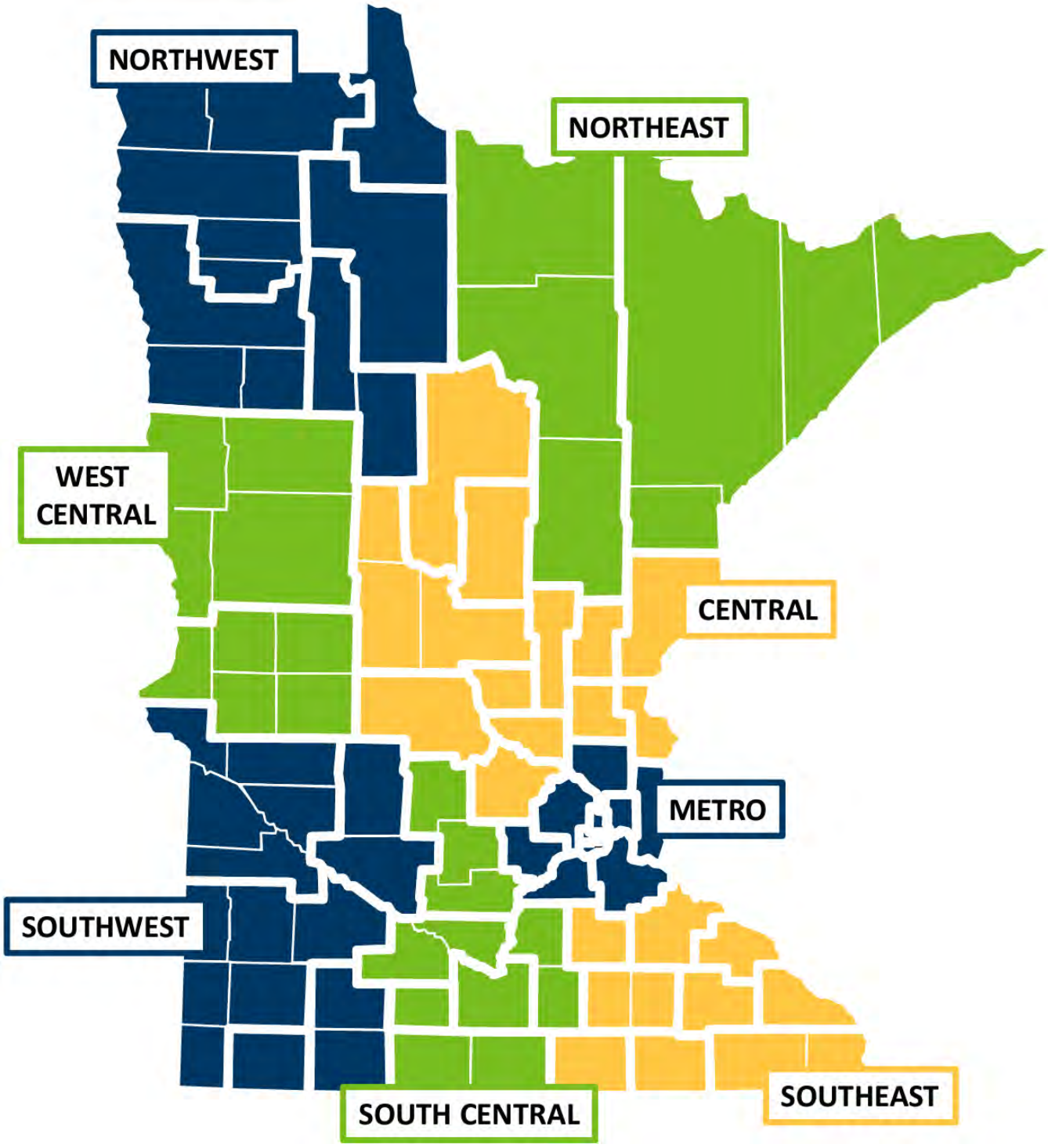
Conducting the Assessment was the first step in the progression towards LHDs and MDH fully implementing the FPHRs. The Assessment provided a comprehensive record of the current implementation of and staffing and spending associated with the Minnesota FPHRs and 2) anticipated staffing and spending needed to fully implement the FPHRs (i.e., what would it take to "fully deliver" the FPHRs if suitably resourced). Despite this, the Assessment does not provide a precise explanation of the strategies needed to fully implement FPHRs.

Achieving full implementation of FPHRs consistently statewide will require the governmental public health system to create minimum standards for the FPHRs. It is important to clearly define and communicate these minimum standards, as they play a significant role in communicating the benefits of FPHRs implementation to the public, policymakers, and prospective funders. Additionally, non-financial barriers need to be identified and addressed such as recruitment and retention of the public health workforce. Overall, statewide, there needs to be an increase in resources to achieve full implementation.

Discussion: *Assessment findings were agnostic to sources of resources for additional investment—a combination of state appropriations, local appropriations, federal funds, and other flexible and sustainable dollars are needed to transform governmental public health in Minnesota.*

APPENDIX A – ADDITIONAL RESOURCES

Figure A-1. Map of State Community Health Services Advisory Committee (SCHSAC) Regions



Source: Minnesota Department of Health. 2023. *SCHSAC regions*.

APPENDIX B – DETAILED METHODS

DESIGN AND DELIVERY OF THE PUBLIC HEALTH COST AND CAPACITY ASSESSMENT

Staff of the University of Minnesota Center for Public Health Systems (UMN CPHS) designed the Assessment to collect key data from all governmental public health departments, including the Minnesota Department of Health (MDH) and all 74 local health departments (LHDs). The Assessment aimed to collect data from Minnesota public health practitioners—across MDH and local public health—to investigate the implementation of the Foundational Public Health Responsibilities (FPHRs) in 2021 ("current" time period) across Minnesota. Data collection was primarily accomplished through a Qualtrics survey but was augmented by ancillary tools used by governmental public health departments to compile or manage their data.

The current time period for the Assessment included data from LHDs' 2021 fiscal year ("FY 2021"), with most LHDs aligned to calendar year 2021, and state fiscal year 2022 ("SFY 2022") for MDH. The 2021 time period was selected due to its recency and for governments to have closed their fiscal year, allowing a certain level of quality and completeness in data collection. The period, like any given year in history, did not fully represent a "typical" year across all public health activities. Namely, the COVID-19 pandemic and response was anticipated to substantially affect certain capacities, revenues, and capacities versus typical periods. Limitations of the collection period are described in the **Limitations** section of the report.

For the purposes of this report, we use the term "agency" to refer to any governmental health department (any of the 74 LHDs and MDH).

MINNESOTA'S FPHR FRAMEWORK

The FPHR framework was the central focus for the Assessment and data collection tools were designed to collect detailed data across the framework levels. In the FPHR framework used in the Assessment, there were 340 activities, 52 headline responsibilities (HRs), and 13 Foundational Capabilities (FCs) & Foundational Areas (FAs) "foundational responsibilities"; 9 FCs and 4 FAs. Throughout the report, findings only include details for the 13 foundational responsibilities and 52 HRs, described within the **Minnesota's FPHR Framework** subsection within the **Design and Delivery of the Assessment** section of the report and detailed operational definitions for the FPHRs are available online within the Operational Definitions Summary (z.umn.edu/Op_Def_Sum).

QUALTRICS SURVEY INSTRUMENT

A Qualtrics survey ("the instrument") was created as the primary data collection tool, designed to collect all of the key variables for the Assessment. LHDs received the same version of the instrument but a modified version of the instrument was sent to MDH (where noted below). The instrument included the following sections, with relevant instrument questions indicated below (e.g., "Q1"):

I. Health Department Identification (LHDs-only)

This section gathered data that identified responding LHDs and their governing community health board (CHB).

The instrument included branching logic that bifurcated LHDs by their LHD name according to 1) LHDs representing a single-county or a fully integrated multi-county CHB and 2) LHDs that participate within a partially integrated multi-county CHB. Single-county and fully integrated multi-county CHBs—thus, their LHDs—reported detailed data to MDH's *Local Public Health Finance and Staffing Survey*[24] and were not requested to complete detailed CHB financial data (Q3–Q5), detailed revenues data (Q17), detailed expenditures data (Q18), nor detailed occupational data (Q19). LHDs that were a part of partially integrated multi-county CHBs did not report such data for their LHDs and were asked to respond to all questions.

II. Health Department Information

This section collected high-level administrative data, with questions posed differentially to LHDs andd MDH.

LHDs from Partially Integrated Multi-County CHBs*: detailed CHB financial data (Q3–Q5), detailed revenues data (Q17), detailed expenditures data (Q18), and detailed occupational data (Q19).

* *The Local Public Health Finance and Staffing Survey*[24] collects detailed administrative data for CHBs (local governing bodies), including aggregated data for LHDs within partially integrated multi-county CHBs. More detail was needed from those LHDs.

All LHDs: description of agency relationship to government (Q6), description of facilities (Q7), description of jurisdictional partnerships (Q8), description of COVID-19 impacts and response (Q9), description of cyclical activities (Q10), agency accounting method (Q12), definition of annual hours per full-time equivalent (FTE) (Q13).

All LHDs and MDH: dates of fiscal period related to the current period (Q11), annual FTE count for past 3 fiscal years (Q14), total revenues and expenditures for past 3 fiscal years (Q15), and description of budget surpluses or deficits (Q16).

III – XIV. Self-Assessment by FPHR

This section was a self-assessment of current implementation of the FPHRs according to expertise and capacity and descriptions of any service sharing.

All LHDs and MDH were requested to self-assess the "expertise" and "capacity" (see **Table E-2**) available within **their community**, beyond just the LHD's, in the current period. Each FPHR headline responsibility and their subordinate activities were self-assessed according to an ordinal scale (*Absent–Expert/Full*). Each of the headline responsibilities were self-assessed independently from the subordinate activities.

Table B-1. Self-Assessment Rubric

Expertise ***Knowledge, skills, education, and experience needed to implement the headline responsibility or activity***		**Capacity** ***Staff and/or other resources with the materials and supplies needed to implement the headline responsibility or activity***
Absent: No or basic awareness of the expertise, but limited ability to apply it.	1	**Absent:** Staff time and other resources are not present or are largely unavailable.
Basic: Knowledge of the expertise and can apply it at basic level.	2	**Minimal:** Some staff time and/or other resources are present to complete basic functions.
Proficient: Expertise is available and can be applied adeptly.	3	**Moderate:** Most staff time and/or other resources are present to partially implement most functions.
Expert: Expertise is routinely applied and those with the expertise can build it within others.	4	**Full:** Sufficient staff time and/or other resources are present to fully implement all functions.
I don't know	**N/A**	**I don't know**

All LHDs and MDH were requested to identify all resource and service sharing arrangements for each headline responsibility in the current period, then to describe how each headline responsibility was delivered in the community in the current period (e.g., solely by LHD, shared governance among agencies). Lastly, for each headline responsibility, all LHDs and MDH were requested to identify whether there was an openness to expand sharing.

XV. Implementation Summary (LHDs-only)

This section gathered descriptions of LHDs' plans, policies, and other documents related to self-assessed items and LHD self-assessment of implementation related to peers.

LHDs were requested to indicate whether they possessed certain plans, policies, and other documents related to the prior self-assessment section and if they shared or deferred development of those materials with other organizations (Q22–Q23).

LHDs were requested to self-assess whether each foundational capability or area may be more or less implemented within their community than the state overall (Q24).

XVI. FY 2021 Spending and Staffing

This section collected data pertaining to allocations of effort and spending from the current period for the FPHR headline responsibilities and community-specific services within major budget categories (e.g., personnel, contractual, capital).

All LHDs and MDH were requested to provide detailed staffing and spending figures for their agency, then allocate those staffing and expenditures across the FPHR framework and into community-specific services.

XVII. Full Implementation Spending and Staffing Estimates

This section collected data around allocations of effort and spending estimated to be needed to fully implement the FPHR headline responsibilities within major budget categories (e.g., personnel, contractual, capital).

All LHDs and MDH were requested to provide detailed staffing and spending estimates for their agency, then allocate those staffing and estimates across the FPHR framework.

XVIII. Certification

The final section requested all LHDs to certify that the instrument was complete and provide contact information for future questions.

An instructional guide was developed as a companion to the instrument (see below). The guide may provide additional detail and description for the Assessment.

Supplemental Materials

The following supplementary tools and resources were created and offered to persons actively contributing to the Assessment from their LHD or MDH ("participants") to assist with their data collection and decision-making:

- **Public Health System Transformation in Minnesota webpage (z.umn.edu/TransformMNPH)**. A project webpage was made available to Assessment participants that provided basic information on the Assessment and included links to the following resources.
- **Project Updates (z.umn.edu/TransformMNPHC_Updates)**. Throughout the early stages of the Assessment, pertinent updates and correspondence were made available to Assessment participants.
- **Frequently Asked Questions (FAQ; z.umn.edu/TransformMNPHC_FAQ)**. The FAQ was created to guide participants throughout the Assessment and was updated as critical questions were received from participants.
- **Qualtrics Assessment Instrument Instructional Guide (z.umn.edu/TransformMNPH_Instrument)**. This tool was created as a companion to the LHD instrument and included most fields and questions in their original form and their response options and also included annotations to describe the purpose and use of most data elements. A minimally modified version of the instrument was shared with MDH (differences between the two are noted in the section above).
- **Current Spending Allocation Workbook (z.umn.edu/TransformMNPH_Spend)**. This Excel-based tool was created to assist in allocating FY 2021 staffing and spending to the FPHRs. The

workbook included a data collection worksheet that allowed participants to enter total FTEs and salary by occupation and total expenditures by expense category, then retrospectively allocate those effort and expenditure totals across the FPHR framework and community-specific services. The workbook included a data export worksheet to aid participants in submitting data into the instrument. Participants' use of the workbook was optional and participants were requested to voluntarily submit any completed workbooks.

