

**Cross-Sector Care Activities and Technological Capabilities
of Federally Qualified Health Centers in Michigan**

by

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Dedication

To my mother, with whom I share my love for learning and helping those less fortunate. She was my greatest supporter and champion of my early academic pursuits. I simply could not have been in a position to pursue a PhD without her. Mom, this one is for you. You are my inspiration.

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Abstract

Health systems and medical practices are taking a greater role in providing social care. Federally Qualified Health Centers (FQHCs) lead these efforts, offering a model for using technology to manage care and exchange patient information. This study describes Michigan FQHC services, partnerships, and technological capabilities that support the delivery of social care. *Methods.* Theories and frameworks from public health and information science were applied in mixed methods research. A sample of Michigan FQHCs ($n=15$) were recruited into the study. Quantitatively, a health information technology (HIT) capability practice survey was developed. Semi-structured interviews were then conducted with FQHC leadership, clinicians, and staff ($n=24$) to explore workforce and technological factors associated with developing care management and partnership data activities. The analyses of the survey and interviews addressed three broad research questions: (i) What preventive and social care services do FQHCs deliver, and to what extent are those services provided in partnership with other organizations? (Chapter 2), (ii) What information infrastructure is available to support these services? (Chapter 3), and (iii) What are the facilitators and barriers to providing preventive and social care? (Chapter 4). *Results.* On average, Michigan FQHCs delivered eight ($M=7.9$, $SD=3.6$) cross-sector services. Most Michigan FQHCs addressed public health prevention ($n=12$, 80%). For behavioral healthcare, the majority of FQHCs ($n=10$, 69.3%) delivered both mental health (MH) and substance use disorder (SUD) services. There was one health center that delivered all 10 social care services studied. Most provided at least 3: food assistance, transportation, and domestic violence. FQHCs formed collaborations with health systems, mental health agencies, and local

health departments to improve communication, care quality, and data management. FQHCs also integrated services and developed partnerships to ensure patients accessed a broader range of preventive services and social care (Chapter 2). Michigan FQHCs developed HIT infrastructure to digitally exchange patient information. Data was typically shared with maternal and infant health ($n=5$, 33.3%), mental health ($n=5$, 33.3%), and substance use ($n=6$, 40%) providers, but FQHCs had not developed similar capabilities with the social care sector. FQHCs leveraged health care and government investments in HIT as a strategy to circumvent non-automated types of data sharing (Chapter 3). Interviews revealed Michigan FQHCs participated in community-wide activities to establish value-based practices and quality care initiatives using shared data and technology. Study participants discussed that their involvement facilitated data management, digital information exchange, and quality improvement efforts. Ultimately, however, limited housing services and inadequate behavioral healthcare created barriers for Michigan FQHCs to refer patients to local resources and treatment (Chapter 4). *Conclusions.* Developing information infrastructure and technological capabilities to manage patient social needs and improve care quality is necessary but insufficient. Investments in both technology and human capital are critical to create a social care infrastructure. Building on the evidence gained from FQHC partnership activities offers insight into policy changes and investments needed. This study provides foundational research to support future investigations of how community health information exchanges and collaborative data practices can be leveraged to deliver high-quality care and improve outcomes.

Chapter 1 Introduction

1.1 Background

The social determinants of health (SDOH) are underlying causes of disease, mortality, and life expectancy (1, 2). Estimates from the literature suggest that only approximately 40% of a person's overall health is determined by genetic predispositions and medical care, while the social determinants of health (SDOH) – social and economic circumstances, environmental and behavioral factors – account for the rest (3). McGinnis and other scholars' determinants of health research have changed the way health and care delivery are evaluated (3-5). Central to McGinnis and colleagues' view is the idea that “our genetic predispositions affect the health care we need, and our social circumstances affect the health care we receive (3).” Social circumstances, e.g., income, wealth, and education are thus drivers or fundamental causes of a wide range of health outcomes (6) and motivate calls for broader and more systematic approaches that look beyond the walls of medical care (3, 7).

1.1.1 Calls to Actions

Addressing SDOH is an increasing interest for health care organizations. Calls to integrate SDOH into medical practice have been issued by the World Health Organization's (WHO) Commission on Social Determinants of Health, National Academy of Medicine (NAM), Healthy People 2020, and many physician groups (8-13). The Office of the National Coordinator for Health Information Technology (ONC), Centers for Medicare and Medicaid Services, and Centers for Disease Control and Prevention have established regulations and policy guidance that

require high-quality primary care practices to include a core set of SDOH measures in electronic health record systems (14-16).

1.1.2 National Efforts to Address the Social Determinants of Health

The Centers for Medicare and Medicaid Services' has implemented local demonstration projects and multi-payer initiatives led by state and health plans, such as the State Innovation Model (SIM) initiative which tests payment reform and service delivery models that focus on population health and the role of SDOH; and, implementation demonstrations of the Accountable Health Communities model which aimed to connect beneficiaries with community services to address SDOH (17, 18). Work on provider-level activities are also increasingly apparent in the literature, such as, the National Association of Community Health Centers' effort to support the health center adoption of a standard SDOH screening tool to better understand, identify, and act on the non-medical and social needs of their patients (19).

1.1.3 Significant Investments in Public Health Prevention and Social Services are Critical

With mounting evidence to suggest that effectively responding to SDOH could reduce mortality and impact health outcomes more than advances in medicine alone (20), studies of primary care's role in integrating SDOH into community practice is paramount to disease prevention and health care reform. In a recent meta-analysis of nearly 50 studies, researchers found SDOH accounted for over a third of total U.S. deaths in one year (21). But, the majority of health care expenditures are disproportionately spent on personal medical care, instead of on prevention and addressing SDOH. One study by Dieleman et al (2016) revealed only 2.8% of total U.S. health care expenditures (\$77.9 billion) were allocated to public health, compared to 97.2% spent on medical care (\$2.7 trillion) annually (22). The inability to act on SDOH in a

prudent and systematic way is further constrained by a medical culture focused on treating disease rather than promoting health (23), among other technological and infrastructural barriers to linking medical care with community-based services (10, 24).

1.1.4 Health Care Policies and Strategies to Address Social Determinants of Health

In the United States, social service agencies, health departments, and public safety net systems have long recognized SDOH. Nutritional enrichment programs and policies promote health, for example, by supporting healthier corner stores in low-income communities (25), farm to school programs (26), community and school gardens, and through broader efforts to support the production and consumption of healthy foods (27). The provision of early childhood education and afterschool programming to children in low-income and minority communities have demonstrated evidence to reduce educational achievement gaps, improve the health of low-income students, and promote health equity (28-30). At the federal level, the Patient Protection and Affordable Care Act established the National Prevention Council (ACA, 2010), charged with convening senior leadership from 20 federal departments, agencies, and offices to posit a National Prevention Strategy that provides state and local leaders with a framework and implementation tools for incorporating health in all policies (31-33).

Health in All Policies is an approach that incorporates health considerations into decision making across sectors and policy areas (34-38). A Health in All Policies approach identifies the ways in which decisions in multiple sectors affect health, and how improved health can support the goals of these multiple sectors. This approach engages diverse partners and stakeholders to work together to promote health, equity, and sustainability, and simultaneously advance other goals such as promoting job creation and economic stability, transportation access and mobility, a strong agricultural system, and improved educational attainment (31, 33, 37). States and

localities utilize the Health in All Policies approach through task forces and workgroups focused on bringing together leaders across agencies and the community to collaborate and prioritize a focus on health and health equity (32, 34, 36).

1.1.5 The Medical Community Cannot Do It Alone

The challenge remains, however, of connecting medical practices with community services and resources to meet coexisting health and social care needs. Community Health Centers, which serve patients whose health risks are high, and whose exposure to the SDOH are profound (39, 40) exemplify this nexus of clinical and community care. These health centers are often capable of handling the complex and chronic medical problems that present from the most vulnerable populations in the United States (41). Nationally, Community Health Centers, often designated as Federally Qualified Health Centers (FQHCs), deliver primary and preventive care to 29 million patients, annually, in over 12,000 urban and rural underserved communities (41).

FQHCs, administered by the Bureau of Primary Care, collectively comprise the federal neighborhood Health Center Program with a total of 1,370 centers (41). The program is funded by the Health Resources and Services Administration (HRSA), and FQHCs receive advocacy, research, and best practice implementation support from the National Association of Community Health Centers (NACHC) and state and regional primary care associations. Many FQHCs are part of the Centers for Medicare and Medicaid Services' federal demonstration projects that research and examine health information technology (HIT) adoption, and new payment and practice models for health care reform (18, 42, 43). These network partnerships offer many system-wide opportunities to generate meaningful knowledge and inform primary care practice through philanthropic and government funded research pilot programs.

Although FQHCs have long sought to understand and address social and economic factors that impact health, their efforts have typically been ad hoc and rarely documented in electronic health records (EHRs) (44, 45). Efforts to help FQHCs and other primary care settings adopt systematic SDOH documentation in EHRs are underway. The National Association of Community Health Centers' Protocols for Responding to and Assessing Patient Assets, Risks, and Exposure (PRAPARE) Implementation and Action Toolkit outlines how FQHCs can collect patient-reported SDOH data and provides EHR-based SDOH screening and data documentation tools (19). Cottrell and colleagues examined the PRAPARE toolkit implementation across a network of FQHCs using a common EHR platform to determine the feasibility of developing EHR-based tools to systematically address SDOH (24). Yet, the investigators found simply activating SDOH information technology doesn't lead to widespread adoption (24). The findings point to a need to explore factors related to SDOH technology implementation and data usage.

1.1.6 Information Technology is Not the Only Answer

Technology alone cannot address the staffing changes and practice-level knowledge, culture, and attitudes associated with implementing an EHR-based SDOH screening tools into primary care practice. In Cottrell and colleague's formative study, FQHCs were constrained by: (1) the need to change perceptions about healthcare teams' responsibilities; (2) lack of clarity on how to make SDOH referrals; (3) staff concerns about collecting data on SDOH needs when no "action" could be taken to address them; (4) limited knowledge on how to use the EHR for SDOH; (5) false-positive screening results; (6) lack of a method for documenting whether patient's want help; and (7) inadequate infrastructure, incentives, and decision support for effective SDOH screening and action (24). These barriers to implementation hindered SDOH documentation and action, thus impeding FQHCs' ability to use SDOH data.

Cottrell and colleagues (2019) revealed multiple barriers to EHR-based SDOH adoption and action in their national study of FQHCs (24). But, the literature remains void of facilitating factors and best practices used to adopt HIT and integrate SDOH data into staffing workflows and pathways to local resources and community services (45). More investigations of FQHCs' infrastructural, organizational, and technological factors, such as governance structures, data policies and activities, and community partnerships will offer insight into care management practices and information infrastructure used to meet social needs in primary care settings.

1.1.7 FQHCs Provide a Natural Laboratory to Study Medical and Social Care Integration

The national network of state primary care associations and FQHCs have provided a natural laboratory for studying innovative practice models for primary care since the inception of the “early” neighborhood health centers dating back to the beginning of the 20th century (46). Today, much of the experimentation surrounding the collection and use of SDOH data takes place in FQHCs because of their historic precedent for addressing social and economic needs as a central component of primary care (40, 46, 47). Michigan Primary Care Association (MPCA) among other state associations continue to partner with researchers to demonstrate the value of FQHCs to the nation's health care system and the overall health of communities (41, 45).

A research partnership with MPCA and their network of FQHCs provides a unique opportunity to systematically examine the integration of social care into medical practice. Given the lack of evidence regarding medical and community partnerships and the technology needed to exchange patient health information across various service sectors, ***this dissertation aims to identify care activities, as well as technological capabilities, developed by FQHCs in Michigan to manage the needs of their patients.*** The specific research questions and methods described

below draw on a single conceptual model that helps organize both services provided, and information infrastructure designed to support FQHCs.

1.2 Conceptual Model Used to Guide the Dissertation Research

This dissertation uses an interdisciplinary research approach drawing on public health theory and a sociotechnical systems model used in information science to form the theoretical basis and conceptual model that guides the research. **Figure 1** presents the study’s conceptual model and outlines organizational and sociotechnical theories used to develop research aims, measurements, and organize dissertation chapters.

Figure 1. Study Conceptual Model and Theoretical Basis

Model for Investigating Services, Care Activities, and Technological Capabilities Developed By FQHCs					
I. Care Activities †	Community-Wide Assemblages (Key public officials, healthcare leaders, business executives, and care partners)				
	Integrated Health Services	Coordinated Linkages	Collaborations		
Partnership Model	Integrated	Coordinated	Collaborative		
Service Delivery Mechanism	FQHC employees & co-located care delivered services	Informal agreements (verbal commitment & memos of understanding)	Formal agreements (service contract & data use agreement)		
II. Technological Capabilities †	Health Information Technology Infrastructure Used To:				
Collect SDOH information	<ul style="list-style-type: none"> Screen SDOH risks Record SDOH diagnosis 				
Manage SDOH data using information system	<ul style="list-style-type: none"> Track SDOH diagnoses, care needs, and referral status 				
Achieve interoperability with partners	<ul style="list-style-type: none"> Digitally exchange SDOH data and patient health information Share data system access 				
Conduct data analytics & reporting activities	<ul style="list-style-type: none"> Manage patient panels/population health Report SDOH data/health information Inform quality care improvement 		<ul style="list-style-type: none"> Perform predictive analytics Create risk stratification models Make risk adjusted payments 		
III. Services	Maternal and infant health, mental health, substance use disorder, child welfare, domestic violence, transportation, housing and homeless, financial assistance, food assistance, child care, criminal justice, employment, educational support				
IV. Sociotechnical Factors‡	Infrastructural	Organizational	Technological		
Evaluation Level	System & Community	FQHCs	Employees	Partners	Patients
Evaluative Dimensions	People and culture		Hardware and software		
	Clinical content, workflows, & communication		Human-computer interface		
	External rules, regulations, & pressures		Organizational policies and procedures		
	System measurement and monitoring				

†Based on Leutz WN (1999) *Five Laws of Medical and Social Service Integration*

‡Sittig and Singh (2010) *A new sociotechnical model for studying HIT in complex adaptive health system*

The study's conceptual model draws on a partnership framework grounded in Walter Leutz' (1999) *Five Laws of Medical and Social Service Integration* (48) to examine FQHC organizational structures and information infrastructure developed in communities. Leutz' theory was developed to explain levels of integration empirically observed in medical and community connections established to improve health and care delivery outcomes. It has been applied to national behavioral health and social care integration efforts to assess partnerships, health information technology adoption, and data activities in medical settings (49, 50).

Leutz' theory posits three levels or models of partnership (Section 1.2 in Figure 1): coordinated, collaborative, and fully integrated. Coordinated linkages describe partnerships using informal agreements, i.e., verbal commitments and memorandums of understanding, to connect patients with government safety net systems and community services. Collaborations refer to care partners using formal agreements, i.e., service contracts and data use agreements, to cooperatively manage patient care and health information. And integrated care services are characterized by co-located services designed to deliver multiple interventions. According to Leutz, different partnership models help support patients and populations based on their care needs. Coordinated linkages are designed for patients with mild-to-moderate needs and addressed in medical practices serving whole populations. Collaboration uses formal structures and designated positions to ensure patients receive services they need across sectors. Full integration involves combining resources from multiple partners and service sectors to rely on one shared health record and care team (48).

In this dissertation, the overall conceptual model also draws on sociotechnical theory from classic case studies of infrastructure, e.g., transportation systems and electric power grid, to better understand the human/organizational (socio) and technological (technical) elements of

large technical systems (51, 52). Using sociotechnical theory, interdependent interactions are revealed through feedback mechanisms, whereby people and technology attenuate, strengthen, distort, halt, or change over time (53, 54). These evolving behaviors and characteristics are notably apparent when conducting empirical observations of health information technology adoption and data practices across networks of medical practices. Thus, using Sittig and Singh's sociotechnical systems evaluative constructs strengthen the theoretical research approach in exploring FQHC information infrastructure, activities, and clinical-community environments.

Sittig and Singh (2010) developed a sociotechnical systems model used in information sciences that is suitable for exploring various stages of IT development, implementation, and use in adaptive health care settings (55). Interdependent constructs from their model, *hardware and software, human-computer interface, organizational culture/policies, clinical content, people, communication, workflows, external regulations and pressures, system measurement and monitoring*, are used to evaluate multi-level social and technical factors of FQHCs in Michigan.

The conceptual model that emerged from the combination of Leutz' integration theory and Sittig and Singh's sociotechnical systems model informed the mixed methods approach used in this dissertation. A survey instrument (discussed in chapters 2 and 3) was developed to capture descriptive information about the current state of service delivery and technological capabilities. An interview guide was developed to assess infrastructural, organizational, and technological factors related to partnership development, IT adoption, and conducting data activities. Semi-structured interviews with FQHC leadership, clinicians, and staff helped organize multi-level and technical factors identified. A mixed methods study design was used to sequence quantitative and qualitative phases and organize research objectives, questions, and measurements into three chapters.

Chapter 2 identifies the services and care management activities developed by FQHCs to address maternal and infant health, behavioral health, and social care needs, and explores factors related to care activity development with partner organizations, such as local hospitals, health systems, government agencies, community-based organizations, and businesses. The purpose of Chapter 2 is to provide an in-depth description of the services and partnerships developed by FQHCs to provide comprehensive care that addresses both medical and social needs.

Specifically, Chapter 2 examines the following research questions:

RQ1. What services and partnership activities have FQHCs developed to deliver maternal health and infant health, behavioral health, and social care?

RQ1.1. What infrastructural, organizational, and technological factors are related to delivering maternal and infant health, behavioral health, and social care services?

RQ1.2. What are barriers and facilitators of developing care activities to meet maternal and infant health, behavioral health, and social care needs?

RQ1.3. How do factors identified related to FQHC partnership activities explain local care management infrastructure development? [Mixed Methods Question]

Chapter 3 identifies the technological capabilities developed by FQHCs to manage maternal and infant health, behavioral health, and social care data, and explores factors related to developing technology used to manage care and exchange patient information across service sectors. This chapter draws on survey responses to questions about technological capabilities to collect and manage SDOH data, achieve data interoperability, manage population health, and address quality using patient information. The purpose of Chapter 3 is to provide an in-depth description of technological capabilities developed by FQHCs to manage care, service partnerships, and data use activities. The research questions for this chapter are:

RQ2. What technological capabilities have Michigan FQHCs developed to manage care and exchange data across public health, behavioral health, and social care sectors?

RQ2.1. What infrastructural, organizational, and technological factors are related to using technology to manage care and exchange patient information across sectors?

RQ2.2. What are barriers and facilitators of developing technological capabilities to manage care and exchange patient information across sectors?

RQ2.3. How do factors related to using information infrastructure explain the technological capabilities developed by FQHCs to manage patient care and information? [Mixed Methods Question]

Chapter 4 explores community health and social needs, and workforce and technological limitations related to developing partnership and data activities used to manage care. This chapter describes unavailable local resources and service gaps critical to meeting patient care needs in communities. Factors associated with forming community activities to address social care and health equity are also presented. The research questions this chapter addresses are:

RQ3. What health and social care needs are difficult to meet in the community?

RQ3.1. What infrastructural, organizational, and technological factors are related to the challenges of meeting health and social care needs in the community?

RQ3.2. What factors are related to engaging in community-wide activities to address social care and health quality?

Finally, **Chapter 5** discusses key findings and implications for FQHCs and for the broader learning health system community, policy, practice, and research.

1.3 Conclusion

Health care organizations are increasingly identifying SDOH risks in clinical practice and forming relationships with government and community agencies to meet medical and social needs (56, 57). The rise of these health care activities are prompted, in part, by federal laws and programs responsible for creating new payment systems and quality standards (e.g., pay-for-performance) incentivizing social care integration (17, 18, 58). Motivated to finance new care activities to address social needs and health disparities, medical care organizations are using technology to integrate SDOH data obtained from patients and partners into clinical practice.

FQHCs are an exemplary model of developing new technological capabilities using information systems and SDOH data to manage social care and monitor quality. Nationally, FQHCs lead efforts to digitally screen SDOH risks and develop partnership care activities to exchange patient information (24, 45). Representing cornerstones of public safety net systems in the United States, FQHCs are deeply entrenched in shaping local policies to improve access to quality health and social care (41). Serving the needs of vulnerable communities and high-risk patients through well-established relationships with social service agencies and local health departments (59), FQHCs create the ideal setting for investigating services, partnership activities, and IT infrastructure developed to manage patient care and information across sectors.

There has not been a systematic investigation of FQHC care management and data practices. A better understanding of which SDOH risks are difficult to meet in communities and why it is key to effectively treating social care needs and managing patient health outcomes. Indeed, there is also incomplete evidence regarding digital capabilities to screen risks and share information and what SDOH information is being used to finance care management and quality activities. More research about infrastructural, organizational, and technological factors limiting

health care activities and IT development is needed to guide practice and policy changes. Yet, measuring care partnership, information infrastructure, and data practices are complicated due to the rapidly evolving IT environment and shifting social care landscape.

This study describes FQHC care management and data practices to offer a snapshot of current technological capabilities used to manage patient care and information. Study findings can help guide health care organizations in developing activities to finance maternal and infant health, behavioral health, and social care using patient SDOH data. Empirical evidence gathered through this dissertation offers a foundation for accelerating future research regarding how local information exchange and collaborative activities can be leveraged to deliver high-quality care.

Chapter 2 Services and Care Management Activities of Federally Qualified Health Centers in Michigan

2.1 Background

Social and environmental conditions impact patient care and outcomes (7). Although, efforts to improve health and care delivery in the United States have traditionally viewed medical practice as the principal driver, calls now amplify the value of public health prevention and the role of communities as critical agents and driving forces of change (3, 5, 7, 37, 38, 60-62). The Patient Protection and Affordable Care Act (ACA) of 2009 established national prevention and quality strategies as part of a broader policy priority to address population health and deliver high-quality care. ACA has incentivized preventive services and more coordinated approaches to connect patients with behavioral healthcare, child and family organizations, food programs, reliable transportation, affordable housing, financial assistance, employment, and educational support (28, 31, 32, 34, 37, 38, 63). To date, there is incomplete evidence regarding how these services are coordinated, specifically, what care management and partnership activities are developed to meet coexisting health and social needs (10, 64). In considering health care's role in responding to social and environmental circumstances of patients, a number of important questions arise, including how to integrate social care into standard medical practice and what workforce and technological infrastructure is required to achieve such reform.

2.1.1 Role of Health Care in Addressing the Social Determinants of Health

Within health care, addressing social determinants of health (SDOH) is a rising trend (Chapter 1). And yet, SDOH has long been recognized by health departments and social service agencies. In recent years, health care organizations have begun using SDOH screening and data analytic tools to understand social risks (45) in order to reduce unnecessary utilization and better manage population health (56, 57). This is in part prompted by the ACA and national strategies (17, 18, 31, 43, 58, 65, 66) that created new payment systems and quality standards to incentivize preventive and social care (18, 67). However, health care organizations funded through private and fee-for-service reimbursements are relatively new to the idea of developing community partnerships and alternative payment methods using SDOH data to finance care activities. Practices serving patients with an overwhelming exposure to SDOH risks, such as Federally Qualified Health Centers (FQHCs), have a longer history of financing services and forming partnership activities to deliver preventive and social care (39, 40).

2.1.2 Federally Qualified Health Centers offer an Exemplary Health Care Model

FQHCs serve high-risk patients and vulnerable populations with a broad range of medical and social needs (40). Nationally, there are 1,370 FQHCs providing primary and preventive care to 29 million patients, annually, reaching over 12,000 urban and rural communities throughout the United States. FQHCs represent the cornerstone of public safety net systems, shaping local policies to improve access to quality health and social care (41). Historically, FQHCs have met patient social needs through referrals to community-based organizations, health departments, and social service agencies (59). Since the passage of the ACA, policy incentives for improving quality support FQHCs in delivering a complete continuum of prevention, acute, chronic, and rehabilitative services that spans across multiple specialties and sectors of care (39, 43, 68).

2.1.3 FQHCs as Managers of Medical and Social Care Using Health Information Technology

ACA and other policy priorities have increased the number of FQHCs (39), authorized federal demonstration projects to test payment and partnership models (18, 43, 69, 70), and incentivized the adoption of patient-centered medical homes that deliver social care (71). Nationally, FQHCs are at the center of this work, financing new care management and quality monitoring activities to improve outcomes. The Centers for Medicare and Medicaid Services (CMS) and Health Resources and Services Administration (HRSA) offer financial incentives and practice guidance through national initiatives that also support FQHCs in forming partnerships and integrating health services to deliver high-quality care (11, 64, 68). With federal policies and programs focused on prevention and quality improvement, FQHCs are leveraging technology investments to better coordinate care, monitor quality, and manage population health (24, 70, 72, 73).

2.1.4 Theoretical Basis and Study Conceptual Model for Investigating FQHC Care Activities

To better understand FQHC services and the information technology that supports them, it is important to assess three key elements: 1) sociotechnical systems, 2) organizational structures (partnerships and collaborations), and 3) social determinants of health data used. A sociotechnical system is infrastructure defined as a set of interactions between people (socio) and technology (technical) that are interdependent and cannot be examined in isolation, and therefore, must be evaluated together (74). While most sociotechnical theorists have addressed both social and technical factors, their theories and models have overlooked the interdependent components of information infrastructure, such as technology adoption and end-user problems (75-77).

Sittig and Singh (2010) offer a model used within complex adaptive health systems to examine technical issues and the symbiotic relationship between information infrastructure and people that use it (55). Dimensions from Sittig and Singh's sociotechnical systems model - *hardware and software, human-computer interface, organizational culture and policies, clinical content, people, communication, workflows, external regulations and pressures, system measurement and monitoring* - are used in this chapter to explore information technology development, and workforce and technological factors related to managing patient care and information.

This chapter also examines aspects of information infrastructure (e.g., data systems and activities) used to coordinate medical and social care. To systematically unpack a sociotechnical system described above, a public health organizational model is also used to help identify where key information infrastructure operates and where it may be missing. Walter Leutz' (1999) *Five Laws of Medical and Social Service Integration* (48) is used to better understand the complexity of interorganizational structures and mechanisms, such as, co-location and formal agreements, often used in care management and data activities with different specialties and service sectors.

According to Leutz, there are partnership activities that support patients and specific populations based on their care needs. Coordinated linkages are designed for patients with mild-to-moderate needs. Collaboration uses formal organizational structures and designated care staff to ensure patients receive services across sectors. Full integration involves combining resources from multiple partners and service sectors to rely on one shared health record and care team (48). Leutz' levels of integration theory is used by federal programs and health care leaders to develop practice-based frameworks for assessing behavioral health and social care integration (49, 50),

including the *Framework for Levels of Health-Related Social Needs and SDH Data Integration* (50).

Finally, examining the provision of services and data activities, i.e., screening SDOH risks and information exchange, developed by FQHCs, helps to identify their technological capabilities. For example, the information infrastructure and patient data shared by FQHCs and partners support SDOH data integration, service coordination, and quality improvement efforts. Thus, services examined were selected by mapping common care management practices and partnership activities to domains identified through an environmental scan of screening tools and quality measures (8, 12, 16, 58, 61). The services identified were then categorized by public health, behavioral health, and social care sectors to align data and information used with the appropriate domain: well-being, safety and violence prevention, family and home, money and resources, occupational support, and prevention. Figure 2.1 presents the alignment map and list of domains, services, and sectors used to enhance the theoretical basis for investigating this chapter's research questions:

RQ1. What services and partnership activities have FQHCs developed to deliver maternal and infant health, behavioral health, and social care?

RQ1.1. What infrastructural, organizational, and technological factors are related to delivering maternal and infant health, behavioral health, and social care services?

RQ1.2. What are barriers and facilitators of developing care activities to meet maternal and infant health, behavioral health, and social care needs?

RQ1.3. How do factors identified related to FQHC partnership activities explain local care management infrastructure development? [Mixed Methods Question]

2.2 Methods

2.2.1 Study Design

A mixed methods study design guided the sequence of quantitative and qualitative data collection and analyses. *Explanatory sequential mixed methods* were used to organize the work into three separate and consecutive phases (i) collection and analysis of quantitative data (ii) collection and analysis of qualitative data, and (iii) interpretation of how the qualitative results explained the quantitative results (78). Phase 1 began by developing and administering a health information technology (HIT) capability practice survey to members of the Michigan Quality Improvement Network (MQIN). MQIN is a Health Resources and Services Administration (HRSA) funded Health Center Controlled Network (HCCN) formed by Michigan Primary Care Association (MPCA) to address patient safety and quality care using information technology (79). FQHCs interested in participating in Phase 2 follow-up interviews were identified through positive responses to the HIT practice survey. A sample of FQHCs were recruited into the study via an academic-community research partnership with MPCA and its network of primary care practices in Michigan. The investigation was limited to FQHCs located in the state of Michigan. The study was determined to be exempt from review by the University of Michigan Institutional Review Board.

2.2.2 Recruitment Procedures

Setting and Site Selection. All FQHCs in Michigan (N=40) were eligible to participate in the study. Practice demographics of Michigan FQHCs are quite similar to FQHCs nationally. Approximately half of the study sites delivered care in rural (53.3%) settings, predominately serving publicly insured (63.5%) and uninsured (14.5%) patient groups (Table 2.1 Clinical and

Service Delivery Characteristics). FQHCs were recruited via an online webinar presentation delivered at the *MQIN Champion Summit* in June 2021. Summit attendees consisted of quality directors and chief operating officers from all 40 Michigan FQHCs. During the presentation, site and subject enrollment procedures were introduced, and the value of the research project was communicated. Following the presentation, follow-up emails with the study details and HIT practice survey link were provided to summit attendees, health center leadership, and other staff who might have not participated in the summit.

Subject Selection. Purposive sampling was used to enroll participants for each site. MQIN Summit attendees were asked to either complete the HIT practice survey or forward it to the person(s) in their practice with the best knowledge of (i) maternal and infant health, behavioral health, and social care services provided or delivered through partner organizations (e.g., hospitals, health systems, community-based organizations, businesses, and government agencies) and (ii) information infrastructure (i.e., technology, information systems, and data activities) used to manage SDOH risks, care needs, and service data. The PI then followed up with subjects to ensure the appropriate staff person(s) was identified for follow-up interviews.

Financial Incentives. Twenty-five-dollar gift cards were provided to study participants for both survey response and interview participation. A contact database of survey respondents and interviewees was developed to track employee position titles, roles, and responsibilities of staff, clinicians, and leadership who participated in the study.

2.2.3 Survey and Measurement Development

Practice Survey Development. The survey was designed by adapting the *Framework for Levels of Health-Related Social Needs and SDH Data Integration* (50), which is based on Leutz' *Five Laws of Medical and Social Service Integration* (48). To capture the broad range of FQHC

partnerships, commonly delivered services and community programs were first mapped to six domains: (i) well-being; (ii) safety and violence prevention; (iii) family and home care; (iv) money and resources; (v) occupational support, and (vi) prevention. This was done to ensure the screening and referral data obtained by FQHCs aligned with the appropriate service. To discover the technological capabilities developed by FQHCs used to manage patient care and information across multiple sectors, the HIT practice survey was designed to ask study participants about maternal and infant health, behavioral health, and social care services and data activities.

Survey Measures. The HIT practice survey assessed *FQHC care activities* by measuring service delivery mechanisms, i.e., partnership agreements, used to deliver social care, behavioral health, and public health prevention services with federal, state, and local partners. The survey installed a three-point scale to measure: *integrated health services* using FQHC employees and co-located care delivered services, *coordinated linkages* using informal agreements with partner organizations (i.e., verbal commitments and memorandums of understanding), and *collaborations* using formal agreements (i.e., service contracts and data use agreements). The measures were pilot tested with one health center and one MPCA staff member. They were then revised based on feedback regarding study constructs and the ability of the measures to capture salient information.

Survey Questions. Survey participants were asked what *maternal and infant health, mental health, substance use disorder, child welfare, domestic violence, housing and homeless, food assistance, child care, financial assistance, transportation, criminal justice, employment, and educational support* services were provided by employees of their health center or were delivered via partnership organizations. For example, “*does your FQHC provide transportation services: (1) yes, an employee driven van; (2) yes, taxi company; (3) no.*” “*Does your FQHC*

provide food assistance: (1) yes, in-house food pantry; (2) yes, delivered meals; (3) no.” Figure 2.1 presents services and service types measured. Survey respondents were also asked basic health center information regarding position and role within the organization. Appendix A provides questions developed for the online survey.

2.2.4 Mixed Methods Data Management and Analysis

Mixed Methods Approach. The mixed methods approach was used to better understand the services and care activities developed by FQHCs and partner organizations. Mixed methods is an approach used in social, behavioral, and health sciences research where investigators gather both quantitative and qualitative data, integrate the two, and then draw interpretations combining the strengths of both sets of data to gain a better understanding of the problem in question (78). This study employed a sequential mixed methods design in which quantitative results informed qualitative interview guide development, which in turn provided context to assist in the interpretation of quantitative results. Consecutive phases of independent and mixed analyses helped manage primary and secondary data (surveys, interviews, and HRSA data) used to offer a richer interpretation of technological capabilities developed by FQHCs and their partners; and adherence to sequential procedures using multiple data sources improved the robustness and reliability of the study findings (80).

2.2.5 Quantitative Data Management and Analysis.

Primary and Secondary Data. The HIT practice survey was administered to generate primary data for analyzing and describing services and care activities of FQHCs and their partners. HRSA 2019 health center data was used to describe *clinical and service delivery characteristics* of FQHCs, explain clinic setting (urban vs. rural), and contextualize site level

differences related to care activity development in the qualitative and mixed method analyses. A database was created to merge and store primary and secondary data for comprehensive analyses and interpretation. The database consisted of survey data collected and practice-level information publicly available and obtained from HRSA's Uniform Data System (UDS)(81).

Descriptive statistics were performed using the following variables from the 2019 UDS dataset: *practice size*, i.e., total delivery sites, annual expenditures, total patients, per patient costs, *setting* (rural/urban), *clinical services*, *patient demographics*, *patient populations*, and *insurance coverage* information. ANOVA and chi-square tests were performed using UDS data to examine associations between the national, state, and study sample (Table 2.1). ANOVA tests examined group differences in *practice size*, *services*, *demographics*, *patient populations*, and *insurance coverage* variables. A chi-square test was calculated to examine group differences in practice *settings*. Average number, standard deviation, and range of services were also calculated using primary data captured through the HIT practice survey.

Descriptive statistics (*n*, %) were used to calculate frequencies and percentages of FQHCs delivering the following services: *maternal and infant health*, *mental health*, *substance use disorder*, *child welfare*, *domestic violence*, *housing and homeless*, *food assistance*, *child care*, *financial assistance*, *transportation*, *criminal justice*, *employment*, and *educational support*. Descriptive statistics were used to calculate frequencies and percentages of FQHCs with the ability to develop *integrated health services* via employees or co-located care, *collaborations* via formal agreements with care entities, and *coordinated linkages* using informal agreements with partners identified in the HIT practice survey.

2.2.6 Qualitative Data Collection and Analysis.

A semi-structured interview guide was created to explore community-infrastructure, FQHC-organizational, and technological factors related to developing services and partnership activities to deliver cross-sector care.

Interview Guide Development. Sittig & Singh's (2010) sociotechnical model for studying HIT in complex adaptive health care systems was used to develop the study's conceptual model (Section 1.2 in Figure 1) and interview guide (Appendix B) (55). All eight dimensions *hardware and software, clinical content, people, workflow and communication, human-computer interface, organizational policies and procedures, and culture, external rules, regulations, and pressures, and system measurement and monitoring* were used from this model to ground the qualitative and mixed method analyses used to explore services and activities (82).

Interview Questions. The interviewees were asked questions about community-wide infrastructure, FQHC-organizational, and technological factors related to developing integrated health services and other partnership activities used to deliver and manage cross-sector care. Key constructs measured included: FQHC/community workforce and technological challenges; and barriers/facilitators of care management and partnership development.

Interview Guide Testing. The interview guide was based on the sociotechnical model dimensions previously described. It was developed, iterated, and piloted tested through the academic-community research partnership.

Interview Sample. The principal investigator interviewed FQHC leadership, clinicians, and staff ($n=24$) in a variety of positions, including executives, quality directors, clinic and program managers, clinicians, social workers, care managers/coordinators, outreach specialists,

patient navigators, community health workers, and IT/EHR specialists from eleven FQHC sites ($n=11$). Figure 2.2. provides a list of position titles by data collection method.

Qualitative Analysis Techniques. A rapid assessment process (RAP) was then deployed by the research team to guide development of a qualitative data extraction template tool using the sociotechnical evaluative model dimensions. RAP is an intensive, team-based qualitative inquiry using data triangulation, iterative analysis, and additional data collection to quickly develop a preliminary understanding of a situation, setting, or phenomena from an insider's perspective (83). RAP has been demonstrated as an efficient method for time sensitive health services research and used in evaluations of clinical informatics (e.g., decision support) across multiple healthcare settings (i.e., hospitals and primary care) (84, 85). RAP was used to assist the research team in quickly forming a better understanding of the multi-level factors and different clinic-community contexts for delivering cross-sector care.

The data extraction template tool was tested by the PI, three research assistants, and partnership team for consistency and reliability before transcript coding commenced. The coding occurred until data saturation was achieved, and the research team could no longer identify disconfirming data. Data matrices were derived from the extraction template tool and used to capture coded information about the sociotechnical domains from transcripts. Domain and subdomain summary profiles were then created to analyze the multi-level factors, themes, barriers, and facilitators related to site, setting (rural/urban), and service differences. A thematic analysis was completed to identify sociotechnical factors (i.e., community-wide infrastructural, FQHC-organizational, and technological factors) and themes associated with partnership development and sharing patient information. Qualitative data tables of factors and themes identified were developed to further analyze setting (rural/urban) and site level differences.

2.3 Results

Twenty-seven FQHC leaders, clinicians, and staff (e.g., chief medical officers, chief executive officers, chief operating officers, quality and program directors, practice managers, clinicians, care managers and supervisors, community health workers, and IT support) from fifteen FQHCs in Michigan ($n=15$) completed the practice survey (37.5% response rate). The number of FQHCs participating in the study represented a generalizable sample of health centers in Michigan. Follow-up interviews ($n=24$) commenced twelve weeks later and were conducted with twenty-four FQHC leadership, clinicians, and staff from eleven health centers ($n=11$) with a site level interview participation rate of 27.5%. Refer to *Figure 2.2 Subject Recruitment by Staff Title and Data Collection Method* for a descriptive list of study participants.

Clinical Characteristics. Table 2.1 compares the site level *clinical and service delivery characteristics* of FQHCs in the study ($n=15$), statewide ($N=40$), and nationally ($N=1,370$). Michigan's FQHCs delivered mental health care to approximately twelve percent of patients (11.9 ± 14.7), consistent with health centers in the study (12.8 ± 13.2), and higher when compared to ten percent of patients (10 ± 10.9) served by FQHCs nationally for mental health needs. When public insurance coverage was examined, significant differences in Medicaid ($p<.031$) and Medicare ($p<.01$) populations served across groups were found.

FQHC Services to Deliver Cross-Sector Care. The average number of services delivered by FQHCs in Michigan was eight ($M=7.9$, $SD=3.6$), with a range from 1-13, a median of nine, and a mode of ten. Most FQHCs addressed public health prevention ($n=12$, 80%) via the service delivery of maternal and infant health care. The majority of FQHCs ($n=10$, 69.3%) delivered both mental health (MH) and substance use disorder (SUD) services. Thirteen FQHCs (86.7%) only provided mental health care and twelve (80%) exclusively addressed SUD needs in

their provision of behavioral healthcare. There was one health center in Michigan that delivered all 10 social care services examined. Thirteen (86.7%) FQHCs offered food assistance, eleven (73.3%) provided transportation, eleven (73.3%) addressed domestic violence needs, ten (66.7%) offered financial assistance, eight (53.3%) delivered housing and homeless services, seven (46.7%) had relationships with child welfare, six (40.0%) offered criminal justice services, five (33.3%) addressed child care, five (33.3%) supported employment needs, and four (26.7%) offered educational support. Table 2.2 presents the results by sector and service level.