- **Full Implementation Estimate Workbook (z.umn.edu/TransformMNPH_Full)**. This Excel-based tool was created to assist in estimating anticipated staffing and spending for full implementation of the FPHRs. The workbook included a data collection worksheet that allowed participants to enter total FTEs and salary by occupation and total expenditures by expense category, then prospectively allocate those effort and expenditure totals across the FPHR framework and community-specific services. The workbook included a data export worksheet to aid participants in submitting data into the instrument. Participants' use of the workbook was optional and participants were requested to voluntarily submit any completed workbooks.
- **Foundational Public Health Responsibilities Self-Assessment Workbook (z.umn.edu/TransformMNPH_Self)**. This Excel-based tool was created to assist participants' self-assessment of their community's expertise and capacity. The workbook included separate worksheets to accommodate and coordinate multiple perspectives with another worksheet to aggregate those perspectives in one place.

Participant Engagement

UMN CPHS staff engaged with participants throughout the process. Engagement included delivery of webinars to orient participants to the Assessment (July 2022) and weekly office hours for LHD and MDH staff (July–September 2022).

The Assessment was made available to LHDs in late July 2022 and MDH in August 2022. Several follow-up emails were sent to LHD participants from August to September. Technical assistance was provided within the weekly office hours and upon request by local and state participants through the instrument closing date (September 30, 2022). The data submitted by LHD participants were reviewed for completeness, errors, and any logical inconsistencies (e.g., substantial underestimations or overestimations of resources dedicated to the FPHRs). UMN CPHS staff corresponded with LHDs between October 2022 and January 2023 to address major data issues. Data were then shared back with LHDs in mid-January 2023 in a more convenient Excel workbook format that flagged key issues (e.g., clear errors, substantial estimation differences). LHDs were requested to review their Excel workbook and correct any discrepancies. Additional technical assistance was provided to aid in correcting the workbook through late March 2023.

In late fall 2022, MDH staff completed an instrument modified to reflect state-specific data elements and also submitted Current Spending workbooks (per MDH division), Full Implementation workbooks (per MDH division), and a single Self-Assessment workbook. These data were combined together for the MDH portion of the Assessment. The data submitted by state public health participants were reviewed for completeness, errors, and any logical inconsistencies (e.g., substantial underestimations or overestimations of resources dedicated to the FPHRs). Data were then shared back with MDH in late April 2023 in a more convenient Excel workbook format that flagged key issues (e.g., clear errors, substantial estimation differences). MDH was requested to review those data and correct any discrepancies.

Cleaning and Adjustment of Data

Data were cleaned according to standard practices and where reasonable. This included correcting clear errors (e.g., correcting 2,088 hours per year to 2,080 hours per year for FTE definition) and removing certain outliers (e.g., substantially high or substantially low FPHR spending). Data cleaning also involved recoding variables into formats more appropriate for analysis (without changing data meaning) and making reasonable adjustments to data where necessary and appropriate.

The following methods were used to create groupings and adjustment approaches for modification. Each factor listed within this section (FTE definition factor, inflation factor, cost of living factor) was used throughout all relevant Assessment analyses (i.e., all FTE data adjusted, all financial transaction data adjusted) according to the approaches listed below.

Standardization of Effort Data

Agencies did not all operate according to the same annual hours equivalent for one (1) FTE. Though most organizations consider 2,080 work hours per year as 1.0 FTE, each agency was requested to report their agency's definition for 1.0 FTE (Q13). The FTE data submitted by agencies were then standardized.

FTE Definition Factor:

$$S_j = D_j \times \frac{1}{2080\ hrs} \quad (1)$$

for each agency (*j*), where the respective agency's FTE definition (D_j) [hours] was divided by 2,080 hours. The resulting FTE definition factor was dimensionless and determined with respect to each agency.

Standardized FTE:

$$SF_j = S_j \times F_j \quad (2)$$

which multiplied the FTE definition factor (S_j) found by **Equation (1)** for a given agency (*j*) and for a given FTE variable (F_j) from the Assessment to determine their standardized FTE. The standardization factor for each agency was applied to all FTE data reported by that agency, though most LHDs (and MDH) operate according to 2,080 hours per year (i.e., standardization factor = 1). The resulting standardized FTE was dimensionless and determined with respect to each agency.

Adjusting for Inflation

Not all participating LHDs reported data for the same time period due to differences in governmental fiscal periods. Beginning and ending dates of the fiscal years were tabulated based on reported fiscal year periods (Q11) for each LHD ("FY 2021") and MDH ("SFY 2022"). This was necessary to account for the different time periods reflected in the Assessment. These timeframes were used to account for inflation, which was higher than typical during the study period, and financial data were adjusted accordingly. The *Government consumption expenditures and gross investment: state and local (implicit price deflator)*, provided by the U.S. Bureau of Economic Analysis, supplied the governmental share of national gross domestic product (GDP) used to adjust for inflation.[28]

Inflation Factor:

$$Inf_y = \frac{g_y}{g_{2020}} \quad (3)$$

for the government's portion of GDP (*g*) [$] for the target year's (*y*) GDP ("nominal") divided by the 2022 GDP ("real"). The resulting deflation factor is dimensionless with 2019–2022 used for nominal periods. Values used in this project were:

- **2019 Inflation Factor (I_{2019})**: 1.19,
- **2020 Inflation Factor (I_{2020})**: 1.16,
- **2021 Inflation Factor (I_{2021})**: 1.09, and
- **2022 Inflation Factor (I_{2022})**: 1.00,

These factors were then used to adjust transaction data (i.e., revenues, expenditures) based on the health department's fiscal year. The resulting inflation factors were dimensionless and determined with respect to each year.

Inflation Adjustment:

$$InfT_j = \frac{T_j}{12\ mo} \times \sum_{y=Y1}^{Y2} (m_y \times Inf_y) \quad (4)$$

for each agency (*j*), where the respective agency's revenue or expense transaction for a given transaction variable (T_j) [$] of the Assessment is divided by a denominator of 12 months, then multiplied by a sum product of the months of the respective financial period (m_y) multiplied by the inflation factor (Inf_y) found by **Equation (3)** for the same period; the sum product for the period (*y = Y1, Y2*) is from the factor period (*Y1*) to the second factor period (*Y2*), in which the sum of months from both periods equaled 12 months. The resulting inflation adjustment was in inflated USD and determined with respect to each agency.

Adjusting for Cost of Living

Given that LHDs are distributed geographically, and regional price parities exist, financial data were adjusted to account for regional differences. The *2021 County Level Cost of Living Index*, provided by the Council for Community and Economic Research, supplied cost of living (COL) indices for Minnesota counties in calendar year 2021.[29] Indices differed by jurisdiction but were used to adjust each jurisdiction for cost of living differences; MDH was considered associated with Minneapolis' jurisdiction.

COL Factor:

$$\boldsymbol{AdjCOL_{j,y} = \frac{COL_{j,y}}{100}} \quad \textbf{(5)}$$

uses the cost of living index value ($COL_{j,y}$) for the jurisdiction (*j*) and period year (*y*), divided by 100, to determine the resulting adjusted COL factor. Adjusted COL factors were determined for 2020 and 2021 years. These factors were used to adjust for regional differences in prices. The resulting COL factor was dimensionless and determined with respect to each agency and year.

COL Adjustment:

$$\boldsymbol{COLT_j = \frac{T_j}{12\ mo} \times \sum_{y=Y1}^{Y2}\left(m_y \times AdjCOL_{j,y}\right)} \quad \textbf{(6)}$$

for each agency (*j*), where the respective agency's revenue or expense transaction for a given transaction variable (T_j) [$] of the Assessment is divided by a denominator of 12 months, then multiplied by a sum product of the months of the respective financial period (m_y) multiplied by the adjusted COL factor ($AdjCOL_{j,y}$) found by **Equation (5)** for the same period; the sum product for the period (*y = Y1, Y2*) is from the factor period (*Y1*) to the second factor period (*Y2*), in which the sum of months from both periods equaled 12 months. The resulting COL adjustment was in USD and determined with respect to each agency.

Adjusting for Inflation and Cost of Living

To finalize adjustment for revenue or expense transactions, the formulas described above were combined to adjust for influences of inflation (differences across periods) and geographic distribution (differences across regions).

Inflation & COL Adjustment:

$$\boldsymbol{InfCOLT_j = \frac{T_j}{12\ mo} \times \sum_{y=Y1}^{Y2}\left(m_y \times Inf_y \times AdjCOL_{j,y}\right)} \quad \textbf{(7)}$$

for each agency (*j*), where the respective agency's revenue or expense transaction for a given transaction variable (T_j) [$] of the Assessment is divided by a denominator of 12 months, then multiplied by a sum product of the months of the respective financial period (m_y) multiplied by the inflation factor (Inf_y) found by **Equation (3)** for the same period and the adjusted COL factor ($AdjCOL_{j,y}$) found by **Equation (5)** for the same period; the sum product for the period (*y = Y1, Y2*) is from the factor period (*Y1*) to the second factor period (*Y2*), in which the sum of months from both periods equaled 12 months. The resulting inflation and COL adjustment was in inflated USD and determined with respect to each agency.

Population Groupings in Assessment

Where appropriate, LHDs were grouped according to the number of persons their jurisdiction served ("population bands"); MDH was kept separate from these bands. The following population bands were used for grouping, decided by the Assessment's Advisory Group:

- Less than 25,000 persons (“<25k”);
- Between 25,000 and 49,999 persons (“25–49k”);
- Between 50,000 and 99,999 persons (“50–99k”); and
- Greater than 100,000 persons (“100k+”).

Mean Population Weighting

Where appropriate, data in the Assessment were adjusted to utilize populations as analytic weights for developing means. In each case, the variable of interest was divided by the population served.

Mean Population Weighting:

$$wx_i = \frac{\sum_{j=1}^{75}(x_{i,j} \times p_j)}{\sum_{j=1}^{75}(p_j)} \quad \textbf{(8)}$$

for each agency (j), the sum product of the variable of interest ($x_{j,j}$) to the population served by that agency (p_j) was divided by the sum of the populations served by all agencies. The resulting weighted variable was in the units of the relevant variable.

Per Capita Adjustments

Where appropriate, data in the Assessment were adjusted to represent those data per capita. In each case, the variable of interest was divided by the population served.

Per Capita Adjustment:

$$PCx_j = \frac{x_j}{p_j} \quad \textbf{(9)}$$

for each agency (j), where the variable of interest (x_j) was divided by the population served by that agency (p_j). The resulting per capita adjustment was in the units of the relevant variable and determined with respect to each agency.

Contextual Administrative Analysis

The following data collected from the *Health Department Information* (“Background”) section of the Assessment were analyzed to provide context for the Assessment (e.g., total revenues and expenditures for the Assessment period and the number and FTE employed by different) and to allow standardization of data across agencies (e.g., inflation adjustment, alignment to 2,080 annual hours). Data are organized by type with specific questions described where necessary.

Analysis of Occupational and Total Effort

Total FTE reported for each fiscal year (Q14) and per occupation for the current period of Assessment (Q19) were first standardized according to the approach described in *Standardization of Effort Data* and calculated by **Equation (2)**. LHDs that were a part of a multi-county partially integrated CHB—possessing a joint governance but independent LHDs—who responded as the “fiscal host” (e.g., lead administrative agency within the CHB) reported FTE for the CHB separate from LHDs (Q4) but were not requested to report their FTE definition, so those CHB data were not standardized.

Analysis of CHB-reported Effort

Those LHDs serving as fiscal host for their CHB were requested to respond with the total FTE for the CHB, itself (Q4). These data, combined with total FTE reported by each of the CHB’s LHDs (Q14), were compared to what the CHB reported to the *Local Public Health Finance and Staffing Survey*.[24] Substantial deviations were found for some LHDs and UMN CPHS staff were unable to conclude the reasons for deviations in discussions with some LHDs. LHDs generally suggested the data submitted to the Assessment be used, rather than the MDH survey data. *No further analyses were performed with CHB data*.

Analysis of Occupations by Type

LHDs submitted total number of staff (whole persons) and total FTE (actual effort) for specific occupations employed in FY 2021 (Q19). The instrument collected data for 29 separate occupation types that were typical for local public health, such as health administrator, epidemiologist, public health nurse. Data for the number of FTE were adjusted to per capita values and analyzed for each occupation type across the 74 LHDs and MDH using descriptive statistics (e.g., count of agencies reporting specific occupation, mean, min, max), then organized according to the LHD population bands and MDH per occupation type; *detailed data on specific public health occupations were not included in the report*.

Analysis of Total Effort

Total effort for the current period was reported by LHDs and MDH (Q14) but also summed by occupation (Q19). Where an agency's reported total FTE for the current period (Q14) and sum of occupational FTE for the current period (Q19) differed, the reported total FTE were retained. FTE totals were then analyzed across the 74 LHDs and MDH using descriptive statistics (e.g., mean, standard deviation) and then used to create all-LHD & MDH and statewide FTE totals; *both sets of totals were included in the report*.

Analysis of Total Revenues

Total revenues reported for each fiscal year (Q15) and per revenue source for each fiscal year (Q17) were first adjusted for inflation according to the approach described in *Adjusting for Inflation* and calculated by **Equation (4)**.

Analysis of CHB-reported Revenues

Those LHDs serving as fiscal host for their CHB were requested to respond with the total revenues for the CHB, itself (Q4). These data, combined with total revenues reported by each of the CHB's LHDs (Q15), were compared to what the CHB reported to the *Local Public Health Finance and Staffing Survey.*[24] Substantial deviations were found for some LHDs and UMN CPHS staff were unable to conclude the reasons for deviations in discussions with some LHDs. LHDs generally suggested the data submitted to the Assessment be used, rather than the MDH survey data. *No further analyses were performed with CHB data*.

Analysis of LHD Revenues by Source

Revenues reported by LHDs per source for each fiscal year (Q17) were aggregated into groups where appropriate, creating the following groups:

- **Insurance:** Medicaid (Title XIX of the Social Security Act), Medicare (Title XVIII of the Social Security Act), Private Insurance sources;
- **Fees:** Client Fees, Other Fees and Fines (non-client);
- **COVID-19:** Federal COVID-19 CARES Funds from State, Federal COVID-19 Funds from a Federal Agency, Other Federal COVID-19 Funds Awarded by State, State COVID-19 Funds, Local COVID-19 Funds, Other COVID-19 Funds; and
- **Other:** any revenue sources specified by LHDs as "other."

Proportions for each revenue source or revenue group (i.e., source divided by aggregated revenue from all sources) were calculated. To estimate the proportion of revenues, the denominator used for total revenues was constructed by the sum of revenues by source (Q17), rather than using the total revenues reported (Q15), as the denominator. Proportional revenues were then analyzed across the 74 LHDs using descriptive statistics (e.g., mean, min, max) and then mean weighted revenues were calculated via **Equation (8)** and reported according to the population bands; *detailed data on specific revenue sources were not included in the report*.

Analysis of Total Revenues

Total revenues reported by LHDs (Q15) were analyzed across the 74 LHDs using descriptive statistics (e.g., mean, min, max). Total revenues were then summed for all LHDs to determine all LHD revenues.

Total revenues reported by MDH (Q15) were retained as a separate group. The all LHD revenue totals and MDH total were then used to create 1) all-LHD total revenues, 2) MDH total revenues, and 3) all-LHD & MDH and statewide revenue totals; *only the all-LHD and MDH and statewide revenue totals were included in the report*.

Analysis of Total Expenditures

Total expenditures reported for each fiscal year (Q15) and per expenditure category for each fiscal year (Q18) were first adjusted for inflation according to the approach described in *Adjusting for Inflation* and calculated by **Equation (4)**.

Analysis of CHB-reported Expenditures

Those LHDs that were a part of a multi-county partially integrated CHB who responded as the fiscal host were requested to respond with the total expenditures for the CHB itself (Q4). These data, combined with total expenditures reported by each of the CHB's LHDs (Q15), were compared to what the CHB reported to the *Local Public Health Finance and Staffing Survey*.[24] Substantial deviations were found for some LHDs and UMN CPHS staff were unable to conclude the reasons for deviations in discussions with some LHDs. LHDs generally suggested the data submitted to the Assessment be used, rather than the MDH survey data. *No further analyses were performed with CHB data*.

Analysis of LHD Expenditures by Category

Expenditures reported by LHDs per MDH's set of 6 funding sources ("category")—"Infrastructure," "Healthy Communities," "Infectious Disease," "Environmental Health," "Disaster Preparedness," and "Health Services"— for each fiscal year (Q17) were analyzed for LHDs.[24] Proportions for each expenditure category (i.e., category divided by total expenditures) were calculated. To estimate the proportion of expenditures, the denominator used for total expenditures was constructed by the sum of expenditures by category (Q17), rather than using the total expenditures reported (Q15), as the denominator. Proportional expenditures were then analyzed across the 74 LHDs using descriptive statistics (e.g., mean, min, max) and then mean weighted expenditures were calculated via **Equation (8)** and reported according to the population bands; *detailed data on specific expenditure categories were not included in the report*.

Analysis of Total Expenditures

Total expenditures reported by LHDs (Q15) were analyzed across the 74 LHDs using descriptive statistics (e.g., mean, min, max). Total expenditures were then summed for all LHDs to determine all LHD expenditures. Total expenditures reported by MDH (Q15) were retained as a separate group. The all LHD expenditure totals and MDH total were then used to create 1) all-LHD total expenditures, 2) MDH total expenditures, and 3) all-LHD & MDH and statewide expenditure totals; *only the all-LHD and MDH and statewide expenditure totals were included in the report*.

Analysis of Qualitative Responses

Agencies were provided a variety of opportunities to provide additional context to quantitative instrument responses and a source of validation. Many of these fields allowed entry of free-text responses. The open text responses were available for the *Health Department Information* section of the Assessment (Q6–Q10, Q16) and *Self-Assessment* section of the Assessment (Q22–Q23, QE.1.b, QG.2.d, QG.3.g, QH.3.c, QI.3.e, QK.3.c, QK.3.e, QL.3.c, and QL.3.e).

The *Health Department Information* free-text items (Q6-Q10, Q16) and *Self-Assessment* free-text items (Q22-Q23) were analyzed using Google Sheets by extracting key themes from participant responses according to deduced ("a priori") coding categories. Assessment questions and their associated coding categories are described below. Please see the *Qualtrics Assessment Instrument Instructional Guide* (z.umn.edu/TransformMNPH_Instrument) for the full context of each of the following questions.

Question 6 (description of relationship to jurisdiction, including funds paid or received)

- Coding Categories: Relationship; LHD Paid Expenses; Non-LHD Directly Paid; Expenses (including in-kind); 2022 Related Comments; Other

Question 7 (description of facilities and any related funds paid).

- Coding Categories: Types/Name of Facilities; Amount/What is Paid; How Facilities are Paid for; Other

Question 8 (description of sharing relationships, partners, etc.)

- Coding Categories: Cross-Jurisdiction; Cross-Sectoral; Inter-Departmental; Other

Question 9 (description of impacts of COVID-19 emergency and response)

- Coding Categories: Actions in Response to COVID-19; Impact due to COVID-19 Response; Other COVID-19 Impacts not Resulting for LHD Response; Other

Question 10 (description of any cyclical or atypical activities from the Assessment period)

- Coding Categories: Actions in Response to COVID-19; Impact due to COVID-19 Response; Other COVID-19 Impacts not Resulting for LHD Response; Other

Question 16 (explanations for any discrepancies between reported revenues and expenditures)

- Coding Categories: Reasons for Discrepancies in 2019; Reasons for Discrepancies in 2020; Reasons for Discrepancies in 2021; Reasons for Discrepancies in Unspecified Year; Other

Question 22 (presence of written plans, presence of collaboration, and description of collaboration)

- Coding Categories: MDH; Another LHD; Another CHB; Private Partners; Other

Question 23 (presence of written policies, presence of collaboration, and description of collaboration)

- Coding Categories: MDH; Another LHD; Another CHB; Private Partners; Other

The *Self-Assessment* free-text items (QE.1.b, QG.2.d, QG.3.g, QH.3.c, QI.3.e, QK.3.c, QK.3.e, QL.3.c, and QL.3.e) were analyzed using Google Sheets by extracting key themes from participant responses according to a priori coding categories. Assessment questions and their associated coding categories are described below. Please see the Qualtrics Assessment Instrument Instructional Guide (z.umn.edu/TransformMNPH_Instrument) for the full context of each of the following questions.

Questions were asked for different headline responsibilities in the *Self-Assessment* section, each having the same response categories.

Question E.1.b (description of health equity trainings, topics, frequency, and staff served)
Question G.2.d (description of technology initiatives, topics, frequency, and staff served)
Question G.3.g (description of workforce trainings, topics, frequency, and staff served)
Question H.3.c (description of public health law trainings, topics, frequency, and staff served)
Question I.3.e (description of emergency preparedness trainings, topics, frequency, and staff served)
Question K.3.c (description of environmental health trainings, topics, frequency, and staff served)
Question K.3.e (description of environmental health initiatives, topics, frequency, and staff served)
Question L.3.c (description of prevention trainings, topics, frequency, and staff served)
Question L.3.e (description of maternal/child initiatives, topics, frequency, and staff served)

- Coding Categories: Response Suggests Activity is Absent; Response Suggests Activity is Basic; Response Suggests Activity is Proficient/Expert

Datasets created from the coding activities were made available to all UMN CPHS staff as context for analyzing the disparate datasets derived from the Assessment and were used to provide context and explanations within the body of the report.

Analysis of Self-Assessed Expertise and Capacity

All LHDs and MDH were requested to self-report their expertise and capacity to implement the FCs and FAs of the FPHR framework and operational definitions **in their communities** (see *III – XIV. Self-Assessment by FPHR* above). As noted above, all LHDs and MDH self-assessed FPHR activities (n =

340) and HRs (n = 52), with headline responsibilities self-assessed independently from the subordinate activities.

Agencies scored according to four-item ordinal Likert scales for expertise (on a scale from 1 to 4 with 1 being "Absent" and 4 being "Expert") and capacity (on a scale from 1 to 4 with 1 being "Absent" and 4 being "Expert"); the rubric with descriptions for response options is available in **Table 1** in the **Analysis of Self-Assessed Expertise and Capacity** section of **Brief Methods** in the report. These responses were coded from 1–4 but the ordinal scale did not establish a true difference or interval between items. Agencies were offered a fifth option, "I don't know" (coded as 5), meant to be a placeholder until they arrived at a clear determination. At the conclusion of data collection, some agencies had not responded to some self-assessment items ("missing"). During analysis, any data points with either missing values or coded as 5 were excluded from analysis.

Activity and Headline Responsibility Analyses

Agency-Level Activity and Headline Responsibility Analyses

Self-assessment values were combined into raw implementation scores for expertise and capacity for each headline responsibility. This was done by squaring the respective expertise and capacity values, then taking the square root of the sum of those squares; the resulting composites were referred to in analysis as hypotenuse ("Hyp") values.

Raw Implementation Score:

$$Hyp_{j,i} = \sqrt{Exp_{j,i}^2 + Cap_{j,i}^2} \quad \textbf{(10)}$$

for each agency (*j*) and expertise ($Exp_{j,i}$) or capacity ($Cap_{j,i}$) value of a given activity or headline responsibility (*i*), where those respective expertise and capacity values were each squared, added together, then the square root was taken of that sum. The resulting raw implementation scores were continuous data, transformed from the ordinal scores.

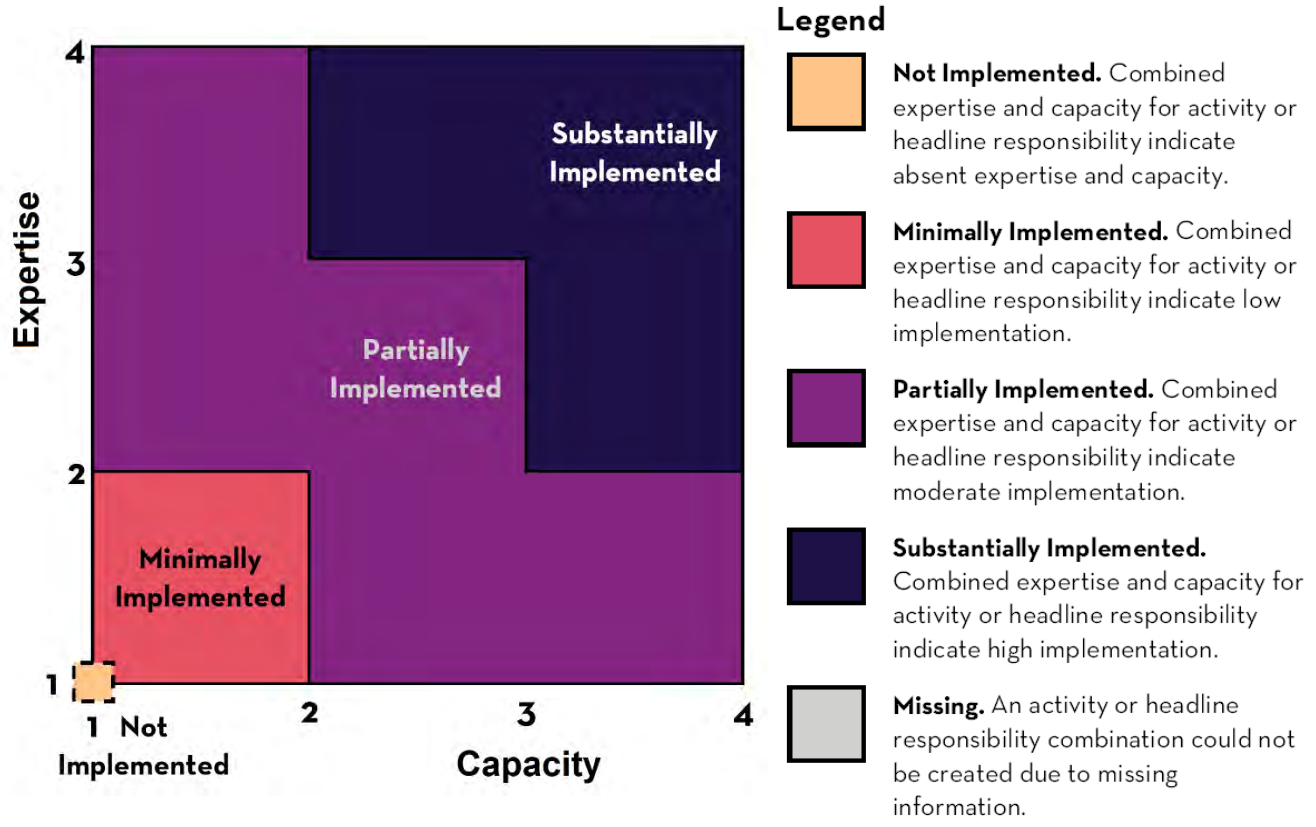
Plotting Level of Implementation

The ordinal expertise and capacity data may be visualized together to illustrate the implicit "level of implementation" for an activity or headline responsibility (i.e., a single measure); the latter self-assessed independent of subordinate activities. UMN CPHS staff normalized scores to a scale of 1–4. The placement of these scores in a x-y coordinate plane—with expertise on the y-axis (from 1–4) and capacity on the x-axis (from 1–4)—fall within specific "zones" of the plot which may be described by relative implementation percentages (see **Figure B-1**). The zones are as follows.