FQHC Care Activities. Public Health. All FQHCs in Michigan developed care activities to deliver maternal and infant health care. Six FQHCs (40%) used coordinated linkages via informal agreements to deliver maternal and infant health (MIH) services, four (26.7%) developed collaborations using formal agreements, and six (40%) integrated MIH care into clinical practice using their employees or co-located care services.

Behavioral Health. Approximately half of FQHCs delivered behavioral health residential treatment [(MH: $n=7$, 46.7%)(SUD: $n=7$, 46.7%)] and made emergency admissions [(MH: $n=6$, 40%) (SUD: $n=5$, 33.3%)] through their coordinated linkages using informal agreements. Outpatient care was most often integrated into clinical practice using FQHC employees and co-located services [(MH: $n=12$, 80%)(SUD: $n=11$, 73.3%)] or through formal agreements [(MH: $n=4$, 26.7%) (SUD: $n=3$, 20%)] in collaboration with state and local partners. Figure 2.3 displays the inverse relationship identified between FQHC care activities (i.e., integrated health services, collaborations, and coordinated linkage) and levels of behavioral health specialty care (i.e., residential, emergency, and outpatient care).

Social Care. Nearly half of FQHCs provided food assistance services through coordinated linkages with local food banks ($n=7$; 46.7%) and government supplemental nutrition (i.e., WIC)

food programs ($n=7$; 46.7%). Approximately half of FQHCs offered transit vouchers ($n=6$, 40%) to patients or used coordinated linkages to connect them to non-emergency medical transportation services ($n=7$; 46.7%). A few FQHCs created collaborations using formal agreements with local taxi companies ($n=3$; 20%). Most FQHCs integrated domestic violence counseling services ($n=9$; 60%) into clinical care using their own employees or co-located care delivered services, and a couple deployed coordinated linkages ($n=2$; 13.3%) using informal agreements to refer patients to counseling services with CBOs.

Some FQHCs delivered the following social care services using informal agreements to refer patients to government programs and CBOs via established coordinated linkages: *financial assistance* - Temporary Assistance for Needy Families ($n=5$; 33.3%) and emergency cash relief ($n=6$, 40%); *housing and homeless* - home retention ($n=6$, 40%) and Section 8 ($n=4$, 26.7); *child welfare* - child protective care ($n=7$, 46.7%) and emergency shelter care ($n=6$, 40%); *criminal justice* - legal aid ($n=4$; 26.7%); *child care* ($n=3$; 20%); *unemployment* ($n=3$; 20%), *vocational support* ($n=4$, 26.7%); and *GED support* ($n=4$; 26.7%). Table 2.3 presents FQHC care activities by sector and services delivered by employees and/or through relationships with CBOs or care providers as evident via co-located delivered services, formal or informal agreements.

2.3.1 Qualitative Results

The study's conceptual model drew on the rigor of an interdisciplinary research approach to better understand the complex partnerships and adaptive information infrastructure developed by Michigan FQHCs. Both sociotechnical and organizational theories shaped the qualitative and mixed method analyses and results. This research approach offered additional insight into the workforce and technological factors associated with developing new services and partnership activities to meet a broad range of patient needs.

Factors Related to Services and Activities to Deliver Cross-Sector Care

During the interviews with FQHC leadership, clinicians, and staff, study participants were asked to discuss community-level infrastructural, FQHC organizational, and technological factors related to developing services and partnership activities (i.e., integrated health services, collaborations, and coordinated linkages) to meet patient care needs. Table 2.4 list themes that emerged from the qualitative analysis of the barriers and facilitators to developing these care management activities.

Infrastructural Barriers. In the interviews with FQHC care managers and supervisors, one core theme that emerged was a lack of financial incentives for employees and community partners. This was identified as a barrier to developing services and partnership activities to deliver cross-sector care: a care manager said, “I think one struggle is we probably could use a lot more community health workers, but right now as a CHW, their services are not reimbursed.” A care supervisor stated, “as far as payment incentives, I'm not aware of anything surrounding social determinants [work].” During the interviews conducted with FQHC program directors and managers responsible for developing community collaborations, they repeatedly reported experiencing communication issues post pandemic as barriers to developing care activities: a program director said, “I think with COVID some organizations have not resumed the level of service they were providing before COVID.” A care manager reiterated that community-wide activities hadn't returned to pre-pandemic levels by explaining, “resources and services remain virtual, remote, and unreachable.”

Infrastructural Facilitators. FQHC leadership typically reported partners focused on care continuity supported new activities: an executive director said, “we continue to identify the current needs and then the resources in the area that can help fill those needs.” A chief medical

officer stated, “linking patients to community care provides continuity and prevents them from falling through the gaps.” During the interviews with FQHC clinic operational directors and practice managers, they generally discussed the local funding and resource development to support their partnerships and collaborations: a clinic manager said, “we partner with the health department on numerous grants, such as Heart Calculator, where we try to bring down a patient's heart age by improving their blood pressure, working on smoking cessation, and lowering BMI.” An operations director stated, “we are sharing different things through grant [programs] where patients sign up and understand that we're sharing their information.” A director of clinic operations also described the availability of local funding via the health department and area non-profits as a facilitator by stating, “local financial resources are used for gas cards, food pharmacies, and nutrition classes.”

Organizational Barriers. The obstacles to forming partnerships and collaborations for the service delivery of cross-sector care included competing FQHC priorities, for example, chronic disease management versus care activities to build service capacity, as well as challenges with proper distribution of funds and resources. These barriers were exacerbated by FQHC staff shortages across all levels – from custodial to healthcare providers. High staff turnover rates among both FQHCs and local organizations also impeded development and continuity of collaborative partnership activities: a care manager said, “...we'll develop a partnership; we'll work with people. I actually work pretty closely with the police department, just across the street, but they're constantly changing their upper management. So it's constantly starting over again.”

During the interviews with FQHC staff (i.e., community health workers) they discussed managing excessive amounts of patient referral data as both time consuming and labor intensive, affecting external communication when staff are stretched thin: a community health worker said,

“I am the only CHW in our office. So a lot of the time I'm working with patients directly. So the time to spend connecting with community partners is difficult. And I think that's the same for the organizations that we try to connect with. We're all understaffed and overworked. And it's hard for any sort of nonprofit or social service organization to have the manpower and the ability to connect, when you're just spending your day addressing needs of the patients in the clinic.”

Organizational Facilitators. Interviews with FQHC program and quality directors revealed that efforts to gain a better understanding of patient needs and the health center's capacity to meet those needs has contributed to a strong motivation to partner for services. Community resources are usually accessible and somewhat easy to connect with, and FQHC staff are highly invested in ensuring positive outcomes for patients. Increased external communication and staff flexibility/accessibility were noted as conducive for a greater degree of community presence and involvement: a program director said, “there's a lot of social needs that are unmet. I mean, there's a lot of strengths in the community and there's a lot of creative ways to overcome some of these barriers. The community really comes together and connects with one another.”

Technological Facilitators. While the COVID-19 pandemic aggravated pre-existing staffing shortages, it was also responsible for advancing workforce IT capabilities. Pandemic restrictions gave rise to virtual appointments, new digital medical documentation processes, and enhanced telecommunication capabilities. FQHC leadership and staff noted examples of how this had empowered not only medical providers and community partners, but patients as well: a care coordinator said, “some people don't have internet access, but most people, even on their phones can follow a link. And we learned that through this whole pandemic when people were doing their medical visits on their phones.”

In addition to increased technological fluency in the workforce, other facilitators for the creation and expansion of community partnerships and collaborations emerged, including IT adoption and data standard usage and improving access to care for shared patients. Digitally sharing patient health records between partners promoted the adoption and use of information systems, data standard usage, and fostered community-wide data-driven decisions. The information shared among FQHCs and community partners were supported by EHR system functions such as interorganizational data permissions for risk stratification and patient tracking, data protections for the confidential treatment of minors, and providing youth access to medical records.

Regional health information exchanges (HIEs) and state-operated community mental health information systems streamlined coordination and communication across sectors among FQHCs in Michigan. This was primarily observed in FQHC behavioral health integration, and their use of multidisciplinary team approaches in clinical practice. FQHC executives discussed an ability to use data and technology more easily and sharing patient information between care management systems more securely as facilitators for community collaborations and partnership development: an executive director said, "...our health department is connected on Epic as well." A chief operating officer said, "we share breast and cervical cancer screening with the health department; making sure those patients can get over there if they need further screenings or follow ups."

2.3.2 Mixed Methods Results

Collaborative Health Care Model Discovered in the Mixed Method Analysis

Strong and established community partners helped address and meet shared patient needs as evident in the qualitative data. Michigan FQHCs relied heavily on existing partnerships to develop care activities that improved patient access to a broad range of preventive, acute, and rehabilitative services. Formal agreements were executed as a strategy to establish collaborations for exchanging information and managing patient health across sectors of care. Figure 2.4 presents the number of FQHCs managing care activities by service type. Data demonstrated that FQHCs integrated health services, referred patients through coordinated linkages, and collaboratively managed care with partners. Mixed methods results suggested that Michigan FQHCs ensured patient care needs were met and developed technological capabilities (e.g., information exchange, shared data analytics, etc.) when service contracts and data agreements were developed. Yet, more importantly, collaborations provided FQHCs and their partners with structure and in some cases the information infrastructure to manage shared patients. Findings offer evidence of an emerging collaborative model identified in the mixed methods analysis.

Collaborative Health Care is characterized as having executed official agreements to create and sustain care management and data activities for cooperatively treating patient needs, coordinating services, addressing quality, and advancing learning health approaches using the latest evidence, data, and technology.

2.4 Discussion

This study examined FQHC services and partnerships to describe the current social care landscape and found Michigan FQHCs developed activities to meet patient maternal and infant health, behavioral health, and social care needs. Although FQHCs generally formed partnerships with local health departments and behavioral healthcare providers, rarely had they developed the organizational capacity to deliver the complete range of social interventions examined. Results concluded nearly all of Michigan FQHCs offered food assistance, domestic violence services, financial assistance, and transportation. However, most FQHCs did not provide housing and homeless services, child care assistance, employment services, and educational support, and had not established activities with child welfare and criminal justice systems beyond their mandatory reporting requirements.

Qualitative findings revealed workforce shortages, technology challenges, and lack of financial incentives contributed to siloed systems of care, fragmented communication, and limited resources (86, 87), prohibiting Michigan FQHCs from meeting patient social care needs. The inability of FQHCs to establish new services and care activities were only amplified by the COVID-19 public health emergency, competing organizational priorities, and insufficient salaries for staff and partner organizations. In contrast to Novick's findings that demonstrated siloed systems and poor coordination were challenges to meeting patient social care needs, this study offered evidence that Michigan FQHCs leveraged IT (i.e., video conferencing, local care management systems, and data exchange) to address communication and information sharing issues with partner organizations.

FQHC interviews with leadership, clinicians, and staff revealed the rapid development of IT capabilities (e.g., virtual appointments, enhanced telecommunications, etc.) during the

COVID-19 public health emergency improved workforce technological fluency and bolstered communication needed to develop care activities and sustain community relationships. There were conflicting priorities, challenging staffing workflow changes, and limited funding that complicated service development, integration, and coordination. FQHC leadership and staff attributed a community's focus on continuity of care and technology solutions as motivating factors to address these barriers and improve access to high-quality care.

Community priorities motivated Michigan FQHCs to develop new services and partnerships to address patient social needs. They were also incentivized by national strategies and quality measures to deliver preventive services and engage in local efforts to address care coordination and health equity. FQHC leadership and staff interviews revealed that established information infrastructure promoted shared system and data standard usage among partners and provided patients access to higher quality care. For example, FQHC executives and quality directors described the ability to achieve higher standards of care by using health information exchanges and EHR platforms to facilitate care activities and multidisciplinary team approaches.

Multidisciplinary approaches were most often discussed in the provision of behavioral healthcare. Moreover, a secondary data analysis of HRSA data revealed that the percentage of patients receiving mental health services in Michigan FQHCs exceeded the national average. Although the difference was not statistically significant, the data suggested that there are more care activities, e.g., integrated health services, to deliver mental healthcare occurring in Michigan than in other states. It is also conceivable that the existing state-operated community mental health data systems might have facilitated multidisciplinary team approaches to care, supported behavioral health integration, and assisted in partnership development to offer FQHC patients better access to different levels of behavioral health care.

In the mixed methods analysis of quantitative and qualitative results, this study found care activities developed by FQHCs provided continuity to improve patient access to prevention services and vital acute and chronic care treatments. The quantitative results revealed an inverse relationship found between partnership activities, i.e., integrated health services, collaborations, and coordinated linkages, and levels of behavioral health specialty care (residential, outpatient, and emergency admission). The data suggested that when FQHCs did not have the organizational capacity to treat the severity of behavioral healthcare needs they developed coordinated linkages and collaborations to meet patient care needs, consistent with Leutz' theory. Both care activities were useful strategies. However, the qualitative data suggested more advanced technological capabilities, i.e., information exchange and sharing data systems and software analytics, were activated when collaborations were created to cooperatively manage care and community health.

Findings also suggested that Michigan FQHCs developed partnership activities to ensure patients accessed a broader range services and specialty care. During interviews with FQHC executives, almost everyone stated that investments made in technology facilitated digital information exchange (16, 88, 89) and collaborative data activities (e.g., shared patient tracking) to manage care more easily across specialties and sectors. Study findings suggest that Michigan FQHCs executed data agreements with state-operated mental health agencies and local health departments to address communication and care management. Qualitative results confirmed these findings, offering evidence that collaborations were key for developing technological capabilities to manage shared patients of state and local partners. For example, FQHCs received data permissions to access state information infrastructure (e.g., care management data systems) and deployed their own EHR systems to authorize local care providers shared access for tracking high-risk patients.

This study also identified that collaborations between FQHCs and partners supported the use of common data standards and patient information exchange. Qualitative results confirmed that FQHCs and state-operated mental health agencies created formal data agreements through collaborations as a strategy to authorize access to information systems, share data management and analytic software, and digitally exchange patient information. Similarly, existing FQHC collaborations were leveraged to cooperatively manage maternal and infant health care using information infrastructure.

FQHCs and local health departments commonly executed both data agreements and service contracts to share responsibilities in managing high-risk patients and populations. For example, agreements authorized data permissions to share patient data, exchange preventive screenings, and administer assessments to populations that were difficult to reach. Michigan FQHCs also executed contracts to ensure care was received from their partners. FQHCs often created service contracts to manage more complex behavioral health and social care needs, such as, ensuring patients accessed residential treatment, staff addressed housing and unemployment needs, and taxis provided reliable and timely service.

2.4.1 Implications for Policy and Practice

Mixed methods results (Figure 2.4) demonstrated that Michigan FQHCs developed collaborations as a strategy to manage patient care and information. The use of collaborations warrants the distinction of an emerging health care activity in an era of increasing IT adoption and new learning health approaches. Based on findings of this study, *collaborative health care* activities may be able to transcend traditional care management practices, i.e., integrated health services and coordinated linkages, to transform care delivery and improve quality. Collaborative health activities identified in this study could help to inform standards for community care, offer

a framework for measuring high-quality outcomes, and provide IT strategies to improve service delivery. Findings support practice in implementing national strategies to develop collaborations across sectors, government agencies, and communities that address larger structural and societal issues impacting health and care delivery (65, 90).

2.4.2 Implications for Research

Findings offer evidence of care management and partnership activities developed by Michigan FQHCs to deliver preventive services, behavioral health, and social care. Building on the evidence gained from FQHCs and their partners in this study will support the development of new technological capabilities and local care management information infrastructure. Examining organizational structures is critical to the provision of social care and meeting community health needs, more broadly. Future studies should examine how collaborative health care activities can support data interoperability and quality initiatives. This evidence will support new strategies for IT adoption and shared data practices used to manage patient care and information.

Moreover, the study's theoretical basis and conceptual model was used to better understand the social care landscape and existing IT environment. The research approach used helped describe Michigan FQHC information infrastructure and partnership activities with local health systems, government agencies, and community organizations. The study's conceptual model and methods can be used in future studies to examine medical practices as complex and adaptive learning health systems with various organizational structures and data activities used to manage care and quality. This will help researchers systematically examine and describe rapidly evolving health care activities and information infrastructure designed to address quality and health outcomes.

2.4.3 Limitations

The investigators did not interview partner organizations. Thus, the study scope was limited to the perspectives of Michigan FQHCs. This was mainly due to the wide range of services and HIT capabilities we were interested in exploring. Moreover, the investigation was conducted during the COVID-19 public health emergency and gaining access to FQHC partners would have been difficult. This was evident in findings and through conversations with FQHC leadership and staff. The research team also had trouble identifying the correct people within FQHCs because of different staff roles and responsibilities for managing patient care and SDOH data throughout MPCA's statewide network. Investigators found it difficult to pinpoint the most knowledgeable person(s) to complete the HIT practice survey and follow-up interviews for that reason. Finally, given the gravity and widespread effect of the COVID-19 pandemic, SDOH initiatives and HIT research were not a high priority of FQHCs. There were increasing obligations to test and treat for COVID-19 and to vaccinate patients and other vulnerable community members. The competing practice resources were compounded by increased data reporting requirements and other requests from regulatory agencies and national network initiatives as result of the pandemic. These study limitations impacted site and subject recruitment, the survey response rate, and leadership and staff willingness to participate in the interviews, therefore, affecting sample size and generalizability of this study.

2.5 Conclusions

This paper examined services and partnership activities used to provide preventive and social care. This study found Michigan FQHCs developed activities to treat maternal and infant health, behavioral health, and social care needs. Although FQHCs generally developed partnerships with local health departments and behavioral health providers, rarely had they developed the organizational capacity to deliver the complete range of social interventions examined. Findings suggested that FQHC collaborations facilitated local information infrastructure and community resource development needed to address care coordination and continuity with their partners. Findings provide public officials, health care leaders, and community-based organizations with insight into the sociotechnical and interorganizational challenges of developing a social care infrastructure. The *collaborative health care* activities identified in the data offer an approach for addressing quality and ensuring patient needs are met in the community. From a system's perspective, collaborative health care approaches can be used to establish new data standards, drive payment and policy incentives, and guide practice-led initiatives using learning health to optimize IT and address service delivery. More investigations are needed to test the reliability of these findings and further examine the effects of collaborative health care activities.