1. **1.0 — Not Implemented.** Combined expertise and capacity for activity or headline responsibility indicate absent expertise and capacity (i.e., 1 x 1). This zone has a relative implementation score of 0% (*but do not extend to 25%*).
2. **1.1–2.0 — Minimally Implemented.** Combined expertise and capacity for activity or headline responsibility indicate low implementation (e.g., 1 x 2, 2 x 2). This zone has a relative implementation score between 25–50%.
3. **2.1–3.0 — Partially Implemented.** Combined expertise and capacity for activity or headline responsibility indicate moderate implementation (e.g., 1 x 4, 2 x 3, 3 x 3). This zone has a relative implementation score between 50–75%.
4. **3.1–4.0 — Substantially Implemented.** Combined expertise and capacity for activity or headline responsibility indicated high implementation (e.g., 3 x 4, 4 x 4). This zone has a relative implementation score between 75–100%.

When either an expertise or capacity score was missing, no combination could be made from the data and that datapoint was excluded from analysis; those scores were then classified as "missing."

Figure B-1. Level of Implementation Diagram



These agency scores, unadjusted, were added to scatter plots (340 activity plots, 52 HR plots); these plots available on the *Public Health Cost and Capacity Foundational Dashboards* (z.umn.edu/TransformMNPH_Dashboard).

Overall Headline Responsibility Analyses

The agency-level headline responsibility scores described above, were averaged together to develop overall scores for each foundational capability and area foundational responsibility, under which they are nested. These averages were developed for denominators of each population band, all LHDs, and all LHDs plus MDH.

FOUNDATIONAL RESPONSIBILITY ANALYSES

Agency-Level Foundational Responsibility Analyses

Headline responsibility scores were used to create "unweighted" and "weighted" averages for each foundational capability and area foundational responsibility. Unweighted averages were first calculated as simple means of all headline responsibility scores within each respective foundational responsibility.

Unweighted Responsibility Averages: $$C_j = \frac{1}{n_b}\sum_{b=1}^{n_b}\left(Hyp_{j,b,c}\right) \quad (11)$$

for each agency (*j*), the sum of the headline responsibility scores described above in **Equation (10)** ($Hyp_{j,b,c}$) across the number of headline responsibilities ($b = 1,\ldots,n_b$) for a given foundational responsibility (*c*) was divided by the total number of headline responsibilities for that foundational responsibility (n_b). When the calculation became zero or an error (because, e.g., there was a missing or an "I don't know" as a value), the datapoint was excluded from analysis. The resulting unweighted foundational responsibility average was dimensionless and determined with respect to each agency.

HR Expenditure Proportion: $$\boldsymbol{p_{j,b,c} = \frac{e_{j,b,c}}{E_{j,c}}}$$ **(12)**

for each agency (*j*), the total current FPHR expense for the headline responsibility ($e_{j,b,c}$) of a given foundational responsibility (*c*) was divided by the total current FPHR expense for the foundational responsibility ($E_{j,c}$). The resulting headline responsibility expenditure proportion was dimensionless and determined with respect to each agency, headline responsibility, and foundational responsibility. When the calculation became zero or an error (0/0), the datapoint was excluded from analysis. It was also excluded from the analysis when its corollary implementation measure was missing.

Weighted Responsibility Averages: $$\boldsymbol{wC_j = \sum_{b=1}^{n_b}\left(p_{j,b,c} \times Hyp_{j,b,c}\right)}$$ **(13)**

for each agency (*j*), the sum product of the headline responsibility expenditure proportion ($p_{j,b,c}$) found by **Equation (12)** to the headline responsibility scores described above in **Equation (10)** ($Hyp_{j,b,c}$) from across the number of headline responsibilities ($b = 1,\ldots,n_b$) for a given foundational responsibility (*c*) was multiplied by the sum of the HR expenditure proportion across the number of headline responsibilities for the given foundational responsibility. The resulting weighted foundational responsibility average was dimensionless and determined with respect to each agency. When the calculation became zero or an error (0/0) or included an "I don't know", the datapoint was excluded from analysis.

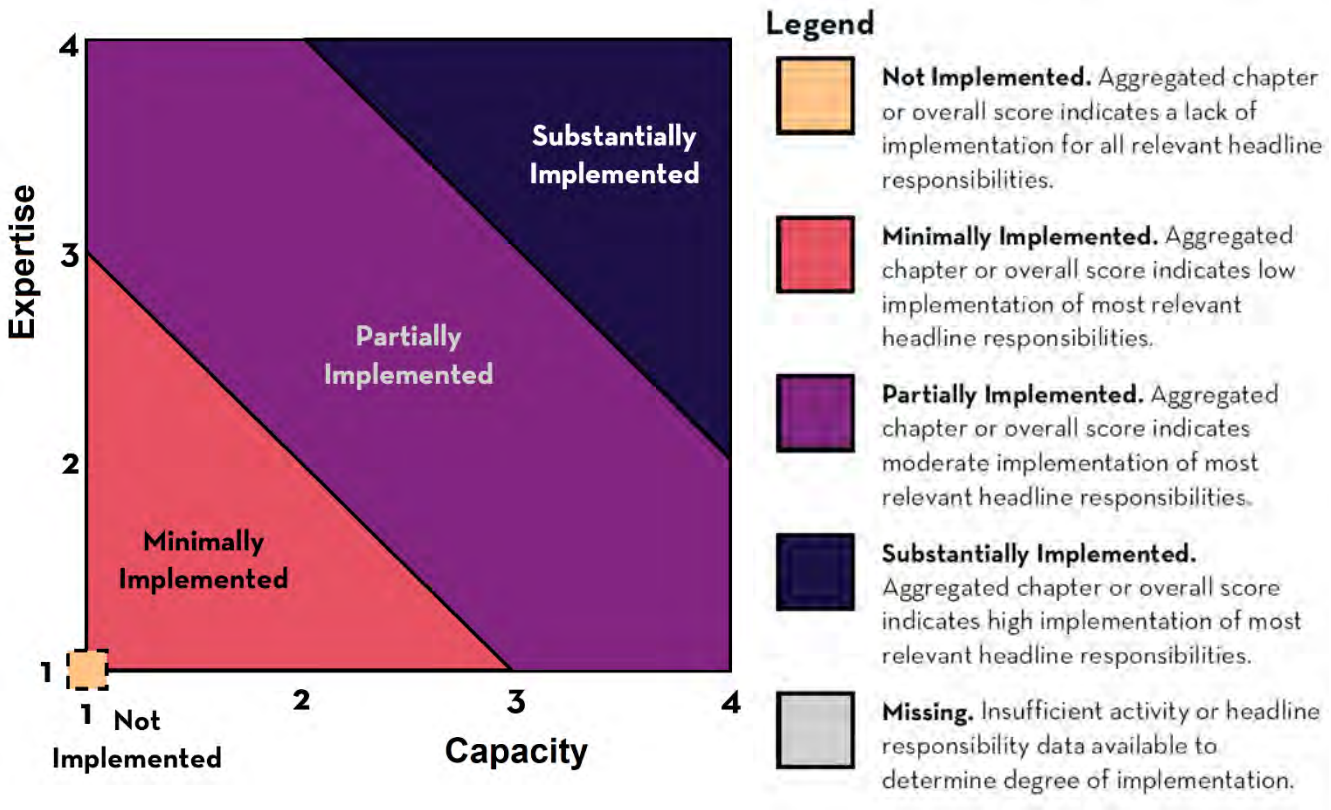
Foundational responsibility averages for all LHDs and overall were then created by averaging data across all LHDs and all LHDs plus MDH after accounting for the relative contribution of expenditures to the total.

Plotting Degree of Implementation

The interval composites may be visualized to illustrate the implicit "degree of implementation" for foundational responsibilities, overall for all FCs, overall for all FAs, and overall across the FPHRs. Similar to what was described in *Plotting Level of Implementation*, the placement of these scores in a x-y coordinate plane—with expertise on the y-axis (from 1–4) and capacity on the x-axis (from 1–4)— fall within specific "zones" of the plot. UMN CPHS staff ascribed specific degrees to several defined zones (see **Figure B-2**). The zones align with those described above with slight differences in meaning.

1. **1.0 — Not Implemented.** Aggregated foundational responsibility or overall score indicates a lack of implementation for all relevant headline responsibilities. This special case occurs when all associated capacity and expertise are absent (i.e., 1 for all capacity and expertise). This zone has a relative implementation score of 0% (*but do not extend to 25%*).
2. **1.1–2.0 — Minimally Implemented.** Aggregated foundational responsibility or overall score indicated low implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise distributed around 2). This zone has a relative implementation score between 25–50%.
3. **2.1–3.0 — Partially Implemented.** Aggregated foundational responsibility or overall score indicated moderate implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise distributed around 3). This zone has a relative implementation score between 50–75%.
4. **3.1–4.0 — Substantially Implemented.** Aggregated foundational responsibility or overall score indicated high implementation of most relevant headline responsibilities (i.e., mixture capacity and expertise leaning toward 4). This zone has a relative implementation score between 75–100%.

Figure B-2. Degrees of Implementation Diagram



These agency scores, unadjusted, were added to scatter plots (9 FC plots, 4 FA plots, 1 overall FC plot, 1 overall FA plot, and 1 statewide overall plot); these plots are available on z.umn.edu/TransformMNPH_Dashboard.

Overall Foundational Responsibility Analyses

The agency-level unweighted foundational responsibility averages found by **Equation (11)**, were averaged together to develop overall scores for each foundational responsibility. These averages were developed for denominators of each population band, all LHDs, and all LHDs plus MDH.

The agency-level weighted foundational responsibility averages found by **Equation (13)**, were averaged together to develop overall scores for each foundational responsibility. These averages were developed for denominators of each population band, all LHDs, and all LHDs plus MDH. Population weighted averages were applied *in addition* to expenditure-weighted averages (or expenditure-unweighted averages) for these aggregations, specifically for all regional or state averages. The reasoning here was that when LHDs were shown individually, an overall picture of the state could be shown, agency-by-agency. However, if population served were not taken into account when aggregations occurred, the fact that 60% of the state's population is served by 10 LHDs (and 80% by about a third of LHDs in the state), we may get a skewed view of state need and capacity. Taken together—showing individual agencies, as well as the state overall—a fuller picture of needs, differences, and concordance of need are illustrated.

Overall Analyses

As with the calculations performed to arrive at unweighted foundational responsibility averages, when calculating unweighted agency-level and statewide averages, simple means were taken and missing data were excluded from the analyses. The aggregated ordinal data (the Implementation composite scores) are continuous and give a sense of some variability within the "Not Implemented," "Minimally Implemented," "Partially Implemented," "Substantially Implemented" scale.

Agency-Level Overall Analyses

Data for each of the foundational capabilities and areas were finally combined to create statewide values. Overall averages for each foundational responsibility can be created from prior data and approaches for either weighted or unweighted overall scores.

Unweighted Overall Averages: $$O_j = \frac{1}{n_c}\sum_{c=1}^{n_c}(C_j) \quad (14)$$

for each agency (*j*), the sum of the foundational responsibility scores (C_j) across the number of foundational responsibilities (*c = 1,...,13*) was divided by the total number of foundational responsibilities (n_c = *13*). The resulting unweighted overall average was dimensionless and determined with respect to each agency. When the calculation became zero, the datapoint was excluded from analysis.

Weighted Overall Averages: $$wO_j = \frac{1}{n_c}\sum_{c=1}^{n_c}(wC_j) \quad (15)$$

for each agency (*j*), a weighted average was calculated by taking the weighted foundational responsibilities score and the expenditures associated with the respective foundational responsibilities (*c = 1,...,13*) and creating an overall agency weighted average accordingly . The resulting weighted overall average was dimensionless and determined with respect to each agency. When the calculation became zero, the datapoint was excluded from analysis.

Statewide Overall Analyses

The agency-level unweighted overall averages found by **Equation (14)**, were averaged together to develop overall scores for the FPHRs. These averages were developed for denominators of each population band, all LHDs, and all LHDs plus MDH. The agency-level weighted overall averages found by **Equation (15)**, were averaged together to develop overall scores for the FPHRs. These averages were developed for each population band, all LHDs, and all LHDs plus MDH.

Analysis of FPHR Spending and Effort Data

Analyses were conducted to estimate (a) the current spending and effort levels for each foundational capability and areas within both MDH and LHDs, (b) full implementation cost and effort for each foundational program and capability in both MDH and LHDs, and (c) the statewide gap in spending and effort.

Prior to analyses for current spending and full implementation spending, all pass-through & transfer expenditures and capital expenditures were removed from the datasets. The reasons for this were two-fold. First, many specific expenditures reported within those two categories are atypical, meaning that agencies may not budget predictably for a similar amount annually (e.g., the same equipment are not often purchased annually, awards passed through to other organizations may vary based on awards agencies receive). Second, some of the funds passed through to other governmental health departments—both MDH to LHD and LHD to LHD pass-throughs—would be double-counted as expenditures (i.e., Agency A reports pass-through expenditure to Agency B, Agency B reports expenditures based on funds received from Agency A). By excluding pass-throughs, transfers, and capital expenses, *the Assessment may focus on total operating costs that may be predictable*.

Organizing Current Effort and Spending

All LHDs and MDH were asked to report current effort and spending for each of the headline responsibilities. The current spending data for each agency were analyzed as total per capita spending, including both labor and nonlabor spending. Similarly, current effort data for each agency were analyzed as total per capita FTE. Data for each variable set (i.e., current and full implementation, FTE and spending) were analyzed per foundational capability and area, summed for all LHD with MDH retained separately, and summed as overall statewide values.

To accommodate the significant and unusual surge in spending and effort levels associated with Preparedness and Response measures due to COVID-19 pandemic, we implemented adjustments to the current spending and effort levels specifically within this context. The procedure for these adjustment is as follows:

Firstly, we computed the gap between nominal full implementation cost and nominal current spending for each headline responsibility. Subsequently, we derived the mean of these gap values.