2.6 Tables

Table 2.1 Clinical and Service Delivery Characteristics

Federally Qualified Health Centers (FQHC)	Nationally (N=1,370)	Statewide (N=40)	Sample (n=15)	P-value
Setting (% rural)	575 (42.0)	18 (45.0)	8 (53.3)	0.6312
Practice Size				
Number of delivery sites (%)	13,289 (100.0)	356 (100.0)	195 (100.0)	-----
Total patients (range)	21,659 ±26,573 (0-267,209)	17,436 ±14,397 (1,178-66,313)	21,530 ±15,978 (1,178-66,313)	0.6044
Annual expenditures - \$	22,642,150 ±3,524,602 (13,564-693,159,642)	17,551,014 ±14,783,692 (829,521-71,499,672)	22,757,038 ±17,219,184 (1,271,611-71,499,672)	<0.0001*
Per patient costs - \$	1,144 ±931 (53-18,044)	1,034 ±445 (273-3,180)	1,065 ±146 (902-1,429)	0.7184
Patient Demographics - %				
Children (<18 years old)	26.9 ±12.5 (0.0-84.4)	24.8 ±12.0 (0.2-56.0)	26.5 ±12.0 (0.2-43.9)	0.5740
Adults (18-64)	62.5 ±12.1 (16.0-99.7)	64.6 ±11.7 (40.7-91.6)	62.0 ±13.1 (50.1-91.6)	0.5483
Older Adults (65 and over)	11.0 ±6.5 (0.0-45.0)	10.6 ±5.8 (2.0-23.1)	11.4 ±6.8 (3.4-23.1)	0.9014
Racial and/or Ethnic Minorities	56.7 ±31.5 (0.0-100.0)	42.1 ±31.8 (1.9-98.9)	28.1 ±25.1 (1.9-88.5)	<0.0001*
Hispanic/Latino Ethnicity	28.7 ±27.8 (0.0-100.0)	10.1 ±14.7 (0.5-81.9)	12.5 ±21.0 (1.0-81.9)	<0.0001*
Black/African American	23.4 ± 26.0 (0.0-98.0)	32.6 ±31.3 (0.3-97.1)	21.3 ±20.0 (0.3-67.4)	0.0850
Asian	4.0 ± 10.8 (0.0-98.1)	1.6 ±2.9 (0.1-17)	1.0 ±1.3 (0.2-5.0)	0.2104
More than on race	3.4 ±7.1 (0-93.4)	2.2 ±2.5 (0.0-11.3)	2.9 ±3.1 (0.2-11.3)	0.5455
At or below 100% of poverty	64.4 ±18.5 (2.8-100.0)	62.6 ±18.9 (17.1=92.3)	62.6 ±18.4 (37.4-88.7)	0.7788
At or below 200% of poverty	89.4 ±11.6 (14.9-100.0)	88.7 ±9.5 (66.8-99.4)	88.2 ±9.8 (66.8-99.0)	0.8613
Patient Populations - %				
Hypertension	29.4 ±9.8 (1.1-74.2)	32.2 ±9.3 (4.7-61.9)	33.0 ±5.0 (28.7-43.5)	0.0769
Diabetes	15.4 ±5.0 (0.8-59.6)	15.1 ±4.0 (2.6-29.4)	15.1 ±2.3 (11.3-20.6)	0.9077
Patient Services - %				
Medical	86.7 ±15.9 (13.7-100.0)	78.4 ±17.0 (22.7-100.0)	78.8 ±12.0 (52.3-100.0)	0.001*
Mental Health	10.0 ±10.9 (0.0-93.2)	11.9 ±14.7 (0.1-83.0)	12.8 ±13.2 (3.7-57.2)	0.3560
Patient Insurance - %				
Uninsured	24.9 ±18.0 (0.0-100.0)	14.4 ±9.8 (3.4-50.8)	14.5 ±11.3 (5.9-50.8)	0.0001*
Medicaid/CHIP	43.2 ±18.6 (0.0-100.0)	50.4 ±13.4 (25.7-74.0)	48.2 ±12.7 (27.4-67.3)	0.0314*
Medicare	11.2 ±7.2 (0.0-45.5)	13.8 ±7.0 (1.5-28.0)	15.3 ±7.0 (6.6-28.0)	0.0078*
Other third party	21.1 ±12.8 (0.0-77.6)	21.5 ±11.0 (3.8-46.2)	21.0 ±9.2 (7.1-36.2)	0.9804

* p-value is less than 0.05

Table 2.2 Cross-Sector Care Services by Sector in Michigan, n=15

<i>Sector</i>	<i>SDOH Domain</i>	<i>Services</i>	<i>FQHCs</i>		<i>FQHCs</i>
			<i>n</i>	<i>%</i>	<i>with the service capacity to address SDOH domain</i> <i>%</i>
Behavioral Health	<i>Well-being, Stress, & Social Isolation</i>	Mental Health	13	86.7	69.3
		Substance Use	12	80.0	
Public Health	<i>Environmental safety & Prevention</i>	Maternal and Infant Health	12	80.0	80.0
Social Care	<i>Safety & Violence Prevention</i>	Domestic Violence	11	73.3	34.2
		Child Welfare	7	46.7	
	<i>Family and Home</i>	Food Assistance	13	86.7	15.4
		Housing and Homeless	8	53.3	
		Child Care Assistance	5	33.3	
	<i>Money and Resources</i>	Transportation	11	73.3	19.6
		Financial Assistance	10	66.7	
		Criminal Justice	6	40.0	
	<i>Occupational Support</i>	Employment	5	33.3	9.0
Educational Support		4	26.7		

Table 2.3 Care Activities, Sectors, Services, and Delivery Mechanisms, n=15

FQHC Care Activities	Integrated Health Services		Coordinated Linkages		Collaborations		No Practice		Total†
	FQHC employees & co-located care		Informal agreements		Formal agreements		No relationship		
Services	No. of FQHCs	(%)	No. of FQHCs	(%)	No. of FQHCs	(%)	No. of FQHCs	(%)	No. of FQHCs
BEHAVIORAL HEALTH									
Mental Health									
Emergency admission	2	(13.3)	6	(40.0)	1	(6.7)	6	(40.0)	15
Residential treatment	1	(6.7)	7	(46.7)	2	(13.3)	5	(33.3)	15
Outpatient care	12	(80.0)	3	(20.0)	4	(26.7)	0	(0.0)	19
Substance Use									
Emergency admission	2	(13.3)	5	(33.3)	1	(6.7)	5	(33.3)	13
Residential treatment	1	(6.7)	7	(46.7)	1	(6.7)	4	(26.7)	13
Outpatient care	11	(73.3)	2	(13.3)	3	(20.0)	1	(6.7)	17
PUBLIC HEALTH									
Maternal and infant health	6	(40.0)	6	(40.0)	4	(26.7)	0	(0.0)	16
SOCIAL CARE									
Food Assistance									
SNAP - Food Stamps	3	(20.0)	4	(26.7)	4	(26.7)	3	(20.0)	14
WIC - Nutrition	2	(13.3)	7	(46.7)	2	(13.3)	3	(20.0)	14
Food banks	3	(20.0)	7	(46.7)	1	(6.7)	3	(20.0)	14
Home delivered meals	0	(0.0)	6	(40.0)	0	(0.0)	7	(46.7)	13
Transportation									
Non-emergency medical transport	3	(20.0)	7	(46.7)	2	(13.3)	1	(6.7)	13
Transit voucher	6	(40.0)	2	(13.3)	1	(6.7)	2	(13.3)	11
Ride-share (Uber, etc.)	1	(6.7)	2	(13.3)	0	(0.0)	8	(53.3)	11
Taxi	1	(6.7)	2	(13.3)	3	(20.0)	4	(26.7)	10
Domestic Violence									
Counseling	9	(60.0)	2	(13.3)	0	(0.0)	0	(0.0)	11
Emergency shelter care	0	(0.0)	10	(66.7)	0	(0.0)	1	(6.7)	11
Financial Assistance									
TANF	2	(13.3)	5	(33.3)	2	(13.3)	1	(6.7)	10
Emergency cash relief	3	(20.0)	6	(40.0)	0	(0.0)	1	(6.7)	10
Burial costs	2	(13.3)	2	(13.3)	0	(0.0)	6	(40.0)	10
Housing									
Section 8 – Rental	1	(6.7)	4	(26.7)	1	(6.7)	3	(20.0)	9
Home retention	0	(0.0)	6	(40.0)	2	(13.3)	1	(6.7)	9
Child Welfare									
Protective services	0	(0.0)	7	(46.7)	0	(0.0)	0	(0.0)	7
Emergency shelter care	0	(0.0)	6	(40.0)	0	(0.0)	1	(6.7)	7
Criminal Justice									
Legal aid	1	(6.7)	4	(26.7)	0	(0.0)	1	(6.7)	6
Parole and probation	1	(6.7)	1	(6.7)	0	(0.0)	4	(26.7)	6
Child Care Assistance									
Child Care	0	(0.0)	3	(20.0)	0	(0.0)	2	(13.3)	5
Application assistance	2	(13.3)	3	(20.0)	0	(0.0)	0	(0.0)	5
Employment									
Unemployment	1	(6.7)	3	(20.0)	0	(0.0)	1	(6.7)	5
Tuition support	0	(0.0)	2	(13.3)	0	(0.0)	3	(20.0)	5
Vocational support	0	(0.0)	4	(26.7)	0	(0.0)	1	(6.7)	5
Educational Support									
GED	0	(0.0)	4	(26.7)	0	(0.0)	0	(0.0)	4
Higher Edu Support	0	(0.0)	1	(6.7)	0	(0.0)	3	(20.0)	4
Tutoring	0	(0.0)	0	(0.0)	1	(6.7)	3	(20.0)	4

† Total may exceed the sample size if the respondent selected more than one response.

Table 2.4 Factors and Themes of Developing Care Activities to Deliver Cross-Sector Services

Factors	Barriers and Facilitators	Themes
Infrastructural	Strong and established community partners help address patient needs and services	Community collaboration and understanding needs are priorities Community focus on resource identification & service expansion Existing community synergy empowers key stakeholders Delivering high standards of care is community-wide priority Strong communication and continuity of care among partners
	Collaborations with area transit authorities	Willing to provide services that meet at county lines Offering bus tickets and token for patients
	Funds are available for local capacity building	Health departments and community organizations offer grants Funds for gas cards, food pharmacies, & nutrition classes
	Communication issues post pandemic	Activity not returning to pre-pandemic levels Resources and services remain virtual, remote, and unreachable
	No financial incentives for people doing the work	Community Health Workers are not reimbursable Insufficient salary for this work
Organizational	Strong motivation to partner for services	To understand available services and resources to meet needs Resources are often close and generally easy to connect with Multiple leaders and staff are highly invested in meeting patient needs
	Increased community involvement	Community presence has grown due to more open external communication, staff flexibility and accessibility
	Competing priorities and resource management issues	Competing priorities (e.g., chronic disease management over SDOH) Difficulties with distribution of funds and resources
	Limited staff and high organizational workload	High staff turnover rates preventing longer-term partnerships Staff shortages across all levels from custodial to providers Managing referral data is time consuming and labor intensive Need more staff to handle external communication
Technological	Established healthcare HIT and data standards	Shared records among partners fosters systems and standard usage HIE enhances community-wide data driven decision making More data driven decision making happening internally
	HIT improves access to care of shared patients	Community HIE streamlines care coordination across sectors EHR system supports behavioral health service integration and multidisciplinary approach to achieve a higher standard of care Health department EHR system enables youth access to medical record, supporting the confidential treatment of minors Shared permissions within EHR systems allows partners to track high-risk patients and connect them to care
	Improved workforce technological abilities	More virtual appointments, medical document digitization, and telecommunications improved workforce technological fluency

2.7 Figures

Figure 2.1 Provision of Services and Data Activities: Mapped Sector and Domain to Commonly Delivered Services†

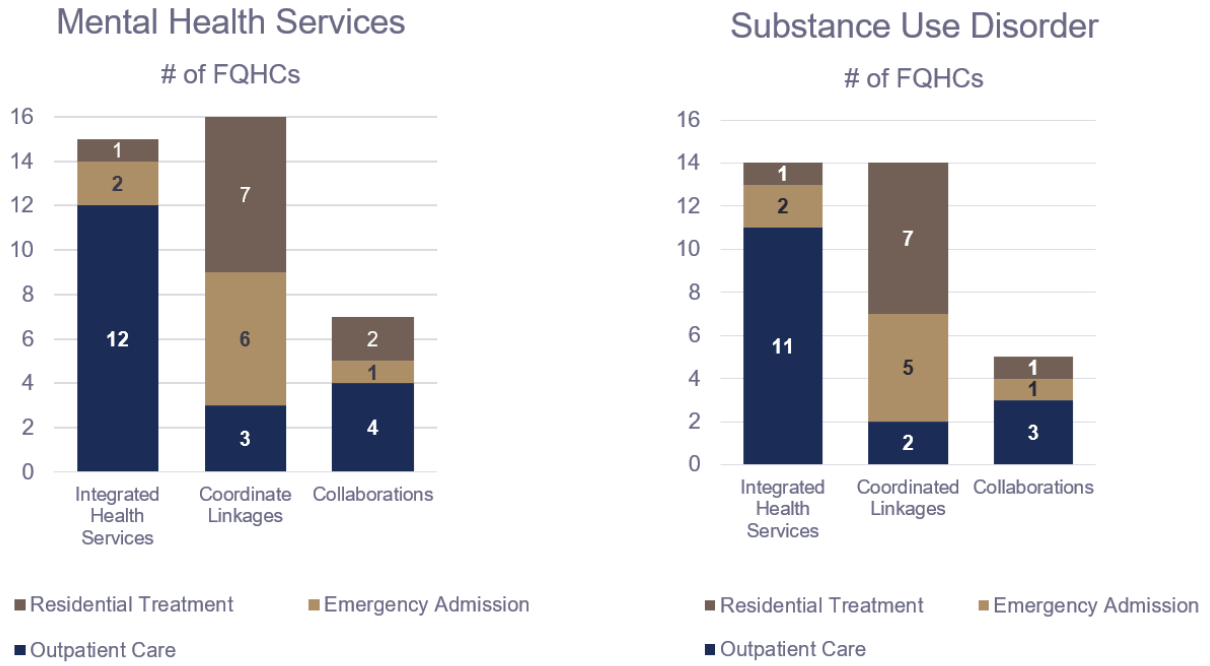
Sector	Domain	Services	Types of Services
Behavioral Health	<i>Well-being, Stress & Social Isolation</i>	Mental Health	Emergency admissions, residential treatment, and outpatient care
		Substance Abuse	
Social Care	<i>Safety & Violence Prevention</i>	Child Welfare	Child protective services and shelter care
		Domestic Violence	Counseling and shelter services
	<i>Family & Home</i>	Housing & Homelessness	Section 8, home retention, utility costs
		Food Assistance	SNAP, WIC, food banks, home delivered meals
		Child Care Assistance	State assistance and local non-profits
	<i>Money & Resources</i>	Financial Assistance	TANF, emergency cash relief, burial costs
		Transportation	Medical transport, transit voucher, ride-share, taxi
		Criminal Justice	Legal aid, parole and probation services
	<i>Occupational Support</i>	Employment	Unemployment benefits, tuition/vocation support
		Educational Support	GED, higher education support, tutoring
Public Health	<i>Prevention</i>	Health Department	Maternal and Infant Health

†Domains identified through an environmental scan of screening tools and quality measures.

Figure 2.2 Subject Recruitment by Staff Position Title and Data Collection Method

Survey and Interview (n=19)	Survey Only (n=8)	Interview Only (n=5)
Executive Director	Chief Analytics Officer	Chief of Behavioral & Integrated Health
Chief Medical Officer/Practicing Physician	Quality Improvement Director	Director of Quality Improvement
Chief Operating Officer	Enabling Services Manager	Quality Registered Nurse
Clinical Operations Director	Substance Use Program Manager	Outreach Supervisor
Quality Improvement Directors (2)	Community Health Worker Supervisor	EHR Support Manager
Quality and Informatics Director	Community Health Worker	
Youth and Legal Program Director	Resource Specialist	
Population Health Manager	IT Coordinator	
Quality Manager		
Clinic Manager		
RN Care Coordinator Manager		
Manager of Patient Services		
Population Health Supervisor		
Behavioral Health/Social Worker Supervisor		
Quality Support Specialist		
Public Health Worker		
Community Health Workers (2)		

Figure 2.3 FQHC Care Activities and Levels of Behavioral Health Specialty Services



*Total may exceed the sample size if the respondent selected more than one response.

Figure 2.4 Cross-Sector Care Activities and Services



Integrated Health (FQHC employees & co-located care)		Coordinated Care (verbal commitments & MOUs)		Collaborative Health (service contracts & DUAs)	
Integrated Health Services		Coordinated Linkages		Collaborations	
	# of FQHCs		# of FQHCs		# of FQHCs
PH-Maternal and Infant Health	6	PH-Maternal and Infant Health	6	PH-Maternal and Infant Health	4
BH-Mental Health		BH-Mental Health	3	BH-Mental Health	
Outpatient	12	Outpatient	7	Outpatient	4
Residential	1	Residential	6	Residential	2
Emergency Care	2	Emergency Care		Emergency Care	1
BH-Substance Use Disorder		BH-Substance Use Disorder	2	BH-Substance Use Disorder	
Outpatient	11	Outpatient	7	Outpatient	3
Residential	1	Residential	5	Residential	1
Emergency Care	2	Emergency Care		Emergency Care	1
SC-Safety & Violence Prevention		SC-Safety and Violence Prevention		SC-Family and Home	
Domestic Violence: Counseling	9	Domestic Violence		Food Assistance	
SC-Family and Home		Shelter Care	10	SNAP	4
Food Assistance		Counseling	2	WIC	2
SNAP	3	Child Welfare		Food banks	1
WIC	2	Protective services	7	Housing	
Food banks	3	Shelter care	6	Section 8	1
Housing: Section 8	1	SC-Family and Home		home retention	2
Child Care: Application assistance	2	Food Assistance		SC-Money and Resources	
SC-Money and Resources		SNAP	4	Transportation	
Transportation		WIC	7	Non-urgent	2
Non-urgent transport	3	Food banks	7	Voucher	1
Voucher	6	Delivered meals	6	Taxi	3
Ride-share	1	Housing		Financial	
Taxi	1	Section 8	4	TANF	4
Financial		home retention	6	SC-Occupational Support	
TANF	2	Child Care	3	Educational Support: Tutoring	1
Emergency cash	3	Application assistance	3		
Burial costs	2	care	3		
Criminal Justice		SC-Money and Resources			
Legal aid	1	Transportation			
Parole & Probation	1	Voucher	2		
SC-Occupational Support		Ride-share	2		
Employment		Taxi	2		
Career	1	Financial			
		TANF	5		
		Emergency cash	6		
		Burial costs	2		
		Criminal Justice			
		Legal aid	4		
		Parole & Probation	1		
		SC-Occupational Support			
		Employment			
		Career	3		
		Vocational Support	4		
		Educational Support			
		GED	4		
		Higher Education	1		

Chapter 3 Technological Capabilities for Managing Patient Care and Information among Michigan Federally Qualified Health Centers

3.1 Background

Since the passage of the Health Information Technology Act of 2009 (HITECH) that prompted the widespread adoption of electronic health records (91, 92), federal policies, such as the Affordable Care Act and 21st Century Cures Act, have supported partnership activities (focus of Chapter 2) and health information exchange to incentivize high-quality care (93-95). Driven by national policy incentives, health care organizations are making significant investments in electronic health record systems and adopting new technology to better manage patient care and information (19, 37, 45, 56, 61, 96). Efforts to leverage investments in this information infrastructure have provided the bedrock for more sophisticated technological capabilities to emerge, generating immense opportunities for quality improvement and learning activities to enhance care, effectiveness, and efficiency (97). This chapter examines technological capabilities that support data integration, management, and exchange.

One recent innovation in technology is the collection of social determinants of health (SDOH) data (e.g., food insecurity), and sharing that information with partners to meet patient care needs (98). With alternative payment systems to finance new services and care management activities, health care organizations are developing strategies to integrate SDOH data into practice (19, 37, 45, 56, 61, 96). Yet, a better understanding of the technology and information infrastructure that supports SDOH data activities is needed. To date, there is incomplete evidence regarding the technological capabilities developed by health care organizations to manage patient

information and is thus a focus of the research presented in this chapter. Specifically, information technology used to support care management and quality activities are not well quantified among practices that address SDOH as part of their core mission, such as Federally Qualified Health Centers.

3.1.1 Federally Qualified Health Centers are Exemplary in using IT to Support Social Care

Federally Qualified Health Centers (FQHCs) lead efforts in developing information infrastructure and adopting innovative activities using SDOH risks, care needs, and referral data. Nationally, FQHCs have attempted to standardize SDOH data collection across a network of 1,370 centers (19, 99). Collectively serving over 29 million patients, annually, most FQHCs (71%) screen SDOH risks to identify patient social care needs (99). Meeting needs of vulnerable communities through well-established relationships with community organizations, social service agencies, and local health departments (59), FQHCs offer an exemplary model for developing partnerships and information infrastructure to manage care given their mission.