Following this preliminary analysis, we then proceeded to impute the current spending and effort levels for Preparedness and Response. The imputation was conducted by multiplying the full implementation spending or effort by the complement of the mean gap proportion. In this way, we achieved a nuanced adjustment, accounting for the extraordinary circumstances introduced by the COVID-19 pandemic. LHDs were organized according to the population bands described above in the **Population Groupings in Assessment** section. Prior to deploying the power model to estimate current spending and effort level for each foundational responsibilities, and overall, outliers were dropped from each FC, FA, or population group that were either (a) above the 1st percentile or above the 99th percentile of the data distribution of population group, or (b) more than 3 standard deviations from the mean. The goal in removing outliers is to ensure that results were not overly influenced by observations that differed substantially from the far end of the distribution.

We opted to substitute outliers with the predicted values derived from the power model for each FC and FA. This approach allows us to preserve the integrity of LHDs' reported figures pertaining to their current spending and efforts. The act of completely eliminating outliers without imputing data from the cost curve could potentially result in an underestimation of current expenditure.

In addition, we adjusted current spending and effort level values either upwards or downwards, as necessary, to align with the predicted total current spending or effort. This normalization process ensures consistency and comparability across various LHD reports.

Organizing Full implementation Effort and Spending

All LHDs and MDH were asked to provide estimations for the financial investment required to achieve full implementation of the FPHS. The full implementation cost and FTE of LHD for FC and FA were analyzed as per capita values. Outliers were excluded to accurately determine the full implementation costs and FTEs. We replaced outliers with predicted values derived from power model for each FC and FA. We also adjusted full implementation spending or effort level values. We also made necessary calibrations to the full implementation spending and effort level figures for each FC/FA, either escalating or reducing them, to ensure consistency with the predicted overall current expenditure or effort.

Estimating Gaps in Spending and FTE

The estimated resource gaps—calculated by subtracting the estimated current effort or spending data from the respective estimated full implementation data —were determined for foundational responsibilities, and overall. However, the project aimed to identify estimated resource gaps that also included "contingencies" (avoided underestimations of needed resources). Moving forward, the term "gap" refers to any respective difference between current and full implementation resources, the term "nominal gap" refers to only the difference between agency-reported current spending and full implementation estimates, and the term "gap with contingencies" refers to instances where potential underestimations of gap were corrected.

Construction of the Power Model

UMN CPHS staff considered multiple different regression models to represent and predict spending and FTE gaps. A power model that regressed the full implementation spending, effort, current spending and effort, as well as the gap in spending and FTE relative to the population served relative to the population served proved the most predictive and performed the best across a variety of model fitting

exercises. The power model was constructed with LHD data* to estimate the overall full implementation spending, effort, current spending and effort, as well as the overall gap in spending and FTE.
** MDH data were not used to construct the power model but were considered with the model in analysis.*

Power Curve Calculation $$In(Y_j) = \beta_0 * p_j^{\beta_1} + \epsilon_j \quad (16)$$

where (j) represents each agency and (p_i) represents the population served per 1,000 persons for each agency. The error term (ϵ_j) encompasses unobserved factors specific to each agency that influence the dependent variables. The coefficient (β_0) captures the scaling factor or baseline value of the dependent variable when the independent variable is equal to 1, which signifies the initial reference point or starting level of the dependent variable. The units of the coefficient (β_0) are contingent upon the units of the dependent variable, as it indicates the magnitude or scale of the dependent variable at the reference level of the independent variable. Conversely, the coefficient (β_1) represents the exponent or power that governs the relationship between the independent variable and the dependent variable, which elucidates the rate or extent of change in the dependent variable as the independent variable varies. Notably, the coefficient (β_1) is dimensionless and lacks specific units. It signifies the mathematical relationship between the independent and dependent variables rather than a physical quantity.

Notably, variables such as spending or FTE often exhibit a "right-skewed" distribution. Right-skewness refers to a situation where the data is asymmetrically distributed, with a longer tail on the right side. To address this right skewness in the data, we employed logarithmic transformation on dependent variables. The logarithmic transformation helps compress the values at the higher end of the distribution, effectively reducing the skewness. As a result, extreme values are brought closer to the center, resulting in a more symmetrical distribution. We utilized the logarithmic transformation of the gap in spending per capita and FTE per capita as the dependent variables.

The model demonstrates a high level of predictive accuracy, indicating its effectiveness in explaining the data; population-weighted power model regression was used successfully in the "Staffing Up" project to develop a national estimate of staffing needed to support elements of the implementation of a minimum package of public health services, known as the Foundational Public Health Services (FPHS), in communities across the US.[11] While Staffing Up had more LHDs to draw from, high-quality data gathered from a single state such as Minnesota allows for a robust estimation process without overfitting the data.

Per capita ("PC") calculations for the dependent variables of gaps in spending and FTE were calculated for each agency:

1. ***Gap in Spending (PC) =*** *Full Implementation Cost (PC) – Current Spending (PC)*
2. ***Gap in FTE (PC) =*** *Full Implementation FTE (PC) – Current FTE (PC)*

To conduct a comparison between nominal FTE and spending gaps reported by each agency and respective curve-estimated per capita gaps an inverse logarithmic transformation was applied to the dependent variable.

Estimating Gap with Contingency

Separate scatter plots were created on x-y coordinate planes for analysis of spending and FTE gaps:

1. **Gap in Spending (PC) Plot** with the per capita spending gap on the y-axis and population served on the x-axis; and
2. **Gap in FTE (PC) Plot** with the per capita FTE gap on the y-axis and population served on the x-axis.

Power curves were created for each plot, based on the per capita gap variable of interest. The power model described above establishes a "floor" for the dependent variable (gap of spending or FTE). That is, if a LHD reports current and full implementation values, for either per capita spending or FTE, that leads to a respective gap value **below** the curve-estimated value (i.e., point with respect to the agency's population served), the resulting gap is then replaced with the curve-estimated value; this

approach to replacing below-curve values with curve-estimated values was referred to as adding "contingency." However, if a LHD reports current and full implementation values, for either per capita spending or FTE, that leads to a respective gap value **above** the curve-estimated value, the reported gap is retained.

Agencies' gap values that were perceived to have been underestimated (hence, underestimated full implementation needs) were adjusted to meet a baseline or floor established by the statistical model, whereas remaining agencies' gap values remained unchanged. Upon adjustment, agencies' full implementation values (for either FTE or spending) similarly adjusted to reflect the gap from respective current spending or FTE; the respective current spending or FTE value remains unchanged.

Following adjustments, for either FTE or spending, both a) agencies' nominal gaps (adjusted values) and unadjusted full implementation values and b) agencies' gaps with contingencies and revised full implementation values were combined together for headline responsibility, foundational responsibility, or overall scores. The gaps with contingencies approach avoided underestimation of the gap for statewide analysis.

Network Analysis of the Minnesota Public Health System

Agencies were asked about the ways in which they shared headline responsibilities, written documents, and policies, then requested to identify the agencies with whom they shared. Relationships that were identified amongst LHDs or between LHDs and MDH were extracted for analysis. Though LHDs described sharing relationships with organizations other than LHDs or MDH, those relationships were not analyzed in great depth. Summary statistics were developed to assess the interconnectedness of LHDs (including relationships within CHBs) and also for sharing between LHDs and MDH to identify the interconnectedness of the state with local public health. Network maps for the state of Minnesota were constructed as interlocal relationships (relationships amongst LHDs) overlaid on choropleth maps for degree of implementation findings, with relationships ("connections") represented by lines between LHDs ("nodes"). Relationships in which LHDs reported a sharing relationship with a multi-county partially integrated CHB were visualized by connections between those LHDs and all LHDs within that respective CHB. Network maps for headline responsibilities, Foundational Capabilities, Foundational Areas, and statewide overall were all contained within the *Public Health Cost and Capacity Network Analysis Dashboard* (z.umn.edu/TransformMNPH_Network).

Data Collected from Local Health Departments

Within the self-assessment section of the instrument, LHDs were asked to report service delivery relationships for each headline responsibility (see the **III – XIV. Self-Assessment by FPHR** section, above). Questions included reporting the existence and type of sharing relationships for each headline responsibility. LHDs were given six options for responding to whether a given headline responsibility was shared with another agency or organization:

1. *No (no sharing relationship);*
2. *Yes, another agency partially delivers this service in my jurisdiction;*
3. *Yes, another agency completely delivers this service in my jurisdiction;*
4. *Yes, we partially deliver this service for another agency;*
5. *Yes, we completely deliver this service for another agency;* and
6. *Yes, we collaboratively deliver this service with another agency.*

If the LHD answered "Yes" in any capacity (i.e., chose one of options 2–6), they were asked to provide the name or names of the entities with whom they shared. Then, they were asked about the formality of the sharing relationship (e.g., Informal, no written agreement; Informal, written agreement; Formal, written agreement; Shared governance). If the LHD answered "No," they were asked whether they would be open to sharing the given headline responsibility in the future.

Additionally, LHDs were asked about the existence of a variety of specific written documents and organizational policies, including for community health assessments, community health improvement plans, and policies for specific health department programs or infrastructure. For each of these items, LHDs indicated potential sharing relationships (e.g., "yes," "no," or "we collaborate with or defer to

another agency or organization's written plan or document"). If the latter was selected, LHDs indicated with whom they collaborated or to whom they deferred.

Data Collected from MDH

MDH was given a modified instrument with which to report service delivery relationships for each headline responsibility. Questions included reporting the existence and type of sharing relationships for each headline responsibility. MDH was given three options for responding to whether a given headline responsibility was shared:

1. *No, we deliver;*
2. *Yes, we collaborate; and*
3. *Yes, someone else delivers.*

MDH was also asked if the headline responsibility was shared with another state department or organization, then to identify that department or organization. Finally, MDH was asked for each headline responsibility if, at the local level, services may be provided on behalf of LPH in any jurisdiction (e.g., "yes all," "yes some," "no").

Analyzing Data

The network analysis investigated sharing arrangements between individual governmental public health departments. LHD sharing arrangements reported to occur with other LHDs were used to identify relationships for the network. Though sharing relationships were reported with nongovernmental organizations and with local governments or governmental departments outside of public health, these relationships were not analyzed in great depth. Relationships between MDH and LHDs were also investigated, using details on sharing relationships identified for headline responsibilities and for specific written documents and policies. These data were reported using summary statistics.

The leaflet R package was used to develop choropleth maps of the 74 LHD jurisdictions in Minnesota, where the choropleth represented the level of implementation of the jurisdiction for the given service (see the **Description of Minnesota's Public Health Network** section, above). Overlaid on the choropleth is the interlocal network between LHDs (indicated by lines connecting LHD nodes). Only one LHD was required to have reported the given relationship for it to be displayed on the map, under the assumption that errors of omission in such a comprehensive assessment would be more likely than errors of invention. Additionally, if an LHD reported sharing with a multi-county partially integrated CHB, this sharing relationship was disaggregated so that sharing was reported between the responding LHD and all LHDs that comprised the partially integrated CHB. Other sharing relationships were not displayed, including relationships with MDH, with nongovernmental organizations, and with non-health local governments.

These maps were built into the *Public Health Cost and Capacity Network Analysis Dashboard* (z.umn.edu/TransformMNPH_Network), which contains network maps for visualization according to headline responsibilities (52 maps), Foundational Capabilities (9 maps), Foundational Areas (4 maps), and a single statewide map.

APPENDIX C – ADDITIONAL FINDINGS

CONTEXTUAL ADMINISTRATIVE ANALYSIS

TIME PERIODS

Question 11: What was the period of your health department's 2021 fiscal year?

We tabulated the begin and end dates of LHDs' fiscal years and found that 69 LHDs (93% of LHDs) were on a January to December fiscal year. The fiscal year of three LHDs was from July 01 to June 30, and the fiscal year of two LHDs was from October 01 to September 30. In order to account for inflation which has been relatively high during the study period, we took into account the fiscal years of LHDs when adjusting revenues and expenditures.

OCCUPATIONS & FTE

Question 13: How many hours per year are considered a full-time equivalent (FTE) at your health department?

We tabulated the responses to this question and found that 64 LHDs (85%) considered 1 FTE equivalent to 40 hours of work per week (2080 hrs/ year). Six LHDs worked 37.5 hours per week toward 1 FTE (1950 hrs/ year) and 1 health department each worked 30, 35, 36, and 39.5 hours per week toward 1 FTE.

Question 19: Please provide your health department's FY 2021 persons and filled FTE by job classification.

Participants listed the number of persons and total FTE in their health department employed under the following occupations - Health Administrator, Administrative/Business Professional, Administrative Support, Communications / Public Information Officer, Community Health Worker, Environmental Scientist and Specialist, Epidemiologist, Health Planner/Researcher/Analyst, Interpreter, Licensure/Inspection/Regulatory Specialist, Medical and Public Health Social Worker, Mental Health Counselor, Occupational Safety and Health Specialist, Other Nurse, Other Public Health Professional, Paraprofessional, Public Health Educator, Public Health Informatician, Public Health Nurse, Public Health Nutritionist, Public Health Physical Therapist, Public Health Physician, Public Health Program Specialist, Service/Maintenance, Technician, and Other.

The total FTE for each of those occupations are present within **Table 5** in the body of the report. The mean FTE for each of those occupations are present within **Table C-1**, below.