Representing cornerstones of public safety net systems in the United States, FQHCs are deeply entrenched in local health care systems and shaping data activities to improve access to medical and social care (41). With guidance and technical assistance from federal agencies and practice-affiliated network initiatives, FQHCs are developing new capabilities to document data collected from patient and care partners (56, 96). Coordinated efforts across the national network have also supported FQHCs in using electronic health record embedded screening tools and data analytic software to understand patient and populations using SDOH information (45, 67, 73). Where IT adoption and data integration are more ubiquitous, FQHCs are developing capabilities to digitally exchange patient information with state and local partners (18, 70). Yet, there has not been a systematic understanding of the information infrastructure and related factors associated

with developing technological capabilities and partnership activities to manage patient care and information across service sectors.

3.1.2 Conceptual Model and Theoretical Basis for Investigating Technological Capabilities

In the previous chapter we examined services delivered by FQHCs and their partners. This chapter examines information infrastructure and data activities developed by FQHCs to collect, share, and use maternal and infant health, behavioral health, and social care patient data. To better understand the technological capabilities that support care and data activities, it is important to assess three key elements: 1) sociotechnical systems, 2) organizational structures (partnerships and collaborations), and 3) social determinants of health data used. A sociotechnical system is infrastructure defined as a set of interactions between people (socio) and technology (technical) that are interdependent and cannot be examined in isolation, and therefore, must be evaluated together (74).

Sittig and Singh (2010) offer a model for examining social and technical factors involved in development, implementation, use, and evaluation of information technology within complex adaptive health systems (55). While most sociotechnical theorists have addressed technology, their theories and models have overlooked the components related to implementation and end-user problems (75-77). Sittig and Singh's sociotechnical system model accounts for hardware, software, content (e.g., clinical data), and user-interface to better understand technical problems and symbiotic relationships between technology and partners that use it. Elements from Sittig and Singh's sociotechnical system model - *hardware and software, human-computer interface, organizational culture/policies, clinical content, people, communication, workflows, external regulations and pressures, system measurement and monitoring* - are used in this chapter to explore workforce and technological factors related to developing the capabilities of FQHCs.

In this chapter, the technological capabilities examined include digitally collecting SDOH risks and diagnoses data, coordinating care needs, and conducting data analytics to manage patient panels and population health. This chapter also examines the technological capabilities that enable organizational structures (partnerships and collaborations) to cooperatively manage care such as using information infrastructure to exchange patient data. To contextualize the sociotechnical system described above, organizational theory helps to identify where key information infrastructure operates and where it may be missing.

Walter Leutz' (1999) *Five Laws of Medical and Social Service Integration* (48) is used to examine care management and data activities in different FQHC clinical-community contexts. According to Leutz, there are partnership levels that support specific patients and populations based on care needs. Coordinated linkages are designed for patient referral and follow-up, where information is provided when asked and asked when needed. Collaboration uses formal structures and designated positions within organizations to coordinate patient care and routinely report information bidirectionally. Full integration involves combining resources from multiple organizations and relying on one shared health record and care team (48). Leutz' levels of integration theory is used by federal programs and health care leaders to develop practice-based frameworks for assessing behavioral health and social care data integration (49, 50), including the *Framework for Levels of Health-Related Social Needs and SDH Data Integration* (50).

Finally, the SDOH data being used by FQHCs helps to identify technological capabilities. For example, the information infrastructure, partnerships, and collaborations they are engaged in, support SDOH data integration and care management activities. Thus, services examined were selected by mapping common care management practices and partnership activities to domains identified through an environmental scan of screening tools and quality measures (8, 12, 16, 58,

61). The services identified were then categorized by public health, behavioral health, and social care sectors to align data and information used with the appropriate domain: well-being, safety and violence prevention, family and home, money and resources, occupational support, and prevention. Figure 2.1 presents an alignment map of the sectors, domains, and service data measured and used to enhance the theoretical basis for investigating this chapter's research questions:

RQ2. What technological capabilities have Michigan FQHCs developed to manage care and exchange data across public health, behavioral health, and social care sectors?

RQ2.1. What infrastructural, organizational, and technological factors are related to using technology to manage care and exchange patient information across sectors?

RQ2.2. What are barriers and facilitators of developing technological capabilities to manage care and exchange patient information across sectors?

RQ2.3. How do factors related to using information infrastructure explain the technological capabilities developed by FQHCs to manage patient care and information? [Mixed Methods Question]

3.2 Methods

To understand the technological capabilities of FQHCs related to SDOH data activities, the survey and qualitative interviews described in Chapter 2 are used. This section reviews that methodology, focusing on the data collection and analyses that directly address the research questions cited above.

3.2.1 Study Design

A mixed methods study design guided the sequence of quantitative and qualitative data collection and analyses. This approach was used to better understand the technological capabilities developed by FQHCs and partner organizations. Mixed methods is an approach used in social, behavioral, and health sciences research where investigators gather both quantitative and qualitative data, integrate the two, and then draw interpretations combining the strengths of both sets of data to better understand the research problem in question (78).

Explanatory sequential mixed methods were used to organize the work into three separate and consecutive phases (i) collection and analysis of quantitative data (ii) collection and analysis of qualitative data, and (iii) interpretation of how the qualitative results explained the quantitative results (78). The sequential mixed methods design relied on quantitative results informing interview guide development, which in turn provided context to assist in the interpretation of quantitative results. Consecutive phases of independent and mixed analyses helped manage primary and secondary data (discussed in chapter 2) used to offer a richer interpretation of technological capabilities developed by FQHCs and their partners; and adherence to sequential procedures using multiple data sources improved the robustness and reliability of the study findings (80). The study was determined to be exempt from review by the University of Michigan Institutional Review Board.

3.2.2 Recruitment Procedures

Setting and Site Selection. All FQHCs in Michigan (N=40) were eligible to participate in the study. Practice demographics of Michigan FQHCs are quite similar to FQHCs nationally. Approximately half of the study sites delivered care in rural (53.3%) settings, predominately serving the publicly insured (63.5%) and uninsured (14.5%). The clinical characteristics of participating FQHCs are described in Table 2.1. FQHCs were recruited via an online webinar presentation delivered at the Michigan Quality Improvement Network *Champion Summit* in June 2021. Summit attendees consisted of quality directors and chief operating officers from all 40 Michigan FQHCs. During the presentation, site and subject enrollment procedures were introduced, and the value of the research project was communicated. Following the presentation, follow-up emails with the study details and practice survey link were provided to attendees, FQHC leadership, and MQIN-designated staff who might have not participated in the summit.

Subject Selection. Purposive sampling was used to enroll participants for each site. MQIN Summit attendees were asked to either complete the HIT practice survey or forward it to the person(s) in their practice with the best knowledge of (i) maternal and infant health, behavioral health, and social care services provided or delivered through partner organizations (e.g., hospitals, health systems, community-based organizations, businesses, and government agencies) and (ii) information infrastructure (i.e., technology, information systems, and data activities) used to manage SDOH needs and service data. The PI then followed up with subjects to ensure the appropriate staff person(s) was identified for follow-up interviews.

Financial Incentives. Twenty-five-dollar gift cards were provided to study participants for both survey response and interview participation. A contact database of survey respondents

and interviewees was developed to track employee position titles, roles, and responsibilities of staff and leadership who participated in the study.

3.2.3 Quantitative Data Collection: Survey and Measurement Development

Practice Survey Development. The survey was designed by adapting the *Framework for Levels of Health-Related Social Needs and SDH Data Integration* (50) based on Walter Leutz' (1999) *Five Laws of Medical and Social Service Integration* (48). To examine technological capabilities (e.g., achieving data interoperability) developed by FQHCs, commonly used service data was first mapped to six domains: (i) well-being; (ii) safety and violence prevention; (iii) family and home care; (iv) money and resources; (v) occupational support; and (vi) prevention (8, 12, 16, 58, 61). This was done to ensure patient information managed by FQHCs aligned with an appropriate service and data use activity. Figure 2.1 displays the alignment map and list of sectors, domains, and service data measured.

Survey Measures. The HIT practice survey was used in this Chapter to examine the information infrastructure developed by FQHCs to collect, track, exchange, and analyze data. The survey used a six-point scale to measure: *collecting SDOH information* using HIT to digitally screen SDOH risks and record diagnoses; *managing SDOH data using information systems* to track care needs and referral status; *achieving data interoperability with partners* to share information systems and/or digitally exchange SDOH data; and *conducting data analytics and mandatory reporting* using information infrastructure to manage patient panels, inform quality improvement, and create risk stratification models for targeted interventions and/or for adjusted payments. The measures were developed through the academic-community partnership and pilot tested with health centers. They were then revised based on feedback regarding study constructs and the ability of the measures to capture salient information.

Survey Questions. Survey participants were asked what public health, behavioral health, and social care patient data were collected using paper-based or electronic screening tools. For example, “*does your health center do any of the following to manage maternal and infant health data: (1) paper-based screening only, data not transferred to EHR; (2) paper-based screening only, data manually entered by staff into EHR; (3) electronic screening and results stored in EHR; (4) electronic tracking of data using EHR; (5) electronic data exchange with other practices or submitted to third party organizations; (6) other, please specify.*”

Survey participants were then asked about achieving data interoperability with partners. For example, “*which of the following best describes your health center’s information exchange practices with external financial assistance partners: (1) separate data systems, no shared access; (2) separate data system; limited shared access; (3) linked data systems, with some shared access; (4) linked data systems with shared access, tracking, and exchange capabilities; (5) integrated information exchange system with formal data policies; or (6) integrated information systems with formal policies, standards, and accountability measures.*”

Survey participants were also asked about conducting data analytics and reporting activities with each source of service data. For example, “*is transportation data used for any of the following activities: (1) patient-panel management; (2) risk stratification models; (3) value-based care (risk adjusted payment models); (4) population health management; (5) continuous quality improvement; and/or (6) mandatory reporting.*” Figure 2.1 presents sectors, services and services measured. Survey respondents were also asked for information regarding their position and role within the organization. The complete survey is provided in Appendix A.

3.2.4 Quantitative Data Management and Analysis.

Primary Data. Descriptive statistics (*n*, %) were used to calculate frequencies and percentages of FQHCs with capabilities to *collect SDOH data using information systems* to screen SDOH risks and record diagnoses; *manage data using information systems* to track care needs and referral status; *achieve data interoperability with partners* by either sharing information system access or digitally exchanging patient health information; and *conduct data analytics and reporting activities* using HIT to manage patient panels and population health data, inform quality improvement, and create risk stratification models, as identified in the HIT practice survey.

Descriptive statistics (*n*, %) were also used to calculate frequencies and percentages of FQHCs that achieved data interoperability with partner organizations through shared information system access or digital exchange of the following service data: *maternal and infant health, mental health, substance use disorder, child welfare, domestic violence, housing and homeless, food assistance, child care, financial assistance, transportation, criminal justice, employment, and educational support.*

3.2.5 Qualitative Data Collection: Interview guide and Interviews.

A semi-structured interview guide was created to explore the community-infrastructure, FQHC-organizational, and technological factors of developing data systems to manage care.

Interview Guide Development. Sittig & Singh's (2010) sociotechnical model for studying HIT in complex adaptive health care settings was used to develop the investigation's conceptual model (Section 1.2 in Figure 1) and interview guide (Appendix B) (55). All eight dimensions *hardware and software, clinical content, people, workflow and communication, human-computer interface, organizational policies and procedures, and culture, external rules,*

regulations, and pressures, and system measurement and monitoring from their model were used to inform interview guide development and ground the qualitative and mixed method analyses to better understand the information infrastructure and data activities developed by FQHCs (82).

Interview Questions. The interviewees were asked questions about community-wide infrastructural, FQHC-organizational, and technological factors related to developing *services* and *technological capabilities* for managing patient care and information across sectors. Key constructs measured included: FQHC and community workforce and technological challenges; barriers/facilitators of care management and HIT infrastructure development.

Interview Guide Testing. The interview guide was based on the sociotechnical model dimensions previously described. It was developed, iterated, and piloted tested through the academic-community research partnership.

3.2.6 Qualitative Data Analysis

Qualitative Analysis Techniques. A rapid assessment process (RAP) was then deployed by the research team to guide development of a qualitative data extraction template tool using the sociotechnical model dimensions previously described. RAP is an intensive, team-based qualitative inquiry using data triangulation, iterative analysis, and additional data collection to quickly develop a preliminary understanding of a situation, setting, or phenomena from an insider's perspective (83). RAP is a demonstrated and efficient method for time sensitive health services research and used in evaluations of clinical informatics (e.g., decision support) across multiple health care settings (i.e., hospitals and primary care) (84, 85). RAP was used to assist the research team in quickly forming a better understanding of multi-level factors (system, practice, and patient) and clinical-community environments for managing cross-sector care and patient information.

The data extraction template tool was tested by the investigator and research assistants for consistency and reliability before transcript coding commenced. The coding occurred until data saturation was achieved, and disconfirming data was no longer identified. Data matrices were derived from the extraction template tool and used to capture coded information about sociotechnical domains from the transcripts. Domain and subdomain summary profiles were then created to analyze the multi-level factors, themes, barriers, and facilitators related to site, setting, and service differences. A thematic analysis was completed to identify sociotechnical factors and themes related to partnership development and sharing information across sectors. Qualitative data tables were developed to further analyze setting and site level differences.

3.3 Results

Twenty-seven FQHC leaders, clinicians, and staff (e.g., chief medical officers, chief executive officers, chief operating officers, quality and program directors, practice managers, clinicians, care managers and supervisors, community health workers, and IT support) from fifteen (n=15) FQHCs in Michigan (37.5% response rate) were surveyed. The number of FQHCs in the study represented a generalizable sample of health centers in Michigan and across MPCA's network. Follow-up interviews (n=24) commenced twelve weeks later and were conducted with twenty-four FQHC leaders, clinicians, and staff from eleven health centers (n=11) with a site level interview participation rate of 27.5%. Refer to Figure 2.2 *Subject Recruitment by Staff Title and Data Collection Method* for a descriptive list of participants.

Technological Capabilities: Collecting and managing SDOH information.

SDOH Screenings Collected Digitally. *Public Health.* Four FQHCs (26.7%) screened maternal and infant health care needs. *Behavioral Health.* Six FQHCs (40%) digitally screened mental health needs and five (33.3%) for substance use disorder needs. *Social Care.* Seven (46.7%) electronically screened for food assistance, five (33.3%) for domestic violence needs, four (26.7%) for transportation needs, three (20%) for housing and homeless needs, and three (20%) for financial assistance needs. One FQHC (6.7%) electronically screened for child welfare service needs. No FQHCs digitally screened for criminal justice, child care, educational support, or employment needs. Table 3.1. presents FQHC capabilities developed to screen and track care needs and referral status by service.

Technological Capabilities: Achieving data interoperability with partner organizations.

Digitally Exchanged SDOH Data and Patient Information. *Public Health.* Five FQHCs (33.3%) exchanged patient information with local health departments and/or maternal and infant health care providers. *Behavioral Health.* Five FQHCs (33.3%) exchanged information with state mental health agencies and/or community-based organizations. Six FQHCs (40%) shared data with substance use disorder providers. *Social Care.* Six FQHCs (40%) exchanged information with domestic violence agencies. Six FQHCs (40%) exchanged information with food assistance organizations. Three FQHCs (20%) shared information with financial assistance providers. Three FQHCs (20%) exchanged patient information with housing and homeless agencies. Two FQHCs (13.3%) shared data with financial assistance organizations. Two FQHCs (13.3%) exchanged data with transportation providers. One (6.7%) health center exchanged patient information with educational support providers. One FQHC (6.7%) shared information with employment service providers. One FQHC (6.7%) exchanged data with child welfare organizations. One FQHC (6.7%) shared data with child care providers. No FQHCs digitally exchanged information with criminal justice providers. Table 3.2. presents FQHCs capable of achieving data interoperability by digitally exchanging information or sharing system access with partner organizations.

Shared Information System Access, Tracking, and Exchange Capabilities. One FQHC (6.7%) accessed, tracked, and exchanged SDOH information with maternal and infant health (*public health*), mental health, substance use (*behavior health*), domestic violence, and food assistance (*social care*) service providers using a health information exchange (HIE). Table 3.2. illustrates use of a HIE by presenting this FQHCs' multi-sector technological capabilities of sharing system access, tracking, and exchanging data by service and sector.

Technological Capabilities: Conduct data analytics and reporting using SDOH information.

Data Analytics and Risk Stratification. *Public Health.* Four FQHCs (26.7%) used maternal and infant health data to develop risk stratification models. *Behavioral Health.* Four FQHCs (26.7%) used mental health data for risk stratification. Five FQHCs (33.3%) used substance use disorder data for risk stratification. *Social Care.* Four FQHCs (26.7%) used food assistance (26.7%) data for risk stratification. Three FQHCs (20%) used housing and homeless data to develop risk stratification models. Three FQHCs (20%) used financial assistance data for risk stratification. Three FQHCs (20%) used domestic violence data for risk stratification. Two FQHCs (13.3%) used transportation data for risk stratification. One FQHC (6.7%) used child welfare data for risk stratification. No FQHCs used child care, criminal justice, employment, or educational support data for risk stratification. Table 3.3.1 presents service data used for risk stratification, continuous quality improvement, and patient panel management.

Value-Based Care Payments. *Public Health.* Four FQHCs (26.7%) used maternal and infant health data for value-based risk adjusted payments. *Behavioral Health.* Three FQHCs (20%) used mental health data to calculate risk adjusted payments. One FQHC (6.7%) used substance use disorder data for risk adjusted payments. *Social Care.* One FQHCs (6.7%) used food assistance data to calculate risk adjusted payments. No FQHCs used housing and homeless, transportation, child care, financial assistance, domestic violence, child welfare, criminal justice, employment, or educational support data to develop risk adjusted payments. Table 3.3.2 presents service data used for risk adjusted payments and mandatory reporting.

3.3.1 Qualitative Results

Factors and Themes of Using Information Infrastructure to Manage Care

HIT and Data Management. During the interviews, FQHC directors and care managers discussed the advantages of using IT (e.g., EHRs) and ICD-10 Z-codes to manage care and improve quality. Specific Z-codes (Z55-Z65) were used to identify and track patient needs related to SDOH: a care manager said, “we can see the chart, whether that particular need had been addressed completely at the time that they were contacted or if there's additional follow-up or additional work that needs to be done.” A quality director stated, “Z-code encounter reasons provide data necessary to enhance quality improvement initiatives.”

Data Standards, Rules, and Procedures. Interviews with FQHC managers and care staff revealed use of information systems supported implementation the of internal data rules and procedures. FQHCs often used EHR systems to restrict sensitive data to a “need to know” basis and controlled staff access using different workflows and access permissions. For example, care managers were to document patient consents in EHR systems before data permissions were authorized to share patient information with partners: a social worker supervisor said, “some notes can be marked sensitive, and then there's some patients that you're not able to access. You have to request access [though the EHR system].” A practice manager stated, “our internal data protections prevent sharing patient information without first receiving patient consent.”

Data Use. When interviewed, FQHC leadership and staff described data activities used to inform patient care and panel management. FQHCs typically used Azara MQIN supported data analytic software to develop care plans, create risk stratification models, and conduct reporting: an executive officer said, “we're calling them, we're getting them care plans and we use all that based on the data in Azara, and then we're able to pull that.” A care manager also said, “Risk

stratification is made possible through the EHR system, using data such as vital health indicators, patient lifestyle, and medical history.”

Formal Data Infrastructure. During the interviews, FQHC care and quality managers discussed existing local health care infrastructure used to obtain access to shared patients: a care supervisor said, I know that some notes can be marked sensitive, and then there's some patients that you're not able to access. You have to request access through [the health system's] EHR system.” A quality manager stated, “we have access to EMRs of all the local hospitals in our area, so the care connectors will actually go in and pull reports on our patients that have been in the ED there, and they do outreach calls. See if they need follow up, try to decrease that ED utilization.” A program manager said, “we exchange data with the health department.... providing biometric information on patients with chronic disease.”

External Policies and Regulations. During the interviews, FQHC executive leaders discussed financial incentives from government and commercial payers helped meet SDOH care-based needs and compensated community health workers for the work. An executive officer said, “So obviously social determinants of health are a cost driver, so an expense. And if we can eliminate those and maybe improve the person's health, we would reduce the cost overall...we always work with the health plans on any HEDIS [Healthcare Effectiveness Data and Information Set] required reporting of that information that helps drive revenue back to us. And then it helps us to hire additional people to monitor that for quality.” Another executive officer stated, “MPCA finances CHWs through the patient navigator grant.” Table 3.4 lists themes that emerged from interviews with FQHC leadership and staff.

Factors and Themes of Developing HIT Capabilities to Deliver Cross-Sector Care

Community Technological Barriers. During the interviews, FQHC quality directors and care staff discussed overreliance on partner manual processes, excessive amounts of data, and incompatible EHR systems as significant barriers to developing technological capabilities to become data interoperable. A practice manager said, there are a lot of manual processes in terms of exchanging [patient information].” A community health worker said, “The excess of patient data available makes tracking and sharing relevant information with partners difficult, and oftentimes information is not readily or easily accessible to our providers and staff.” A care supervisor stated, “we don't really have that kind of relationship with our partners generally speaking, where we use technology for referrals.” A quality director said, “so that took a ton of manual work because we don't have a shared [EHR] system.” Another quality director discussed their local efforts to integrate software and improve data-sharing processes as a community HIT strategy to “bridge the gap” between incompatible care management information systems.

Community Workforce Barriers. Workforce capacity issues also impeded IT capability development, as staffing shortages across IT and data analytic teams were frequently reported during interviews with FQHC quality directors and managers. High staff turnover and shortages necessitated frequent training and additional onboarding to introduce IT practices, data policies, and processes: a quality director stated, “with staff change, keeping workflow processes running well in itself is a challenge... I'd say we've had some struggle with workflow in the past year, just with COVID and staff changing and making sure everybody's trained in the same way. That's been a barrier.” FQHC managers also described a limited shared vision throughout communities as a workforce barrier to collectively developing HIT capabilities to deliver cross-sector care. A practice manager said, “getting everybody on the same page in the community to

respond to a shared spot, a shared database” had hindered progress. A care manager stated, “there is poor accountability in the community regarding service referrals,” stressing workforce challenges with executing a shared vision for delivering cross-sector care.

FQHC-Organizational Barriers. During the interviews, FQHC directors and care managers discussed barriers of integrating SDOH data into information systems. Preventive screenings, data storage, and workflows were often paper-based and multiple reporting platforms presented challenges with data integration. A quality director explained, “when providing treatment plans or resources for patients, the responsibility to follow up typically falls to the patient, meaning referrals often necessitate a direct request for continuity of support by the patient.” Another care manager echoed, “I mean, we give them the resources, but there's not an extra follow-up. We give them what they need and we kind of put it on them at that point.” A quality director explained, “double-charting due to multiple mandatory reporting guidelines and ill-matched information systems” inhibited their ability develop HIT capabilities needed.

As pre-existing workforce capacity issues were exacerbated by the COVID-19 pandemic, more staff training was required for the enhanced technological capabilities (e.g., virtual appointments) and the EHR system changes only compounded heavy staff workloads. FQHC leadership and staff turnover disrupted practice workflows, consistency, and HIT capability development: a quality director stated, “It’s a challenge when we've had a change in leadership, change in multiple support staff, change in providers, and don’t have enough bandwidth from our CMO to make sure each provider is onboarded and trained, and making referrals in the same way.” A practice manager said, “If you're so focused on the daily grind, you're not able to think big and think larger. And you're not able to make time to think about what a partnership would look like. A care manager discussed “difficulties getting buy-in to develop workflows for

defining patient panels” as a workforce barrier to developing HIT capabilities necessary to deliver cross-sector care.

FQHC-Organizational Facilitators. Due to increased healthcare demands and rapidly evolving conditions prompted by the COVID-19 pandemic, staff achieved a greater level of technological fluency and workplace adaptability. Pandemic restrictions gave rise to virtual appointments, new digital medical documentation processes, and enhanced telecommunication that changed staffing responsibilities, organizational workflows, and standardized care processes. A resource manager described how workflow templates streamlined community referrals, “Now, we have a resource department site, and we have a list of cheat sheets and a list of tracking logs for things we're doing. And then we duplicate that in our files, like our individual files. So we also have our handouts and all of our community resources at our fingertips...” A care manager also explained new workflows using technology, “some people don't have internet access, but most people, even on their phones can follow a link. And we learned that through this whole pandemic when people were doing their medical visits on their phones.”

Patient-level Barriers. Developing capabilities to deliver cross-sector care required broadband internet reached all communities and vulnerable populations presented as a recurring challenge for health centers. During the interviews, FQHC directors and managers revealed the technological challenges related to reaching vulnerable patients and subpopulations, particularly those from low-income and rural communities: a care manager said, “Homeless populations lack permanent addresses for communication and the internet doesn’t reach remote communities, making Telehealth difficult.” A quality director stated, “some patients have a really tough time connecting to the internet or have no WIFI access at all.” Another care manager explained, “Cell phone service shut-offs limit providers’ referral and follow-up capacity.”

Patient-level Facilitators. FQHC care managers also discussed advantages of technology. For patients in communities where enhanced telecommunications was available and accessible, new HIT capabilities enabled better patient care through virtual visits and the ability to digitally upload and document relevant clinical and patient information related to their medical and social needs: a care manager said, “they can just snap a picture with their phone and upload it right into their case. I mean, there is no more having to go to the library to print stuff out, to fax stuff, to find a ride, to take you down there, to put stuff in the drop box, all that goes away.” Table 3.5 lists themes that emerged from interviews with FQHC leadership and staff.

3.4 Discussion

The study demonstrated that Michigan FQHCs developed capabilities to manage care, quality, and population health using SDOH data and other patient information exchanged with partner organizations. Achieving data interoperability with state and local partners provided FQHCs with critical infrastructure and shared data practices used to coordinate care and digitally exchange patient information. Although Michigan FQHCs were often challenged by complicated siloed sectors of care, fragmented communication, and limited resources (86, 87), study findings suggested that they were able to circumvent traditional referral processes, i.e., phone, email, fax, incompatible data systems, and vendor sourcing conflicts by authorizing partners permissions to access their information systems to communicate and share health records.

Results demonstrated that authorized EHR system access and data permissions were used by Michigan FQHCs to exchange readily available patient information for meeting maternal and infant health, behavioral health, and social needs. Thus, consistent with Gold and colleagues (2017), results from the study survey offered evidence that FQHCs developed new technological capabilities for managing care using information infrastructure to either manually enter SDOH data or digitally screen SDOH risks (73). However, while Michigan FQHCs generally developed capabilities of sharing SDOH data with public health and behavioral health sectors, rarely had they developed similar capabilities with the complete range of social care providers.

The study offered evidence that some FQHCs established the technological capabilities of digitally exchanging patient information with food assistance and domestic violence partners. However, most Michigan FQHCs were not data interoperable with financial assistance, housing and homeless, transportation, child care, employment, and educational providers, or had not developed capabilities to share information with child welfare or criminal justice systems.

Qualitative findings provided a better understanding of the barriers Michigan FQHCs encountered in partnership with social service agencies. Data suggested an overreliance on partner paper-based processes and incompatible care management information systems thwarted IT development, data use, and the capability of digitally exchanging patient information. Study results confirmed Onie and colleagues' (2018) findings, further suggesting that Michigan FQHCs and community partners remained reliant on labor intensive, unstructured and non-automated types of information sharing because they often could not agree on one common vendor platform to share referral information (100).

The investigation's empirical data revealed that FQHCs documented information systems during patient visits and conducted annual SDOH screenings using tablets, EHR portals, email survey links, and in rare instances paper forms. While Cole and colleagues' (2022) national study found nearly three-quarters of FQHCs screened for SDOH risks (99), this study offered evidence that Michigan FQHCs had developed this capability using digital data collection methods. The data demonstrated that about one-third of Michigan FQHCs electronically screened for maternal and infant health (37.5%), mental health (37.5%), substance use disorder (33.3%) and domestic violence (33.3%) risks. And, nearly half of Michigan FQHCs (46.7%) digitally screened for food assistance, and approximately one-quarter for transportation (26.7%) needs.

The mixed methods analysis suggests that existing information infrastructures were fundamental to establishing internal rules and procedures which guided data management (i.e. use of ICD-10 Z-codes and data protections) (101) and facilitated data interoperability with partner organizations. Quantitative results were further supported by the qualitative findings to describe the partners FQHCs shared information system access with and if they leveraged health care or government HIT investments to develop these technological capabilities. Data revealed

FQHCs either shared state information systems with local health departments, mental health agencies, and the public assistance program, i.e., MI Bridges, or granted partner access to their own EHR systems for collaboratively managing care and addressing community health needs.

The study's mixed methods design and interdisciplinary research approach inform an understanding of the system-wide and organizational-level factors associated with using information infrastructure to manage patient care and SDOH data. Findings suggested strategies that controlled costs and supported workforce development were key to developing information infrastructure and technological capabilities. The qualitative results confirmed the quantitative findings which suggested FQHCs established new pay-for-performance reporting measures and risk adjusted payments using SDOH information to reduce expenditures and address quality care. Results demonstrated that Michigan FQHCs used maternal and infant health, behavioral health, and social needs data to generate additional revenue for care management and quality activities.

Michigan FQHCs developed data activities for continuous quality improvement by integrating patient self-reported and partner generated SDOH information into care management systems. Establishing digital information exchange and data system sharing practices with state and local partners facilitated care coordination and learning activities using the curated SDOH information. Mixed method results verified predictive analytics were conducted to create risk stratification models with SDOH data to identify patient social needs and target interventions for chronic disease management programs. The study offered evidence that FQHCs developed new strategies for addressing health disparities and incorporated learning health activities using patient panels to manage social care.

3.4.1 Implications for Policy and Practice

With increasing health care demands to deliver high-quality care, comes greater awareness of key data partnership and data activities using patient SDOH information. FQHCs serve as a model for health care that may be replicated. Functioning as distinctive learning health systems, Michigan FQHCs leveraged their HIT investments to develop alternative payment and practice models to manage care and address quality. Partnership and data activities using SDOH information supported FQHCs in developing technological capabilities to understand patient needs and coordinate care. Curated SDOH data from patients and partners was used by FQHCs to finance care management and quality monitoring activities. Capable of achieving data interoperability with maternal and infant health, behavioral health, and social care partners, Michigan FQHCs established strategies to develop information infrastructure. Efforts to capitalize on existing health care and government information infrastructure helped Michigan FQHCs overcome the challenges of working with under-resourced, low-tech care sectors.

3.4.2 Implications for Research

Technological capabilities described in this study offer strategies to integrate behavioral health and social care data into practice for learning health to occur. This study's findings point to future investigations of how community partnerships and collaborations can be leveraged to improve care delivery and health outcomes. Additional studies should examine local information infrastructure and SDOH initiatives designed to coordinate social care and address health equity. This type of evidence will reveal community-wide technological capabilities and partnership activities that support information exchange, data integration, and advanced analytic techniques used to better manage care and population health. Knowledge gained will inform new strategies and activities using learning health system approaches to deliver high-quality care.

3.4.3 Limitations

The investigators did not interview partner organizations. Thus, the study scope was limited to the perspectives of Michigan FQHCs. This was mainly due to the wide range of services and HIT capabilities the investigator was interested in exploring. Moreover, the study was conducted during the COVID-19 pandemic public health emergency. Therefore, gaining access to FQHC partners would have been difficult, as evident in findings and through conversations with FQHC leadership and staff. The research team also had trouble identifying the correct people within FQHCs because of different staff roles and responsibilities for managing patient care and SDOH data throughout MPCA's statewide network. Moreover, we found it difficult to pinpoint the most knowledgeable person(s) to complete the HIT practice survey and follow-up interviews for that reason. Finally, given the gravity and widespread effect of the COVID-19 pandemic, SDOH initiatives and HIT research were not a high priority of FQHCs. There were increasing obligations to test and treat for COVID-19 and to vaccinate patients and other vulnerable community members. The competing practice resources were compounded by increased data reporting requirements and other requests from regulatory agencies and national network initiatives as a result of the ensuing pandemic. These study limitations impacted site and subject recruitment, the survey response rate, and leadership and staff willingness to participate in the interviews, therefore, affecting the sample size and generalizability of this study.

3.5 Conclusions

This investigation examined information infrastructure and data practices. The study found that FQHCs in Michigan financed care and quality activities using SDOH data and developed technological capabilities to exchange patient information across sectors. Results suggested that achieving data interoperability with both state and local partners provided FQHCs with critical information infrastructure and internal data practices to manage care. Data also demonstrated that Michigan FQHCs developed the ability to integrate maternal and infant health, behavioral health, and social care data into medical practice. Qualitative findings provided a better understanding of the barriers Michigan FQHCs encountered in partnership with social care providers. Data suggested that partner non-automated processes and staffing (i.e., internal and external) changes thwarted FQHCs data integration and IT development. The study offers public officials and health care leaders with insights into the broader community and system-level infrastructural, organizational, and technological factors associated with financing and managing patient care using SDOH information. Findings offer promising strategies used by FQHCs to develop alternative payment and partnership models for managing population health and monitoring quality care.

3.6 Tables

Table 3.1 Technological Capabilities: Collecting and Managing SDOH Data by Service

Technological Capabilities	Digitally Screen				Track Care Needs			Track Referral Status		
	No. of FQHCs with Capability	% ‡	No. of FQHCs That Provide the Service	% †	No. of FQHCs with Capability	% ‡	% †	No. of FQHCs with Capability	% ‡	% †
Cross-Sector Care Services										
Behavioral Health										
Mental Health	6	40.0	13	46.2	5	33.3	38.5	5	33.3	38.5
Substance Use Disorder	5	33.3	12	41.7	5	33.3	41.7	5	33.3	41.7
Public Health										
Maternal and Infant Health	4	26.7	11	33.3	2	13.3	16.7	1	6.7	8.3
Social Care										
Food Assistance	7	46.7	13	54.0	4	26.7	30.8	3	20.0	23.1
Domestic Violence	5	33.3	11	46.5	3	20.0	27.3	1	6.7	9.1
Transportation	4	26.7	11	36.4	3	20.0	27.3	2	13.3	18.2
Housing and Homeless	3	20.0	10	37.0	4	26.7	50.0	3	20.0	37.5
Financial Assistance	3	20.0	8	30.0	3	20.0	30.0	0	----	----
Child Welfare	1	6.7	7	14.3	1	6.7	14.3	0	----	----
Child Care	0	----	6	----	0	----	----	0	----	----
Criminal Justice	0	----	5	----	1	6.7	16.7	0	----	----
Employment	0	----	4	----	1	6.7	20.0	0	----	----
Educational Support	0	----	5	----	1	6.7	25.0	0	----	----

‡ Percentage is calculated based on sample size (n=15)

† Percentage is calculated based on the number of FQHCs who provide the service

Table 3.2 Technological Capabilities: Achieving Data Interoperability with Partners by Service

Technological Capabilities	Digital Exchange				Shared System Access			Shared System Access Tracking & Exchange		
	No. of FQHCs with Capability	% ‡	No. of FQHCs That Provide the Service	% †	No. of FQHCs with Capability	% ‡	% †	No. of FQHCs with Capability	% ‡	% †
Cross-Sector Care Services										
Behavioral Health										
Mental Health	5	33.3	13	39.0	6	40.0	46.2	1	6.7	7.7
Substance Use Disorder	6	40.0	12	50.0	4	26.7	33.3	1	6.7	8.3
Public Health										
Maternal and Infant Health	5	33.3	11	41.7	2	13.3	18.2	1	6.7	9.1
Social Care										
Food Assistance	6	40.0	13	46.2	4	26.7	30.8	1	6.7	7.7
Transportation	2	13.3	11	18.2	3	20.0	27.3			
Domestic Violence	6	40.0	11	55.0	3	20.0	27.3	1	6.7	9.1
Financial Assistance	3	20.0	10	30.0	2	13.3	20.0			
Housing and Homeless	3	20.0	8	37.5	4	26.7	50.0			
Child Welfare	1	6.7	7	14.3	1	6.7	14.3			
Criminal Justice	0	----	6	----	2	13.3	33.3			
Employment	1	6.7	5	20.0	2	13.3	40.0			
Educational Support	1	6.7	4	25.0	2	13.3	50.0			
Child Care	1	6.7	5	20.0	1	6.7	20.0			

‡ Percentage is calculated based on sample size (n=15)

† Percentage is calculated based on the number of FQHCs who provide the service

Table 3.3 Technological Capabilities: Conducting Data and Reporting Activities using SDOH

Table 3.3.1 Patient Panel Management, Quality Improvement, and Risk Stratification

Technological Capabilities	Patient Panel Management				Continuous Quality Improvement			Risk Stratification Models		
	No. of FQHCs with Capability	% ‡	No. of FQHCs That Provide the Service	% †	No. of FQHCs with Capability	% ‡	% †	No. of FQHCs with Capability	% ‡	% †
Cross-Sector Care Services										
Behavioral Health										
Mental Health	5	33.3	13	38.5	9	60.0	69.2	4	26.7	30.8
Substance Use Disorder	5	40.0	12	41.7	7	46.7	58.3	5	33.3	41.7
Public Health										
Maternal and Infant Health	5	33.3	11	45.5	6	40.0	50.0	4	26.7	36.4
Social Care										
Food Assistance	0	----	13	----	3	20.0	23.1	4	26.7	30.8
Housing and Homeless	1	6.7	8	12.5	2	13.3	25.0	3	20.0	37.5
Transportation	1	6.7	11	9.1	3	20.0	27.3	2	13.3	18.2
Financial Assistance	1	6.7	10	10.0	2	13.3	20.0	3	20.0	30.0
Child Care	1	6.7	5	20.0	1	6.7	20.0			
Criminal Justice	0	6.7	6	----	2	13.3	33.3			
Domestic Violence	1	----	11	9.1	2	13.3	18.2	3	20.0	27.3
Child Welfare	1	6.7	7	14.3	1	6.7	14.3	1	6.7	14.3
Employment	0	----	5	----						
Educational Support	0	----	4	----						

‡ Percentage is calculated based on sample size (n=15)

† Percentage is calculated based on the number of FQHCs who provide the service

Table 3.3.2 Mandatory Reporting and Value-Based Care (Risk Adjusted Payments)

FQHCs Data Activities	Reporting (HRSA, Insurance Payers, and State of Michigan)				Value-Based Care (Risk Adjusted Payments)		
	No. of FQHCs with Capability	% ‡	No. of FQHCs That Provide the Service †	% †	No. of FQHCs with Capability	% ‡	% †
Cross-Sector Care Services							
Behavioral Health							
Mental Health	8	53.3	13	61.5	3	20.0	23.1
Substance Use Disorder	9	60.0	12	75.0	1	6.7	8.3
Public Health							
Maternal and Infant Health	9	60.0	12	75.0	4	26.7	33.3
Social Care							
Food Assistance	10	66.7	13	76.9	1	6.7	7.7
Housing and Homeless	8	53.3	8	100.0			
Transportation	3	20.0	11	27.3			
Financial Assistance	5	33.3	10	50.0			
Domestic Violence	3	20.0	11	27.3			
Employment	1	6.7	5	20.0			
Criminal Justice	1	6.7	6	16.7			
Child Welfare	1	6.7	7	14.3			
Child Care	----	----	5	----			
Educational Support	----	----	4	----			

‡ Percentage is calculated based on sample size (n=15)

† Percentage is calculated based on the number of FQHCs who provide the service

Table 3.4 Factors and Themes of Using Health Information Technology to Manage Care