Table C-1. LHDs' FY 2021 Mean Standardized FTE by Occupation

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Average FTEs
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Occupations*					
Public Health Nurse	3.1	7.9	9.9	20.7	**10.4**
Administrative Support	1.2	3.0	3.8	12.3	**5.1**
Other Nurse	1.7	2.4	4.7	8.4	**4.3**
Environmental Scientist and Specialist	0.2	0.3	2.0	8.2	**2.7**
Medical and Public Health Social Worker	0.4	1.9	1.6	6.3	**2.5**
Administrative / Business Professional	0.6	1.1	1.6	6.4	**2.4**
Paraprofessional	0.7	0.7	1.6	6.7	**2.4**
Public Health Nutritionist	0.2	0.6	2.0	6.8	**2.4**
Public Health Educator	0.7	1.4	1.8	4.6	**2.2**
Health Administrator	0.8	1.2	1.3	5.2	**2.1**
Health Planner / Researcher / Analyst	0.1	0.2	0.5	6.2	**1.7**
Public Health Program Specialist	0.0	0.0	1.0	5.7	**1.7**
Community Health Worker	0.2	0.1	0.1	5.7	**1.5**
Other Public Health Professional	0.2	0.6	0.3	4.3	**1.3**
Licensure / Inspection / Regulatory Specialist	0.0	0.1	0.4	3.3	**1.0**
Technician	0.0	0.1	0.9	1.6	**0.6**
Epidemiologist	0.0	0.0	0.0	2.4	**0.6**
Mental Health Counselor	0.0	0.0	0.0	1.5	**0.4**
Other	0.3	0.1	0.2	0.3	**0.2**
Service / Maintenance	0.0	0.0	0.0	0.8	**0.2**
Public Health Informatician	0.0	0.1	0.0	0.6	**0.2**
Interpreter	0.0	0.0	0.1	0.0	**0.1**
Public Health Physician	0.0	0.0	0.0	0.1	**0.0**
Communications / Public Information Officer	0.0	0.0	0.0	0.0	**0.0**
Occupation Safety and Health Specialist	0.0	0.0	0.0	0.0	**0.0**
Public Health Physical Therapist	0.0	0.0	0.0	0.0	**0.0**

* Occupations are ordered according to total average FTEs.

Notes: All full-time equivalents (FTEs) were standardized to 2,080 annual hours. These data (Q19) were submitted separately from total FTEs (Q14) and the FY 2021 FTEs by FPHR and numbers may differ.

REVENUES & EXPENDITURES

Question 15: Please provide your health department's total FY 2019, 2020, and 2021 Revenues and Expenditures.

To adjust for the differences in cost of living / prices and for the usually high inflation during the study period we used the state and local government deflator and cost of living indices to readjust expenses and revenue based on the 2022 prices by multiplying the instrument responses by the inflation and cost of living adjustment factors.

Question 17: Please provide your health department's FY 2019, 2020, and 2021 Revenues by Source.

For ease of interpretation, we aggregated Medicaid (Title XIX of the Social Security Act), Medicare (Title XVIII of the Social Security Act) and Private Insurance revenues into one group. We also aggregated all revenues inspired by the COVID-19 pandemic into one category. These included federal COVID-19 CARES Funds from State, Federal COVID-19 Funds from a Federal Agency, Other Federal COVID-19 Funds Awarded by State, State COVID-19 Funds, Local COVID-19 Funds, and Other COVID-19 Funds. To estimate the proportion of revenues from different sources, we aggregated the revenues from these multiple sources rather than using the total operating revenue of the LHDs.

Tables describing LHDs' FY 2019 and FY 2020 proportional means of inflation-adjusted revenues by source are available in **Table C-2** and **Table E-2**, respectively. A table describing LHDs' FY 2021 proportional means of inflation-adjusted revenues by source is available within the body (**Table 3**).

Table C-2. LHDs' FY 2019 Proportional Means of Inflation-Adjusted Revenues by Source

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Revenue Sources^					
Local Tax	24%	23%	18%	37%	**31%**
Other Federal Funds	15%	19%	24%	20%	**20%**
Other State Funds	14%	15%	15%	12%	**13%**
Insurance Revenues	24%	25%	20%	7%	**12%**
Local Public Health Grant	9%	8%	10%	8%	**8%**
Fees and Fines	3%	2%	5%	7%	**6%**
Other Local Funds	5%	2%	2%	5%	**4%**
Federal Temporary Assistance for Needy Families (TANF) Funds	3%	3%	3%	2%	**3%**
Federal Title V Funds	2%	2%	2%	2%	**2%**
Other Revenues	0%	1%	0%	0%	**0%**

* Total proportional means are based on all 74 LHDs.
^ Revenue sources are ordered according to total proportional means.

Table C-3. LHDs' FY 2020 Proportional Means of Inflation-Adjusted Revenues by Source

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Revenue Sources^					
Local Tax	19%	21%	18%	28%	**25%**
Other Federal Funds	14%	19%	20%	20%	**20%**
COVID-19 Funds	14%	9%	11%	16%	**14%**
Other State Funds	13%	13%	14%	10%	**11%**
Insurance Revenues	20%	21%	18%	4%	**10%**
Local Public Health Grant	8%	8%	8%	6%	**7%**
Fees and Fines	1%	2%	4%	6%	**5%**
Other Local Funds	5%	2%	2%	4%	**3%**
Federal Temporary Assistance for Needy Families (TANF) Funds	2%	2%	2%	2%	**2%**
Federal Title V Funds	2%	2%	2%	2%	**2%**
Other Revenues	0%	1%	0%	0%	**0%**

* Total proportional means are based on all 74 LHDs.
^ Revenue sources are ordered according to total proportional means.

Question 18: Please provide your health department's FY 2019, 2020, and 2021 Expenditures by Funding Source.

Participants listed their total expenditures in fiscal years 2019-2021 in the following categories: Infrastructure, Healthy Communities, Infectious Disease, Environmental Health, Disaster Preparedness, Health Services, and Total Expenditure for All Areas. The revenues were adjusted for inflation and cost of living by multiplying by the inflation and COL adjustment factors.

Tables describing LHDs' FY 2019 and FY 2020 proportional means of inflation-adjusted expenditures by category are available in **Table C-4** and **Table C-5**, respectively. A table describing LHDs' FY 2021 proportional means of inflation-adjusted expenditures by category is available within the body (**Table 4**).

Table C-4. LHDs' FY 2019 Proportional Means of Inflation-Adjusted Expenditures by Category

	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Expenditure Categories^					
Healthy Communities	40%	45%	47%	42%	**43%**
Health Services	30%	31%	26%	22%	**24%**
Environmental Health	1%	2%	8%	17%	**13%**
Infrastructure	21%	17%	13%	9%	**12%**
Infectious Disease	5%	3%	3%	7%	**6%**
Disaster Preparedness	3%	3%	3%	3%	**3%**

* Total proportional means are based on all 74 LHDs.
^ Expenditure categories are ordered according to total proportional means.

Table C-5. LHDs' FY 2020 Proportional Means of Inflation-Adjusted Expenditures by Category

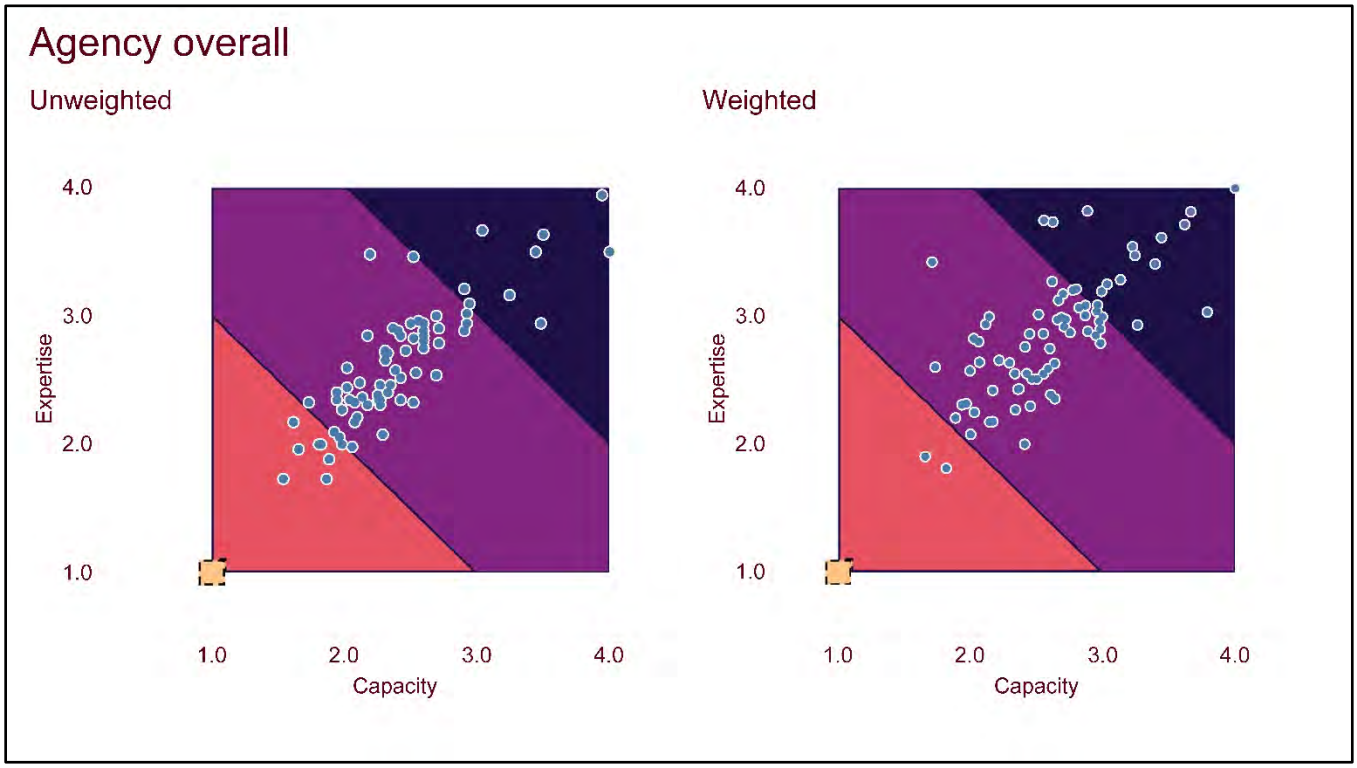
	Population Served				
	Less Than 25,000	25,000-49,999	50,000-99,999	Greater Than 100,000	Total*
Count of LHDs	*26*	*25*	*11*	*12*	***74***
Expenditure Categories^					
Healthy Communities	37%	46%	44%	37%	**39%**
Health Services	28%	30%	24%	19%	**22%**
Environmental Health	1%	3%	10%	15%	**12%**
Infrastructure	19%	13%	13%	10%	**11%**
Infectious Disease	8%	5%	4%	9%	**8%**
Disaster Preparedness	7%	3%	5%	10%	**8%**

* Total proportional means are based on all 74 LHDs.
^ Expenditure categories are ordered according to total proportional means.

Analysis of Self-Assessed Expertise and Capacity

Weighted vs Unweighted Foundational Responsibility -Level and Overall Data

Figure C-1. Example Weighted vs Unweighted Overall Scores



Analysis of FPHR Spending and Effort Data

Spending and Effort on FPHRs for Local Public Health and Minnesota Department of Health

Table C-6. Local Public Health Spending and Effort on FPHRs

	Current Implementation			Full Implementation			Gap		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$96,900,000**	***per capita***	**635**	**$161,100,000**	***per capita***	**1195**	**$64,200,000**	***per capita***	**560**
Assessment and Planning	$3,600,000	*$0.65*	30	$8,600,000	*$1.50*	70	$4,900,000	*$0.85*	45
Communications	$4,300,000	*$0.75*	30	$9,800,000	*$1.70*	80	$5,500,000	*$0.95*	50
Community Partnerships	$14,200,000	*$2.50*	80	$19,700,000	*$3.45*	140	$5,500,000	*$0.95*	60
Data and Epidemiology	$4,900,000	*$0.85*	35	$10,900,000	*$1.90*	95	$6,000,000	*$1.05*	60
Health Equity	$3,700,000	*$0.65*	25	$8,800,000	*$1.55*	70	$5,100,000	*$0.90*	45
Leadership and Governance	$4,500,000	*$0.80*	25	$8,500,000	*$1.50*	55	$4,000,000	*$0.70*	30
Organizational Management	$38,600,000	*$6.75*	225	$53,300,000	*$9.35*	360	$14,700,000	*$2.60*	130
Policy Development	$3,300,000	*$0.55*	25	$7,700,000	*$1.35*	60	$4,500,000	*$0.80*	35
Preparedness and Response	$19,800,000	*$3.45*	160	$33,800,000	*$5.95*	265	$14,000,000	*$2.45*	105
Foundational Areas	**$97,400,000**		**590**	**$171,400,000**		**1140**	**$74,100,000**		**550**
Infectious Disease Prevention and Control	$18,900,000	*$3.30*	105	$30,400,000	*$5.35*	205	$11,500,000	*$2.00*	100
Environmental Health	$23,600,000	*$4.15*	165	$36,400,000	*$6.40*	260	$12,800,000	*$2.25*	95
Prevention and Population Health Improvement	$46,300,000	*$8.10*	245	$78,600,000	*$13.80*	515	$32,400,000	*$5.65*	265
Access to Health Services	$8,600,000	*$1.50*	75	$26,000,000	*$4.55*	160	$17,400,000	*$3.05*	90
Total	**$194,300,000**	***$34.00***	**1225**	**$332,500,000**	***$58.35***	**2335**	**$138,300,000**	***$24.20***	**1110**

Table C-7. Minnesota Department of Health Spending and Effort on FPHRs

	Current Implementation			Full Implementation			Gap		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$69,200,000**	***per capita***	**475**	**$164,500,000**	***per capita***	**745**	**$95,400,000**	***per capita***	**265**
Assessment and Planning	$1,100,000	*$0.20*	10	$3,700,000	*$0.65*	25	$2,700,000	*$0.45*	15
Communications	$3,100,000	*$0.55*	30	$10,200,000	*$1.80*	60	$7,100,000	*$1.25*	30
Community Partnerships	$2,100,000	*$0.35*	25	$12,500,000	*$2.20*	35	$10,400,000	*$1.85*	10
Data and Epidemiology	$12,200,000	*$2.15*	75	$21,400,000	*$3.75*	120	$9,200,000	*$1.60*	40
Health Equity	$1,800,000	*$0.30*	20	$8,200,000	*$1.45*	30	$6,400,000	*$1.10*	10
Leadership and Governance	$4,800,000	*$0.85*	30	$5,800,000	*$1.00*	40	$1,100,000	*$0.20*	10
Organizational Management	$27,700,000	*$4.85*	185	$52,800,000	*$9.25*	190	$25,100,000	*$4.40*	5
Policy Development	$1,300,000	*$0.25*	10	$3,100,000	*$0.55*	20	$1,700,000	*$0.30*	10
Preparedness and Response	$15,100,000	*$2.65*	90	$46,800,000	*$8.20*	225	$31,700,000	*$5.55*	135
Foundational Areas	**$129,900,000**		**1100**	**$452,900,000**		**1855**	**$323,000,000**		**755**
Infectious Disease Prevention and Control	$16,400,000	*$2.85*	150	$50,500,000	*$8.85*	245	$34,100,000	*$5.95*	90
Environmental Health	$34,400,000	*$6.05*	340	$120,100,000	*$21.05*	650	$85,700,000	*$15.00*	310
Prevention and Population Health Improvement	$28,900,000	*$5.05*	245	$106,900,000	*$18.75*	510	$78,000,000	*$13.65*	265
Access to Health Services	$50,200,000	*$8.80*	365	$175,400,000	*$30.75*	450	$125,200,000	*$21.95*	90
Total	**$199,100,000**	***$34.90***	**1575**	**$617,400,000**	***$108.25***	**2600**	**$418,400,000**	***$73.25***	**1020**

Table C-8. Statewide Public Health System Spending and Effort on FPHRs

	Current Implementation			Full Implementation			Gap		
Foundational Responsibilities	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)	Spending (2022 $)		FTEs (2080hrs)
Foundational Capabilities	**$166,000,000**	***per capita***	**1100**	**$325,600,000**	***per capita***	**1935**	**$159,600,000**	***per capita***	**835**
Assessment and Planning	$4,700,000	*$0.80*	35	$12,300,000	*$2.15*	95	$7,600,000	*$1.35*	60
Communications	$7,400,000	*$1.30*	60	$20,000,000	*$3.50*	140	$12,600,000	*$2.20*	80
Community Partnerships	$16,200,000	*$2.85*	105	$32,200,000	*$5.65*	175	$15,900,000	*$2.80*	70
Data and Epidemiology	$17,100,000	*$3.00*	110	$32,300,000	*$5.65*	215	$15,200,000	*$2.65*	105
Health Equity	$5,600,000	*$0.95*	45	$17,000,000	*$3.00*	100	$11,500,000	*$2.00*	55
Leadership and Governance	$9,300,000	*$1.60*	60	$14,400,000	*$2.50*	95	$5,100,000	*$0.90*	35
Organizational Management	$66,200,000	*$11.60*	410	$106,000,000	*$18.60*	550	$39,800,000	*$6.95*	140
Policy Development	$4,600,000	*$0.80*	30	$10,800,000	*$1.90*	80	$6,200,000	*$1.10*	50
Preparedness and Response	$34,900,000	*$6.10*	245	$80,600,000	*$14.15*	485	$45,700,000	*$8.00*	240
Foundational Areas	**$227,100,000**		**1680**	**$624,300,000**		**3000**	**$397,200,000**		**1300**
Infectious Disease Prevention and Control	$35,300,000	*$6.20*	255	$80,900,000	*$14.15*	450	$45,600,000	*$8.00*	190
Environmental Health	$58,000,000	*$10.15*	500	$156,500,000	*$27.40*	910	$98,500,000	*$17.25*	405
Prevention and Population Health Improvement	$75,100,000	*$13.15*	490	$185,500,000	*$32.50*	1025	$110,400,000	*$19.35*	530
Access to Health Services	$58,700,000	*$10.30*	435	$201,400,000	*$35.30*	615	$142,700,000	*$25.00*	175
Total	**$393,100,000**	***$68.80***	**2780**	**$949,900,000**	***$166.45***	**4935**	**$556,800,000**	***$97.55***	**2135**

Reported Gap vs Gap Adjusted by Regional Price Indices

Final data from the Assessment were also adjusted by regional price indices (county cost of living indices)[29], with MDH's financial data adjusted according to the headquarters jurisdiction, Ramsey County; see the **Adjusting for Cost of Living** section, above.

Table C-9. Local Public Health Spending and Effort on FPHRs (COLI-adjusted)

Foundational Responsibilities	Current Implementation Spending (2022 $)		Current Implementation FTEs (2080hrs)	Full Implementation Spending (2022 $)		Full Implementation FTEs (2080hrs)	Gap Spending (2022 $)		Gap FTEs (2080hrs)
Foundational Capabilities	**$104,100,000**	***per capita***	**635**	**$176,600,000**	***per capita***	**1195**	**$72,200,000**	***per capita***	**560**
Assessment and Planning	$3,800,000	*$0.65*	30	$9,000,000	*$1.60*	70	$5,200,000	*$0.90*	45
Communications	$4,500,000	*$0.80*	30	$10,500,000	*$1.85*	80	$5,900,000	*$1.05*	50
Community Partnerships	$15,300,000	*$2.70*	80	$21,400,000	*$3.75*	140	$6,000,000	*$1.05*	60
Data and Epidemiology	$5,300,000	*$0.95*	35	$12,100,000	*$2.10*	95	$6,700,000	*$1.20*	60
Health Equity	$4,000,000	*$0.70*	25	$9,400,000	*$1.65*	70	$5,400,000	*$0.95*	45
Leadership and Governance	$4,800,000	*$0.85*	25	$9,100,000	*$1.60*	55	$4,300,000	*$0.75*	30
Organizational Management	$42,300,000	*$7.40*	225	$59,600,000	*$10.45*	360	$17,400,000	*$3.05*	130
Policy Development	$3,400,000	*$0.60*	25	$8,200,000	*$1.45*	60	$4,700,000	*$0.85*	35
Preparedness and Response	$20,700,000	*$3.60*	160	$37,300,000	*$6.55*	265	$16,600,000	*$2.90*	105
Foundational Capabilities	**$106,300,000**		**590**	**$180,000,000**		**1140**	**$73,700,000**		**550**
Infectious Disease Prevention and Control	$20,500,000	*$3.60*	105	$33,200,000	*$5.80*	205	$12,700,000	*$2.25*	100
Environmental Health	$26,200,000	*$4.60*	165	$40,200,000	*$7.05*	260	$14,100,000	*$2.45*	95
Prevention and Population Health Improvement	$50,800,000	*$8.90*	245	$87,800,000	*$15.40*	515	$37,000,000	*$6.50*	265
Access to Health Services	$8,800,000	*$1.55*	75	$18,800,000	*$3.30*	160	$9,900,000	*$1.75*	90
Total	**$210,400,000**	***$36.90***	**1225**	**$356,600,000**	***$62.55***	**2335**	**$145,900,000**	***$25.65***	**1110**

Note: Compare these data with that of **Table C-6**, above.

Table C-10. Minnesota Department of Health Spending and Effort on FPHRs (COLI-adjusted)

Foundational Responsibilities	Current Implementation Spending (2022 $)		Current Implementation FTEs (2080hrs)	Full Implementation Spending (2022 $)		Full Implementation FTEs (2080hrs)	Gap Spending (2022 $)		Gap FTEs (2080hrs)
Foundational Capabilities	**$79,500,000**	***per capita***	**475**	**$189,400,000**	***per capita***	**745**	**$109,800,000**	***per capita***	**265**
Assessment and Planning	$1,200,000	*$0.20*	10	$4,300,000	*$0.75*	25	$3,100,000	*$0.55*	15
Communications	$3,600,000	*$0.65*	30	$11,800,000	*$2.05*	60	$8,200,000	*$1.45*	30
Community Partnerships	$2,400,000	*$0.40*	25	$14,400,000	*$2.50*	35	$12,000,000	*$2.10*	10
Data and Epidemiology	$14,000,000	*$2.45*	75	$24,600,000	*$4.30*	120	$10,500,000	*$1.85*	40
Health Equity	$2,100,000	*$0.35*	20	$9,400,000	*$1.65*	30	$7,300,000	*$1.30*	10
Leadership and Governance	$5,500,000	*$0.95*	30	$6,700,000	*$1.20*	40	$1,300,000	*$0.20*	10
Organizational Management	$31,800,000	*$5.60*	185	$60,700,000	*$10.65*	190	$28,900,000	*$5.05*	5
Policy Development	$1,500,000	*$0.25*	10	$3,600,000	*$0.60*	20	$2,000,000	*$0.35*	10
Preparedness and Response	$17,400,000	*$3.05*	90	$53,900,000	*$9.45*	225	$36,500,000	*$6.40*	135
Foundational Capabilities	**$149,400,000**		**1100**	**$521,100,000**		**1855**	**$371,700,000**		**755**
Infectious Disease Prevention and Control	$18,900,000	*$3.30*	150	$58,100,000	*$10.20*	245	$39,200,000	*$6.85*	90
Environmental Health	$39,600,000	*$6.95*	340	$138,200,000	*$24.20*	650	$98,600,000	*$17.30*	310
Prevention and Population Health Improvement	$33,200,000	*$5.80*	245	$123,000,000	*$21.55*	510	$89,800,000	*$15.75*	265
Access to Health Services	$57,700,000	*$10.10*	365	$201,800,000	*$35.35*	450	$144,100,000	*$25.25*	90
Total	**$228,900,000**	***$40.05***	**1575**	**$710,500,000**	***$124.45***	**2600**	**$481,500,000**	***$84.40***	**1020**

Note: Compare these data with that of **Table C-7**, above.

Table C-11. Statewide Spending and Effort on FPHRs (COLI-adjusted)

Foundational Responsibilities	Current Implementation Spending (2022 $)		Current Implementation FTEs (2080hrs)	Full Implementation Spending (2022 $)		Full Implementation FTEs (2080hrs)	Gap Spending (2022 $)		Gap FTEs (2080hrs)
Foundational Capabilities	**$183,900,000**	***per capita***	**1100**	**$365,800,000**	***per capita***	**1935**	**$182,100,000**	***per capita***	**835**
Assessment and Planning	$5,000,000	*$0.90*	35	$13,300,000	*$2.35*	95	$8,300,000	*$1.45*	60
Communications	$8,200,000	*$1.45*	60	$22,200,000	*$3.90*	140	$14,100,000	*$2.45*	80
Community Partnerships	$17,800,000	*$3.10*	105	$35,800,000	*$6.25*	175	$18,000,000	*$3.15*	70
Data and Epidemiology	$19,400,000	*$3.40*	110	$36,600,000	*$6.40*	215	$17,300,000	*$3.05*	105
Health Equity	$6,100,000	*$1.05*	45	$18,800,000	*$3.30*	100	$12,800,000	*$2.25*	55
Leadership and Governance	$10,200,000	*$1.80*	60	$15,800,000	*$2.75*	95	$5,500,000	*$0.95*	35
Organizational Management	$74,100,000	*$13.00*	410	$120,400,000	*$21.10*	550	$46,300,000	*$8.10*	140
Policy Development	$5,000,000	*$0.90*	30	$11,700,000	*$2.05*	80	$6,700,000	*$1.20*	50
Preparedness and Response	$38,100,000	*$6.65*	245	$91,200,000	*$16.00*	485	$53,100,000	*$9.30*	240
Foundational Capabilities	**$255,600,000**		**1680**	**$701,100,000**		**3000**	**$445,300,000**		**1300**
Infectious Disease Prevention and Control	$39,300,000	*$6.90*	255	$91,300,000	*$16.00*	450	$51,900,000	*$9.10*	190
Environmental Health	$65,700,000	*$11.50*	500	$178,400,000	*$31.25*	910	$112,600,000	*$19.75*	405
Prevention and Population Health Improvement	$84,000,000	*$14.70*	490	$210,800,000	*$36.95*	1025	$126,800,000	*$22.20*	530
Access to Health Services	$66,600,000	*$11.65*	435	$220,600,000	*$38.65*	615	$154,000,000	*$27.00*	175
Total	**$439,500,000**	***$77.00***	**2780**	**$1,066,900,000**	***$186.95***	**4935**	**$627,400,000**	***$109.95***	**2135**

Note: Compare these data with that of **Table C-8** above.

APPENDIX D – OVERVIEW OF PROJECT DASHBOARDS

PUBLIC HEALTH COST AND CAPACITY FOUNDATIONAL RESPONSIBILITY DASHBOARDS

The dashboard has two sets of tabs: statewide FPHR analysis tabs and Individual Agency Dashboard tabs. They are available here: z.umn.edu/TransformMNPH_Dashboard.

All choropleth maps are shaded according to the self-assessment shading scales described in the report. All maps also include a toggle to show/hide network relationships amongst LHDs. The visualizations should be thought of has interactive figures as taking the place of dozens or hundreds of appendix figures, rather than standalone dashboards. Users may hover over points on the dashboards to see more information.