Technological Factors	Organizational and Community Capacity	Themes
<i>Technology and Data Management</i>	EHR capabilities	<p>Diagnostic codes used for both billing and tracking care</p> <p>ICD-10 Z-Codes used to identify and track specific SDOH needs</p> <p>Internal referrals initiated and tracked in the EHR system</p> <p>External referrals are entered and tracked in the EHR system</p>
<i>Data Standards, Rules and Procedures</i>	Data standards and use	<p>Internal data rules and procedures are managed by EHR vendor</p> <p>Internal data protection standards prevent the sharing of patient information without patient consent to external partners</p> <p>Sensitive data can be restricted in the EHR (“need to know basis”)</p> <p>Health centers have EHR access permissions with local hospitals</p>
	Guiding policies and rules	<p>Patients sign consent forms when enrolling in external services and community programs to authorize data sharing</p> <p>Non-electronic sensitive information is relayed via telephone, encrypted mail, and face-to-face interaction</p> <p>Data from paper screenings manually keyed into EHR by staff</p> <p>Staff trained in data protections/standards during onboarding</p> <p>All staff are compliant with HIPAA guidelines</p>
<i>Data Use</i>	Data activities to improve care and population health	<p>Patient cohorts are created through Azara to run subpopulation health reports and tailor targeted intervention plans</p> <p>Risk stratification is made possible through the EHR system</p> <p>Quality staff address policies and procedures for improvement</p>
<i>Formal Data Infrastructure</i>	Information sharing using public data systems	<p>Biometric information is shared for patients with chronic diseases</p> <p>Data is shared with public health departments</p> <p>MiHIN receives data from external partners with outbound interfaces: Affinia, Wellcentive, MPCA, and Azara</p> <p>Informal referrals limit information to name and client situation</p> <p>EHR system provides data infrastructure and reporting processes</p>
	External policies and regulations	<p>Multiple quality incentives for chronic disease management via government and commercial insurance improvement initiatives</p> <p>Financial incentives received from state and commercial payers</p> <p>Patient navigator grant from state primary care association</p>

Table 3.5 Factors and Themes of Developing Technological Capabilities to Manage Care and Data

Factors	Barriers and Facilitators	Themes
<i>System-level & Community-wide</i>	Technological	<p>Incompatible EHR systems create challenges between external partners</p> <p>Difficulty getting community partners to agree on a shared database or vendor platform to establish a referral process</p> <p>Reliance on manual processes for data collection and exchange</p> <p>Frequent issues with “double-charting” or duplication of reports due to incompatible data systems and multiple mandatory reporting guidelines</p> <p>Capacity issues prevent adoption of new technological processes</p> <p>Healthcare partners echo the goal of software integration and improving data-sharing processes as a HIT strategy to, “bridging the gap”</p>
	Workforce	<p>High staff turnover and shortages necessitates frequent trainings and additional onboarding for HIT practices, data policies and processes</p> <p>Short staffing across IT and data analytics teams</p> <p>State Innovation Model initially supported SDOH implementation, but funding ended and limited the continuity of the community work</p> <p>Lack of shared vision across the community and accountability regarding service referrals</p>
<i>FQHC-Organizational</i>	Technological	<p>Health screening surveys and data storage are still paper based</p> <p>External referrals mostly phone-based or occur face-to-face</p> <p>Challenges with internal data integration across multiple platforms</p> <p>Information is not readily or easily accessible to internal providers</p> <p>Excess of patient data available makes tracking and sharing relevant information with partners difficult</p> <p>Staff workflow templates create standardized processes</p> <p>Improved technological fluency and staff adaptability due to pandemic</p>
	Workforce	<p>Poor processes for connecting patients with resources unless the patient in question directly requests support and follows up</p> <p>COVID exacerbated pre-existing capacity issues</p> <p>Staff training on changing EHR systems adds to practice workloads</p> <p>Staff and leadership changes contribute to lack of workflow consistency</p> <p>Some leadership aren’t motivated or engaged in developing HIT capabilities</p> <p>Difficulty getting buy-in to develop workflows for defining patient panels</p>

Patient-level

Technological

Homeless populations lack permanent addresses for communication
Internet doesn't reach remote communities and makes Telehealth difficult
Cell phone service shut-offs limit referral and follow-up capacity
Telehealth and communications enable greater patient capacity-building
(i.e., virtual visits and uploading patient documentation)

Chapter 4 Community-Wide Activities to Address Social Care and Health Equity among Michigan Federally Qualified Health Centers

4.1 Background

It is widely recognized that patient safety, health, and well-being are fundamentally linked to social and physical environments, and the societal distribution of power, wealth, and resources (8, 102). Strong and compelling evidence demonstrate that improvements in health and health care depend on broader and systematic approaches to address social and environmental conditions of patients and populations (10, 11). The World Health Organization (WHO), National Academy of Medicine (NAM), federal agencies, and physician groups have all issued calls for health care to address the social determinants of health (SDOH) (8-13). The SDOH represents a growing priority and instrument tool used to assess patient risks and coordinate services often outside of traditional medical care. Research has demonstrated that when health care systems, government programs, and community-based organizations join efforts to meet medical and social needs, the linkages formed help to enhance quality by producing more appropriate, consistent, and timely coordinated care (12).

Calls to address SDOH are increasing efforts to provide preventive services in medical practice and elevating the role of communities as critical change agents in health and care delivery (3, 5, 7, 37, 38, 60-62). Over the last two decades, federal policies, such as, the Patient Protection and Affordable Care Act (ACA) have focused on health in non-health sectors to address larger societal and structural issues that impact access to quality medical care, available transportation, healthy food, employment creation, economic stability, educational attainment,

and social justice (28, 31, 32, 34, 37, 38, 63). The ACA has also guided health care activities through changes in federal tax code and hospital fiscal reporting requirements that benefit entire communities (103, 104).

With ACA and national strategies incentivizing new payment systems and quality standards to meet social needs (68, 100), health care organizations are engaging in community-wide activities to better manage care and address health equity. Yet, siloed sectors of care, fragmented communication, and the over medicalization¹ of population health have limited resources and constrained financial reallocation, negatively impacting quality and outcomes (31-34). To date, there is incomplete evidence regarding local efforts to develop care management information infrastructure and the workforce required to meet a broad range of health and social needs, and thus is the research presented in this chapter. Specifically, the SDOH data initiatives formed by health systems, government agencies, and community-based organizations to improve care coordination and quality, and local resource and service needs are not well quantified.

4.1.1 Investments in Social Services and Public Health Infrastructure Are Pivotal

More recent evidence has demonstrated that larger financial investments in social and community services result in better patient outcomes than health care investments alone (25-26). However, the United States spends the least amount per capita on social services (9.1% of GDP) when compared to other advanced nations (105). Annual expenditures on public health infrastructure and primary prevention (\$79 billion) also pale in comparison to what the United States spends on medical care (\$2.2 trillion) (22). This growing body of research suggests that the disproportionate amount of spending on prevention and social services is contributing to high

¹ Medicalization is defined as an overly clinical or medical approach to improve health at the expense of or with disregard to real factors that shape health. (National Academies of Sciences, Engineering, and Medicine 2019. Integrating Social Care into the Delivery of Health Care: Moving Upstream to Improve the Nation's Health. Washington, DC: The National Academies Press <https://doi.org/10.17226/25467>)

health care costs and poor outcomes. This is because social care needs exist well before chronic illness present and early detection of SDOH risks prevents patients from engaging in dangerous health behaviors that lead to high-cost emergency care and hospitalizations (106).

4.1.2 The Role of Health Care in Exploring Clinical-Community Activities.

More research on health care partnerships and community activities are critical to discovering new approaches and strategies to address care quality and health equity (10, 64). Investigations of health care activities are more apparent among federal demonstration projects designed to meet behavioral health and social needs within communities (24, 69). Federal policy changes are also guiding multi-payer initiatives led by states and health plans to examine new payment and practice models for social care (34, 78). Public and private payers are incentivizing state- and practice-led health equity initiatives that screen for risks (e.g., SDOH), identify system super-utilizers with data, and refer high-risk patients to government programs and community services (17, 18, 58, 65). Nonetheless, there is a lack of evidence regarding community-wide activities to cooperatively manage social care, address population health, and identify technological needs.

Variation in health care activities and the complexity of information infrastructure also suggests community-wide activities are emerging differently, presenting problems for delivering quality care and controlling costs that demands new strategies to effectively guide practice and policy changes. This guidance is especially urgent among Federally Qualified Health Centers (FQHCs) in the vanguard of leveraging information technology investments and developing partnerships to better serve patients with an overwhelming exposure to SDOH (41).

4.1.3 FQHCs are Developing Community Strategies to Support Cross-Sector Care Activities.

Nationally, FQHCs represent the cornerstones of public safety net systems in over 12,000 urban and rural communities. They are responsible for shaping local policies to improve access to quality health care (41). Historically, FQHCs have met patient complex needs via partnerships and collaborations with community-based organizations, health departments, and social service agencies (59). In more recent years, FQHCs have leveraged their IT investments to integrate SDOH data into practice (56, 96). They are increasingly using information system embedded screening tools and data analytic software to collect and share patient information with partner organizations (45, 67, 73). FQHCs are also exploring new payment and partnership care models to meet health and social needs (18, 41, 69, 107). Their active community involvement and role in developing service partnerships and collaborative data activities offers insight and creates a setting to examine the challenges of meeting health and social needs in the digital era.

4.1.4 Study Conceptual Model for Exploring Local Resources and Community Services

In previous chapters we examined which services were provided by Michigan FQHCs and their partner organizations, and information infrastructure used to deliver those services. In this chapter we examine community-wide activities used to address social care and health equity. To better understand the technological capabilities that support community-wide activities to deliver social care and address quality, it is important to assess three key elements: 1) sociotechnical systems, 2) organizational structures (partnerships and collaborations), and 3) social determinants of health data used. A sociotechnical system is infrastructure defined as a set of interactions between people (socio) and technology (technical) that are interdependent and cannot be examined in isolation, and therefore, must be evaluated together (74).

Sittig and Singh's sociotechnical system model accounts for hardware/software, content (e.g., clinical data), and user-interface to better understand the technical problems and symbiotic relationships between technology and providers that use it (55). Elements from Sittig and Singh's sociotechnical model - *hardware and software, human-computer interface, organizational culture/policies, clinical content, people, communication, workflows, external regulations and pressures, system measurement and monitoring* - are used in this chapter to explore factors related to FQHCs participation in community-wide activities and to identify gaps in local resources and services needed to meet social needs in communities.

This chapter also examines technological capabilities that enable interorganizational structures (partnerships and collaborations) to cooperatively manage patient care needs and develop data activities to address quality using information infrastructure. To help unpack the sociotechnical system described above, organizational theory is used to identify where key information infrastructure operates and where it may be missing at the community level. Walter Leutz' (1999) *Five Laws of Medical and Social Service Integration* (48), discussed in the previous chapters, is used to better understand the complexity of local network governance structures and processes, e.g., shared information infrastructure, data agreements, etc. used to manage care and quality among various partners in different communities.

According to Leutz, there are partnership levels that support specific patients and populations based on care needs. Coordinated linkages are designed for patient referral and follow-up, where information is provided when asked and asked when needed. Collaboration uses formal structures and designated positions within organizations to coordinate patient care and routinely report information bidirectionally. Full integration involves combining resources from multiple organizations and relying on one shared health record and care team (48). Leutz'

levels of integration theory is used by federal programs and health care leaders to develop practice-based frameworks for assessing behavioral health and social care data integration (49, 50), including the *Framework for Levels of Health-Related Social Needs and SDH Data Integration* (50).

Finally, examining SDOH data used by FQHCs helps to identify their technological capabilities. For example, information infrastructure and patient data used by FQHCs and their partners support SDOH data integration, service coordination, and quality improvement efforts. Thus, services examined were selected by mapping common care management practices and partnership activities to domains identified through an environmental scan of screening tools and quality measures (8, 12, 16, 58, 61). The services identified were then categorized by public health, behavioral health, and social care sectors to align data and information used with the appropriate domain: well-being, safety and violence prevention, family and home, money and resources, occupational support, and prevention. Figure 2.1 presents an alignment map of the sectors, domains, and service data measured and used to enhance the theoretical basis for investigating this chapter's research questions:

RQ3. What factors are related to engaging in community-wide activities to address social care and health quality?

RQ3.1. What health and social care needs are difficult to meet in the community?

RQ3.2. What infrastructural, organizational, and technological factors are related to the challenges of meeting health and social care needs in the community?

4.2 Methods

4.2.1 Study Design

This chapter describes a qualitative study of FQHC involvement in community-wide activities to address social care and health equity. Sampling was used to recruit FQHCs and subjects via an academic-community research partnership with the Michigan Primary Care Association (MPCA) and its network of primary care practices in Michigan. The investigation was limited to FQHCs in the state of Michigan. The study was determined to be exempt from review by the University of Michigan Institutional Review Board.

4.2.2 Recruitment Procedures

Setting and Site Selection. All FQHCs in Michigan (N=40) were eligible to participate in the study. Like most FQHCs, nationally, approximately half of the study sites delivered care in rural (53.3%) settings, predominately serving publicly insured (63.5%) and uninsured (14.5%) patients. The clinical characteristics of participating FQHCs are described in Table 2.1. FQHCs were recruited through an online webinar delivered at the Michigan Quality Improvement Network (MQIN) *Champion Summit* in June 2021. MQIN is a Health Resources and Services Administration (HRSA) funded Health Center Controlled Network formed by MPCA to address patient safety and quality care using IT and data (79). Summit attendees consisted of quality directors and chief operating officers from all 40 Michigan FQHCs. During the webinar, site and subject enrollment procedures were introduced, and the value of the research project was communicated. Following the webinar, emails with study details were provided to summit attendees, leadership, and other staff who might have not participated in the summit.

Subject Selection. Purposive sampling was used to correctly identify the appropriate FQHC employees to enroll in the study. MQIN summit attendees were invited to participate in an interview or identify a person(s) in their practice with the best knowledge of (i) maternal and infant health, behavioral health, and social care services provided or delivered through partner organizations (e.g., health systems, government agencies, community-based organizations, etc.) and (ii) information infrastructure (i.e., technology, information systems, and data activities) used to manage SDOH needs and service data. Subjects were then contacted to ensure the appropriate staff person(s) was identified for follow-up interviews.

Financial Incentives. Twenty-five-dollar gift cards were provided to study participants for their interview participation. A contact database of interviewees was developed to track employee position titles, roles, and responsibilities of staff and leadership who participated.

4.2.3 Qualitative Data Collection and Analysis.

A semi-structured interview guide was created to explore community-infrastructure, organizational, and technological factors related to community-wide efforts to address health equity and the availability of local resources and community services to meet patient care needs.

Interview Guide Development. Sittig & Singh's (2010) sociotechnical model for studying HIT in complex adaptive health care systems offered the theoretical basis and was used to develop the evaluative framework (Chapter 1, Section 1.2) and interview guide (Appendix B) (55). All eight dimensions, *hardware and software, clinical content, people, workflow and communication, human-computer interface, organizational policies and procedures, and culture, external rules, regulations, and pressures, and system measurement and monitoring*, from their model were used to inform the interview guide development and ground the qualitative analyses

to better understand community-wide activities and infrastructure developed to address social care and health equity (82).

Interview Questions. The interviewees were asked about their FQHC involvement in local activities to address quality improvement, community capacity building, HIT adoption, and shared data use for improving health and care delivery. Key constructs measured included: community priorities and initiatives to address social care and health equity; and community-wide payment models and financing strategies used to build community capacity for meeting social needs. Interviewees were also asked about challenging care needs to meet and local services available; and community and organizational factors related to partnership activity and IT development.

Interview Guide Testing. The interview guide was based on the sociotechnical model dimensions previously described. It was developed, iterated, and piloted tested through the academic-community research partnership.

Qualitative Analysis Techniques. A rapid assessment process (RAP) was then deployed by the research team to guide development of a qualitative data extraction template tool using the sociotechnical model dimensions previously described. RAP is an intensive, team-based qualitative inquiry using data triangulation, iterative analysis, and additional data collection to quickly develop a preliminary understanding of a situation, setting, or phenomena from an insider's perspective. RAP is a demonstrated and efficient method for time sensitive health services research and used in evaluations of applied clinical informatics (e.g., decision support) across multiple health care settings (i.e., hospitals and primary care) (84, 85). RAP was used to assist the research team in quickly forming a better understanding of multi-level factors (system,

practice, and patient) and clinical-community environments for managing cross-sector care and patient information.

The data extraction template tool was tested by the investigator and research assistants for consistency and reliability before transcript coding commenced. The coding occurred until data saturation was achieved, and disconfirming data was no longer identified. Data matrices were derived from the extraction template tool and used to capture coded information about sociotechnical domains from the transcripts. Domain and subdomain summary profiles were then created to analyze the multi-level factors, themes, barriers, and facilitators related to site, setting, and service differences. A thematic analysis was completed to identify sociotechnical factors and themes related to partnership development and sharing information across sectors. Qualitative data tables were developed to further analyze setting and site level differences.

4.3 Results

Twenty-four interviews were conducted with leadership, clinicians, and staff from eleven (n=11) Michigan FQHCs for a site level participation rate of 27.5%. Four executives, six quality directors, two practice managers, three clinicians, five care managers, two community health workers, one outreach supervisor, and an electronic health record specialist were interviewed. Refer to *Figure 2.2 Subject Recruitment by Staff Title and Data Collection Method* for a detailed list of participant roles and titles.

4.3.1 Factors and Themes of Community Activities to Address Social Care and Health Equity

During the interviews with FQHC leadership and staff, study participants were asked to discuss their involvement in community initiatives to address social care, HIT infrastructure, and local health needs. Table 4.1 provides themes that emerged from the qualitative analysis. The themes described infrastructural and sociotechnical barriers and facilitators of implementing community initiatives and responding to federal incentive programs for coordinating social care.

Community Health Priorities and Initiatives. In the interviews with FQHC leadership and staff, they generally discussed addressing quality, digital information exchange, and sharing data analytic services as major priorities of local SDOH and health equity initiatives. Various FQHC leaders and care staff described the process and goals for community health prioritization. For example, one quality director said, “we have bimonthly meetings with our PHO [physicians health organization], where we're looking at quality, and what are some of the areas we really need to improve on as an overall PHO, and as individual locations.” A chief operating officer explained, “We are attempting to get better data flow as a group. We are working to get the information back to us more streamlined, instead of having to go look in several different places to try to find a diagnostic report or something.” An electronic health record specialist stated, “My

supervisor attends a lot of the meetings with MiHIN [Michigan Health Information Network] to try and get better data flow.” We also heard from another quality director that said, “our ACO [accountable care organization] is using Azara but they will be switching to HealtheIntent.”

Community Workforce Development Initiatives. FQHC leadership and staff typically discussed expanding care management infrastructure and collaborating on grants to build local capacity as key initiatives to address SDOH and patient care needs. Directors, managers, and care staff all described the strengths of partnerships and shared resources, as benefits of participating in community activities. A quality manager stated, “there is a collaboration with care managers from different practices in the area through a value-based program. And so, they are big on sharing resources in the community with care managers from different primary care practices.” A quality director explained, “There was a speaker from Michigan State University through the Integrated Health Partnership. And they've talked specifically about SDOH.” A community health worker said, "Most of the coalitions try to write grants to try to get further." A chief operating officer stated, “some of our partners have applied for grants to help with getting them communication stuff and technology stuff going.”

During our interviews with the FQHCs involved in *State Innovation Model* (SIM) projects to test care models and HIT solutions, we learned that those federal investments have been sustained. Various executives described how SIM projects have continuously evolved to identify local resource needs and supported IT and workforce development to improve data and care quality. An executive director explained, “The committee and steering committee have members from all over and within the community. Obviously, they've spent a lot of time creating the SDOH needs form to make sure it fits. The infrastructure, to pull the data and gather the information and then discussions around how we can do better care management of people, how

we can make sure that we are reaching the people that needed to be reached. Are we missing any gaps in care, that type of thing. And, so they continue to meet, and it just keeps evolving around continuing to identify the current needs and then the resources in the area that can help fill those needs.” A chief operating officer stated, Our community used [a SDOH screener] to develop a model through community linkages. We contracted with [a vender] to help us with the development of this model so that community agencies can be connected as well and can be involved. For example, [social service agency x] can get on the [community information exchange] just like we can, and they fill out a document to send us medical referrals to call the patient and make an appointment.”