STATEWIDE FPHR ANALYSIS TABS

- **Activities**. This tab allows display of level of implementation charts for each of the 340 activities. On the Y-axis is Expertise, on the X-axis is Capacity. The tab is filterable by foundational responsibilities or headline responsibilities to allow the user to view individual FPHRs. Additionally, the user may compare by either population size served or geographic region. Turning on the "Jitter" feature will disaggregate the point to see how many LHDs are on a vertex.
- **Headline Responsibilities (HRs)**. This tab shows figures at the Headline Responsibility level only. It is filterable by Foundational Area or Capability. Turning on the "Jitter" feature will disaggregate the point to see how many LHDs are on a vertex.
- **Agency FA FC.** This tab shows the Foundational Areas and Foundational Capabilities side by side. Each agency is represented as a point on the chart.
- **State FA FC.** This tab shows an aggregated Foundational Area score or Foundational Capability score, by agency. The user may toggle between the two from a dropdown list in the upper righthand corner.
- **Agency overall.** This tab contrasts unweighted versus weighted implementation estimates at the agency total level, by agency.
- **Spending.** This chart allows users to view Current Spending vs Full Implementation Spending, including the results of the statistical model fit to the data. Users may view the results by Foundational Area or Capability, as well as toggle by total spending or per capita spending. Users may activate a feature that is a 'what if' upper bound contingency and raises full implementation to at least the predicted curve.
- **FTEs.** This chart allows users to view Current FTEs vs Full Implementation FTEs, including the results of the statistical model fit to the data. Users may view the results by Foundational Area or Capability, as well as toggle by total FTEs or FTEs per 100,000 people. Users may activate a feature that is a 'what if' upper bound contingency and raises full implementation to at least the predicted curve.
- **Icicle chart.** This chart lets users view all Foundational Area and Capability data in aggregate, as well as individual Headline Responsibility implementation levels. It is strongly recommended users hover over individual boxes to view additional information about the Foundational Area, Capability, or Headline Responsibility.
- **HR (horizontal).** As with **Headline Responsibilities (HRs)** above, this tab shows figures at the Headline Responsibility level only. *It is included as selecting a Foundational Area or Capability will display in a more easily 'screenshot'-able' format,* though it is somewhat less user friendly. Turning on the "Jitter" feature will disaggregate the point to see how many LHDs are on a vertex.
- ***Individual Agency dashboard***. This tab is a set of visualizations that highlight individual agencies. They mirror those above but use an "X" to indicate the agency, which is selectable by via a dropdown list.

Public Health Cost and Capacity Network Analysis

The dashboard has three tabs: a Headline Responsibilities tab, a Foundational Responsibilities tab, and an Overall Summary Maps tab. All choropleth maps are shaded according to the self-assessment shading scales described in the report. All maps also include a toggle to show/hide network relationships between individual LHDs.

- **Headline Responsibilities**. This tab allows display of maps for each of the 52 headline responsibilities through a dropdown menu.
- **Foundational Responsibilities**. This tab allows display of maps for each of the 13 foundational responsibilities through a dropdown menu.
- **Overall Summary Maps**. This tab allows display of maps for all Foundational Capabilities, all Foundational Areas, and Overall Implementation through a dropdown menu.

APPENDIX E – ABBREVIATIONS AND GLOSSARY

Table E-1. Abbreviations List

Abbreviation	Term
145A	Community Health Services Act (Minn. Stat § 145A)
CDC	Centers for Disease Control and Prevention
CHB	community health board
CHWTP	Community Health Worker Training Program
COL	cost of living
COVID-19	coronavirus disease
CPHS	Center for Public Health Systems
FA	Foundational Area
FAQ	frequently asked questions
FC	Foundational Capability
FDA	Food and Drug Administration
FPHRs	Foundational Public Health Responsibilities
FPHS	Foundational Public Health Services
FTE	full-time-equivalent
FY	fiscal year
GDP	gross domestic product
HR	headline responsibility
HRSA	Health Resources and Services Administration
LHD	local health department
LPH	local public health
LPHA	Local Public Health Association of Minnesota
MDH	Minnesota Department of Health
MRC	Medical Reserve Corps
PC	per capita
PH WINS	Public Health Workforce Interests and Needs Survey
SCHSAC	State Community Health Services Advisory Committee
SFY	state fiscal year
TANF	Temporary Assistance to Needy Families
UMN	University of Minnesota

Table E-2. Glossary of Terms

Term	Definition
additional increment	Extra spending needed to achieve full implementation of foundational public health services.
a priori	A qualitative data analysis method that determines coding categories ahead of the analysis.
agency	Any governmental public health department.
Areas of Public Health Responsibility	Parts of public health that community health boards are tasked with addressing.
The Assessment	The Minnesota Public Health Cost and Capacity Assessment in Minnesota that used Minnesota's Foundational Public Health Responsibilities framework.
Background	Data collected within the Instrument pertaining to high-level administrative and financial data.
capacity	To what degree the organization currently has the staffing and resources necessary to provide the services/deliverables dictated.
expenditure category	One of six (6) expenditure sets corresponding to Minnesota Department of Health's expenditures.
connections	A line in the network analysis map indicating a connection.
contingency	Additional increment added to full implementation resources to prevent underestimations of needed resources.
COVID-19	The coronavirus pandemic from 2020 to 2023.

Term	Definition
cross-jurisdictional sharing	The deliberate exercise of public authority to enable collaboration across jurisdictional boundaries to deliver public health services and solve problems that cannot be easily solved by single organizations or jurisdictions.
current effort and spending	Data collected within the Instrument pertaining to effort and spending toward the Foundational Public Health Responsibilities for the current period.
current time period	Foundational Public Health Responsibilities delivered in 2021.
Degree of Implementation	An implicit measure of expertise and capacity for a given activity or headline responsibility that have interval values.
expertise	To what degree the organization's current capacity aligns with the appropriate knowledge necessary to implement the services/deliverables dictated.
fiscal host	The lead administrative agency within a community health board that responded to the Assessment on behalf of a local health department.
floor	The power curve in each local health department's spending and full-time-equivalent plot.
Foundational Area (FA)	Basic public health, topic-specific responsibilities aimed at improving the health of people and communities.
Foundational Capability (FC)	The knowledge, skills, and abilities needed to successfully implement the basic public health protections key to ensuring the community's health and achieving equitable health outcomes.
Foundational Responsibility	Any particular Foundational Capability or Foundational Area (i.e., refers to that level of the FPHR framework).
full implementation estimates	Data collected within the Instrument pertaining to effort and spending toward the Foundational Public Health Responsibilities for the current period.
gap	Difference between current and needed resources.
jitter	A toggle function present with dashboards that subtly moves local health department vertices away from other scores.
Level of Implementation	An implicit measure of expertise and capacity for a given activity or headline responsibility that has discrete values.
Local Public Health Act	The Community Health Services Act (Minn. Stat § 145A) that was first established in 1976 and stated which public health activities are delivered through a state-local public health partnership.
locally	A subset of governmental public health services that a local health department or community health board delivers only in their jurisdictions.
nodes	A dot in the network analysis map indicating a local health department.
nominal gap	Difference between agency-reported current spending and full implementation estimates.
Operational Definitions (FPHR)	Descriptions of foundational services that: • describe "what" FPHR provides for Minnesota's communities, but not "how" the governmental public health system should provide it; • are agnostic to which governmental public health provider should provide it; • are reduced to discrete activities (define as few actions as possible per statement) and begin with a verb identifying the action to be taken; and • align with existing statutes, rules, regulations, and guidelines.
populations bands	Groups created according to the number of persons in local health departments' jurisdictions served.
self-assessment	Data collected within the Instrument pertaining to self-assessed expertise and capacity for activities and responsibilities.
The Great Recession	A downward trend in the United States economy in 2008.
The Instrument	The Qualtrics survey that was created as the primary data collection tool and collect all of the key variables for the Assessment.
Title V program	A federal block grant that is a key source of support for promoting and improving the health and well-being of mothers and children.
unweighted	Raw data scores.
vertex/vertices	A level of implementation plot that situations a local health department's composite score at a clearly defined intersection of expertise and capacity.
weighted	Data scores that were adjusted.
zones	Plots of degree of implementation scores corresponding to not implemented, minimally implemented, partially implemented, and substantially implemented.

APPENDIX F – REFERENCES

1. Tilgner SA, Bickford BE, Beaudrault S, Bodden J, Courogen M, Flake M. Resetting the Course for Foundational Public Health Services (FPHS) During COVID-19. J Public Health Manag Pract. Jul-Aug 01 2022;28(4 Suppl 4):S122-S129. doi:10.1097/PHH.0000000000001479
2. Habile Consulting LLC. Colorado Public Health System Transformation: Core Public Health Services Needs Assessment Report. 2020.
3. Orr JM, Leider JP, Kuehnert P, Bekemeier B. COVID-19 Revealed Shortcomings Of The US Public Health System And The Need To Strengthen Funding And Accountability. Health Aff (Millwood). Mar 2023;42(3):374-382. doi:10.1377/hlthaff.2022.01234
4. Martin AB, Hartman M, Benson J, Catlin A, The National Health Expenditure Accounts T. National Health Care Spending In 2021: Decline In Federal Spending Outweighs Greater Use Of Health Care. Health Aff (Millwood). Jan 2023;42(1):6-17. doi:10.1377/hlthaff.2022.01397
5. Committee on Public Health Strategies to Improve Health. For the Public's Health: Investing in a Healthier Future. National Academies Press (US); 2012.
6. Mamaril CBC, Mays GP, Branham DK, Bekemeier B, Marlowe J, Timsina L. Estimating the Cost of Providing Foundational Public Health Services. Health Serv Res. Aug 2018;53 Suppl 1(Suppl Suppl 1):2803-2820. doi:10.1111/1475-6773.12816
7. Bekemeier B, Marlowe J, Squires LS, Tebaldi J, Park S. Perceived Need Versus Current Spending: Gaps in Providing Foundational Public Health Services in Communities. J Public Health Manag Pract. May/Jun 2018;24(3):271-280. doi:10.1097/PHH.0000000000000612
8. Galea S, Vaughan R. Reaffirming the Foundations of Public Health in a Time of Pandemic. Am J Public Health. Dec 2021;111(12):2094-2095. doi:10.2105/AJPH.2021.306548
9. Woolf SH, Schoomaker H. Life Expectancy and Mortality Rates in the United States, 1959-2017. JAMA. Nov 26 2019;322(20):1996-2016. doi:10.1001/jama.2019.16932
10. Brownson RC, Burke TA, Colditz GA, Samet JM. Reimagining Public Health in the Aftermath of a Pandemic. Am J Public Health. Nov 2020;110(11):1605-1610. doi:10.2105/AJPH.2020.305861
11. Leider JP, McCullough JM, Singh SR, et al. Staffing Up and Sustaining the Public Health Workforce. J Public Health Manag Pract. May-Jun 01 2023;29(3):E100-E107. doi:10.1097/PHH.0000000000001614
12. Hare Bork R, Robins M, Schaffer K, Leider JP, Castrucci BC. Workplace Perceptions and Experiences Related to COVID-19 Response Efforts Among Public Health Workers - Public Health Workforce Interests and Needs Survey, United States, September 2021-January 2022. MMWR Morb Mortal Wkly Rep. Jul 22 2022;71(29):920-924. doi:10.15585/mmwr.mm7129a3
13. de Beaumont Foundation, Public Health National Center for Innovations. Staffing Up: workforce levels needed to provide basic public health services for all Americans. 2021. October 2021. Accessed January 18, 2023. https://debeaumont.org/wp-content/uploads/2021/10/Staffing-Up-FINAL.pdf
14. Office of the Revisor of Statutes. Ch. 145A MN Statutes. Office of the Revisor of Statutes. Accessed May 28, 2023. https://www.revisor.mn.gov/statutes/cite/145a
15. Minnesota Department of Health. Minnesota's public health system: History and context. Minnesota Department of Health. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/about/history.html
16. Minnesota Department of Health. Expenditures summary for Minnesota's local public health system in 2021. 2022. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/lphact/annualreporting/docs/2021finance.pdf

17. Minnesota Department of Health. Workforce summary for Minnesota's local public health system in 2021. 2022. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/lphact/annualreporting/docs/2021staffing.pdf

18. Minnesota Department of Health. Find a local or tribal health department or community health board. Minnesota Department of Health. May 21, 2023. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/connect/findlph.html

19. Beitsch LM, Grigg M, Menachemi N, Brooks RG. Roles of local public health agencies within the state public health system. J Public Health Manag Pract. May-Jun 2006;12(3):232-41. doi:10.1097/00124784-200605000-00003

20. Hsuan C, Rodriguez HP. The adoption and discontinuation of clinical services by local health departments. Am J Public Health. Jan 2014;104(1):124-33. doi:10.2105/AJPH.2013.301426

21. Beck AJ, Boulton ML. The Public Health Nurse Workforce in U.S. State and Local Health Departments, 2012. Public Health Rep. Jan-Feb 2016;131(1):145-52. doi:10.1177/003335491613100121

22. Center for Public Health Systems. Public Health System Transformation in Minnesota: Operational Definitions Summary. 2022. August 8, 2022. https://drive.google.com/file/d/1v7Nje78ZCsgu2MZUzjnvGUx5vhohn4ty/view

23. Minnesota Department of Health. Foundational public health responsibilities. Minnesota Department of Health. May 21, 2023. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/systemtransformation/foundationalresponsibilities.html

24. Minnesota Department of Health. Finance and staffing, LPH Act annual reporting. Minnesota Department of Health. May 28, 2023. Updated February 2, 2023. Accessed May 28, 2023. https://www.health.state.mn.us/communities/practice/lphact/annualreporting/finance-staffing.html

25. Center for Sharing Public Health Services. A Roadmap to Develop Cross-Jurisdictional Sharing Initiatives. 2017. CPHS/13-01-V3. September 1, 2017. Accessed May 28, 2023. https://phsharing.org/wp-content/uploads/2017/09/Final-RoadmapRevised2017.pdf

26. Public Health National Center for Innovations. Foundational Public Health Services. Public Health National Center for Innovations. May 30, 2023. Accessed May 30, 2023. https://phnci.org/transformation/fphs

27. National Center for Education Statistics. Data from: Fall 2011 through Fall 2021, Completions component. Postsecondary Certificates and Degrees Conferred. 2023. U.S. Department of Education, Institute of Education Sciences.

28. U. S. Bureau of Economic Analysis. Government consumption expenditures and gross investment: State and local (implicit price deflator). Federal Reserve Bank of St. Louis. Accessed May 28, 2023. https://fred.stlouisfed.org/series/A829RD3A086NBEA

29. Council for Community and Economic Research. County Level Index - Products - C2ER Cost of Living Index. Council for Community and Economic Research. May 28, 2023. Accessed May 28, 2023. https://www.coli.org/products/