Alternative Payment Systems. During interviews with FQHC leadership and management they often discussed payments and financial incentives to support care and quality activities. A chief operating officer from a rural practice stated, “Through some of the insurance companies and our quality department we're able to add community health workers and outreach specialists.” A clinical manager from a major metropolitan area explained, “Molina value-based contracts incentivize CHW treatment for a subgroup of patients without a primary provider or health center.” An executive officer from another urban health center further stated, “we have value-based contracts with Melina, Meridian, and United Healthcare. We also meet different HEDIS [Healthcare Effectiveness Data and Information Set] quality measures to build in incentives to pay for staff.” A chief operating officer from a different rural practice said, “We are working with payer incentive models.” A program manager stated, “Many insurances use fee-for-service for reimbursement, preventative care or alternative payment models.

Community Quality Activities and Incentives. During the interviews with quality directors and care managers, study participants commonly discussed pay for performance measures used

to support quality and community activities. One quality director explained, “CQI initiatives involve differential rungs, and each has a shared savings component and a quality measure performance component and a diversity component to drive change.” A care manager described quality improvement incentives of both public and private payers, “For Meridian the CHW is working on gaps in care reports, high ED use and social determinants of health. And, the Healthy Michigan Plan through Medicaid, provides transportation assistance to get clients to appointments and other medical needs, such as rides to the pharmacy and rides to mental health providers.” Another quality director discussed CQI incentives available through the statewide network of FQHCs, “[the primary care association] has contracted with Molina on disparities of care improvement and now they have existing contracts. Payments are tied to whether you reduce some of these gaps.”

4.3.2 Factors and Themes of Community Resources and Services to Meet Patient Needs

In the interviews with FQHC leadership and staff, study participants were asked to discuss local resource needs and service gaps. Table 4.2 provides themes that emerged from the qualitative analysis of the barriers to meeting health and social care needs in the community.

Infrastructural Barriers. During the interviews conducted with FQHC leadership and staff, nearly everyone discussed unavailable resources in their respective communities. Limited affordable housing and permanent housing options for homeless populations were identified as local issues throughout Michigan: a community health worker explained, “Probably the biggest unmet need is housing resources. We do not have a lot of affordable rental housing in this area.” A care manager described how patients can go untreated because of unavailable resources and compounding social problems, “if there's no housing available and the people don't have jobs, it does get really difficult to match them up with local resources for that.” A quality director also

expressed a need for more housing and recognized this limited resource as a systemic issue, "The biggest need is housing, and I think that's across the whole state. "A chief operating officer from another practice further characterized the lack of permanent housing as a major catastrophe, "We have a real housing need, I would call it a crisis, where long-term housing is a challenge for many folks."

In the interviews with FQHC leadership, managers, and care staff, study participants also described a lack of behavioral health services in their respective communities throughout Michigan. A social worker from urban practice said, "There's no psychiatrist. It's very difficult to get psychiatry. Even in an area like Ann Arbor or Troy [affluent communities in Michigan], good luck finding a psychiatrist if you have Blue Cross. Imagine speaking only Spanish, no insurance, recently come from another country, not a lot of social relationships, so not knowing the systems, and you're experiencing a mental health emergency. It's very, very challenging." A clinic manager discussed challenges of providing quality care and offered reasons why patients go untreated, "There have been poor patient experiences with behavioral health providers due to short staffing and only a few alternatives available." A director of behavioral health discussed resource and service gaps, "lack of recovery support programs and psychiatric services presents barriers for our patients trying to access care in the community."

During interviews with FQHC directors and managers, they often discussed unreliable programs and services and scarce funding as barriers to meeting patient care needs in both urban and rural communities. Erratic funding levels, changing eligibility criteria, and limited program capacity were frequently mentioned. A quality manager described inconsistent care coordination as one reason why patients don't get the treatment they need, "The biggest gap has always been that follow-up piece." Another quality director echoed, "There are poor processes for connecting

patients with therapists and psychiatrists.” A program manager described local funding shortages and increasing demands for housing financial assistance, “There is a 3-year waitlist for Section 8 housing.” A care manager further explained a lack of investment in local resources and services is the root problem that inhibits FQHCs from meeting patient social care needs in communities, “You're not going to find an organization that can help every single person. Everybody is limited on budget and first come first serve sort of thing.” A quality director offered additional insight, “Funding and upfront monies are structured oddly. You get to these periods of time where there's just not anything available.” A program director summed it up best by stating, “there is too much competition for scarce resources in the nonprofit world.”

During the interviews with FQHC managers and clinicians, they described community workforce shortages as barriers to serving the care needs of patients. A quality director stated, “The staffing is a big barrier for a lot of the groups.” A care manager explained, “It wasn't as tough prior to COVID, but once COVID hit, you had a lot of those communities that just couldn't support the needs, whether it was funding, or their staffing is now working from home.” A quality manager reiterated the workforce issues, “there are staffing shortages at the local food bank.” A clinician echoed, “There are food and driver shortages in the food pharmacy program.”

FQHC-Organizational Barriers. Interviews with FQHC executives and quality directors often revealed internal staffing challenges and competing resources as barriers to meeting patient social care needs. A chief medical officer from urban practice explained, “There are multiple competing priorities. We may have the vision and want to do the work, but on a day to day, our providers are busy and maybe even do they have the resources?” A quality director from rural practice stated, “We're short, and we're really short on providers right now. And every month, I'm preparing two provider letters for providers leaving the agency that we're sending out to all

the patients on their panel. And then you can just feel, Oh, that's going to impact access so much. That's just more patients that aren't going to be able to get in as soon, and ugh. I just ... We have a real challenge.” An executive officer from different urban center further explained how staffing shortages has impacted care quality efforts and outcomes, “We're working with the same amount of employees trying to get patients tested for COVID now, give out COVID vaccines, plus see our patients and provide the highest quality care that we can in an appointment. And then also meet the SDOH and then meet the grant requirements that we have signed up for. If we're not addressing that and serving the community, there's no way that we can meet any of our quality initiatives or patient outcomes.”

Technological Barriers. During the interviews with FQHC leadership and staff, study participants repeatedly described limited technological expertise and information infrastructure as barriers to meeting patient care needs in communities. This was particularly evident among FQHCs and their social care providers throughout Michigan. A quality director explained, “The way they document their EHR does not facilitate the information crossing over and interfacing with our EHR system.” A population health supervisor asserted, “They don't have an electronic form yet, so only doing the paper form.” A chief operating officer also stated, “A lot of things are still done on paper.” A care manager echoed, “Systems don't interact at all.” A community health worker explained, “The entire infrastructure in this area is very limited. There are some places that still have dial up internet. ”A care manager reiterated, “Not everyone has internet and communication is a big hurdle.”

4.4 Discussion

During the interviews, FQHC leadership, clinicians, and staff discussed benefits of participating in community activities to address health care. Data demonstrated that Michigan FQHCs developed value-based care practices, engaged staff in SDOH trainings, and leveraged local grant awards to improve communication and information infrastructure. For Michigan FQHCs participating in the *State Innovation Model* (SIM) federal demonstration projects, data revealed those efforts had continuously evolved to meet patient social care needs and supported IT and workforce development in their respective communities.

Study findings suggested the community initiatives offered structure and processes for developing FQHC care management activities and sustained partnership efforts to address information infrastructure, data exchange, and care quality. Yet, consistent with Hughes and colleagues (2020), this investigation confirmed more research on community-wide activities are critical to better understand the underlining health infrastructure and to properly scale partnership activities (69). Data from this study also suggested that obtaining additional funding was critical to sustain efforts of federal demonstration projects (e.g., SIM), as investigators learned, a shift to quality care and data activities loosely kept these community-wide activities together when funds for HIT development were scarce.

This study examined broader societal and structural issues restricting local resources that often overwhelm community non-profits and public safety net systems. The results demonstrated that patients of Michigan FQHC often experienced insufficient housing and homeless services, inadequate psychiatric care, and limited substance use disorder programs. This created barriers for both urban and rural practices to treat behavioral health and social needs. Findings suggested major investments in public health infrastructure and social services may be more critical than

only investing in medical care and IT when developing policies and strategies for improving quality and outcomes (105).

If there was one thing to learn from the HITECH Act of 2009, it is that incentivizing information system adoption and use is not enough to transform health care (89, 91). It is the rise of health care partnerships and activities that will create the environment for developing local information infrastructure and data practices to address quality and distinctive community needs. Thus, national policies that scale and incentivize alternative payment systems and partnership activities using shared patient data are vital to treating coexisting medical and social needs. It is this type of large-scale policy reform that is needed to guide local health care systems and communities in meeting patient social needs and addressing health equity more broadly.

Furthermore, the study results point to significant staffing turnover and workforce shortages among Michigan FQHCs and their partners currently focused on providing social care. During the interviews with FQHC leadership, almost everyone discussed competing priorities and staffing shortages as barriers to developing financial incentives to support care management and continuous quality improvement initiatives. Nonetheless, Michigan FQHCs found ways to develop public and private payment reimbursements and pay-for-performance quality reporting measures using patient SDOH data to generate additional revenue for preventive and social care.

The study findings suggested these efforts might have afforded Michigan FQHCs with new financial strategies for hiring staff to manage patient care needs and monitor quality efforts. The data further demonstrated that nearly all FQHCs leveraged traditional fee-for-service and value-based contracts to obtain reimbursements for a broader range of services and partnership activities. Results confirmed contracts with private payers were used to address health disparities and care access among homeless populations and other vulnerable groups FQHCs did not serve.

4.4.1 Implications for policy and practice

Identifying social needs in medical practice is only the tip of the iceberg for health care organizations. Results of this study revealed challenges that go well beyond linking patients to social care. With an affordable housing crisis, chronic homelessness, mental health parity challenges, and growing opioid epidemic, local health departments and social service agencies are not capable of meeting social needs alone. It will be difficult to establish local information infrastructure without significant investments in workforce, partnership development, and community interventions needed to address these broader societal and structural issues. Findings from this study underscore the importance of investing in behavioral health, housing programs, and local non-profits to build a social care infrastructure.

New policy priorities are imperative to scale critical human capital and information infrastructure that supports local care management and collaborative data activities to meet social needs and address health equity. Health system and medical practice participation in community-wide activities offer structure and processes for forming partnerships to address unavailable local resources, service gaps, and care coordination challenges. These initiatives are often organized by local coalitions, accountable health organizations, and different physician groups to develop community capacity and data practices for managing shared patients. Payers and federal agencies need to incentivize the development of community-wide activities. This can be achieved with new pay-for-performance quality reporting measures and value-based care practice guidance.

4.4.2 Implications for research

The study described a multifaceted and rapidly evolving social care landscape. Building on evidence gained, more research on infrastructural, interorganizational, and sociotechnical factors will inform policy changes and financial investments in public health and social services.

Future studies should examine patient access to permanent housing and homeless services, psychiatric care, and substance use disorder programs to develop new community interventions and IT strategies. More research funding and investments in government demonstration projects are critical to develop and test partnership care models and community-wide activities using IT and data to address health equity.

4.4.3 Limitations

The investigators did not interview federal, state, or local partners which limited the scope of the study to perspectives of FQHCs. This was mainly due to the wide range of services and HIT capabilities we were interested in exploring. Moreover, the investigation was conducted during the COVID-19 pandemic. Therefore, gaining access to FQHC partners would have been difficult, as evident in the findings, and through our conversations with FQHC leaders and staff. Investigators also had trouble identifying the correct people within FQHCs due to various roles and responsibilities throughout MPCA's network focused on SDOH data collection and patient care management. Therefore, it was difficult to pinpoint the most knowledgeable person(s) to complete the survey and follow-up interviews for that reason. Finally, given the gravity and widespread effect of the COVID-19 pandemic, SDOH initiatives and HIT research were not a high priority of FQHCs. There were increasing obligations to test and treat for COVID-19 and to vaccinate patients and other vulnerable community members. The competing practice resources were compounded by increased data reporting requirements and other requests from regulatory agencies and national network initiatives as a result of the ensuing pandemic. These study limitations impacted site and subject recruitment, and willingness to participate in the interviews, therefore, affecting the sample size and generalizability.

4.5 Conclusions

The results of this study demonstrated that FQHC participation in community activities, such as local coalitions, accountable health organizations, and federal demonstration projects, supported SDOH data management, digital information exchange, and care quality improvement. But even with new payment systems incentivizing FQHC partnership activities, limited housing and homeless services, inadequate psychiatric care, and lack of substance use disorder programs created barriers to meeting patient needs in communities throughout Michigan. This is because care management and digital health information exchange across service sectors are dynamic processes between multiple organizations, people, and technologies. Rapidly evolving IT innovation only further challenged Michigan FQHCs and communities in expanding social care infrastructure because of competing vendors and data governance issues (89, 108, 109). This created conflicts and tremendous stress on Michigan FQHCs and their community's ability to develop information infrastructure and shared data practices. Yet, community-wide activities offered structure and processes for developing value-based care practices and new health equity initiatives.

4.6 Tables

Table 4.1 Factors and Themes of Community-Wide Activities to Address Social Care and Health Equity

Activities	Factors	Themes
Community-Wide Health Initiatives	Priorities and goals	<ul style="list-style-type: none"> Develop new patient engagement strategies Address quality care and information exchange between partners Move towards using shared data analytics Integrate Azara software into MiHIN for more rapid data analytics Update and maintain community services and resources rosters Streamline data and staff workflows between community partners Finance data analytic software to be shared by the community Work to allow two EHR systems to interface Source grants for communication and technology development
Community Workforce Development	Key initiatives	<ul style="list-style-type: none"> Expanding local care management infrastructure Developing HIT to share clinical data w/partners and health plans Collaborating on grants for workforce and technological development Pinpointing gaps in care and lead SDOH outreach initiatives Sharing local hospital EHRs system with community providers
Payment Models or Financing Strategies	Models that incentivize collaboration	<ul style="list-style-type: none"> Reimbursements for preventive care using fee-for-service model Alternative payment models to support clinical-community linkages Patient centered-care payer incentive models State PCA contracted with health plans on care disparity CQI that led to value-based contracts to address needs and service gaps Fee-for-service reimbursement from commercial health plans Funding from state Primary Care Fund and PCA to finance CHW role Value based contracts for CHWs to address integrated health services, partnerships, and patients without primary care provider Nontraditional sources of community funding for non-billable services
Continuous Quality Improvement (CQI) Initiatives	CQI for SDOH & population health equity	<ul style="list-style-type: none"> Healthcare Effectiveness Data and Information Set (HEDIS) measures used to create financial incentives to pay for staff dedicated to SDOH CQIs addressing preventive screening and outreach tracking CQIs addressing unmet SDOH needs and gaps in community care CQIs addressing high emergency dept. utilization and health disparities

Table 4.2 Factors and Themes of Community Resources and Services to Meet Patient Care Needs

Factors	Community and Organizational Issues	Themes
<i>Infrastructural</i>	Unreliable programs and community services	Limited affordable housing and low supply of rental units Homeless shelters nearing capacity and no long-term housing Slow-moving waitlists for Section 8 Housing Unavailable and inaccessible inpatient programs for substance abuse disorder and mental health services Poor referral processes for substance use services Some shelters operate on a volunteer basis Changing program funding levels Inconsistent service eligibility and capacity
	Limited budgets and grant funding	Upfront monies run out before year ends Geographic spread makes grant not dependable in rural settings
	Diminishing community synergy	Changing priorities and community leadership
	Community workforce capacity	Activity is not returning to pre-pandemic levels Pandemic has exacerbated capacity issues for external services Communication challenges as some partners remain remote Staff shortage for external partners and services
	Lack of providers and resources	Lack of housing options, long waitlist with few alternatives Small pool of resources to access for non-profit organizations Very limited psychiatric providers and services Lack of support programs and services substance use disorder Lack of community housing partners in rural communities
<i>Organizational</i>	Staff workforce capacity	Staff shortage for internal workflows High staff turnover rate prevents long-term partnerships Limited strategic planning and coordination efforts makes service connections more difficult Not all staff onsite / in-office due to COVID-19
	Time and resource management	Health Center is experiencing competing priorities Difficulties with distribution of funds/resources
<i>Technological</i>	Lack of technology and technical assistance	Partners do not have interfacing technology and data system Internet & Wi-Fi is sparse in many rural areas

Chapter 5 Conclusion

Health care organizations are taking a greater role in screening risks and forming partnerships to treat a broad range of medical and social needs (56, 57). FQHCs lead these efforts, offering a model for leveraging investments in technology to manage care and patient information. Yet, there has been little empirical work to describe the information infrastructure and partnerships developed across sectors of care, in a concerted effort to identify activities and strategies that could guide policy and practice. As both a social and technical issue, the challenge of developing technology and partnership data activities to provide preventive and social care in medical practice remained understudied. This dissertation research was motivated by a demand for greater systematic insights into local information infrastructure and partnership activities used to manage social care and address health equity.

Chapters 2 through 4 of this dissertation had methodological and empirical aims to better understand the current social care landscape and rapidly evolving IT environment. Drawing on theories and frameworks from public health and information science offered a research approach to describe Michigan FQHC services, partnerships, and technological capabilities developed to support the delivery of preventive and social care. By combining Leutz' organizational theory with sociotechnical theory using Sittig and Singh's evaluative framework, results from this study advanced both theories by accounting for emerging cross-sector care activities and technological capabilities of these complex and adaptive learning health systems.

Leutz's levels of service integration provided the framework for understanding why Michigan FQHCs developed care activities, i.e., integrated health services, coordinated linkages, collaborations, beyond the desire for meeting the severity and breadth of patient needs. Study findings suggested that Michigan FQHCs developed different partnership activities, not only to ensure patient care needs were met, according to Leutz, but to also safeguard, exchange, and manage patient health information. Data demonstrated that Michigan FQHCs integrated health services and formed partnerships to better manage care. Patient SDOH data was then used by FQHCs to finance new care management and quality improvement activities.

Core elements from Sittig and Singh's sociotechnical model were categorized into infrastructural, organizational, and technological factors at the system, community, provider, employee, patient, and partner levels in the study's conceptual model (Section 1.2, Figure 1) to guide methods using an interdisciplinary research approach. This helped to describe local resource needs, service shortages, and multi-level facilitators and barriers related to developing local care management information infrastructure and collaborative data activities. It also revealed system- and community-wide infrastructural, interorganizational, and sociotechnical factors associated with integrating health services into medical practice and developing new partnerships and technological capabilities using patient data for improving care and quality.

The academic-community partnership with Michigan Primary Care Association and its network of FQHCs strengthened the research design and sampling techniques to ensure study generalizability statewide and to the health care system more broadly. The explanatory mixed methods design sequenced quantitative and qualitative study phases of the study to analyze and describe different care activities, technological capabilities, and clinical-community contexts. The observational data collected using the study's practice survey and follow-up interviews

provided FQHC leadership and staff perspectives of the care management and data activities developed using information technology to exchange information across multiple sectors. Descriptive statistics and tests of associations calculated using secondary HRSA data helped to contextualize information obtained through the HIT practice survey and interviews regarding care activity development and local resource and service gaps.

In chapter 2, Michigan FQHC care management and partnership activities were enumerated. The study revealed that formal and informal partnership agreements were used to connect patients with services and exchange information. Descriptive statistics conducted using survey data demonstrated that while FQHCs generally integrated or formed partnership activities to deliver maternal and infant health and behavioral health services, rarely had they developed the same level of activities with the full range of social care partners. Results from the mixed methods analysis suggested that Michigan FQHCs were partnership activities and collaboration using formal agreements to provide patient access to a broader range of medical and social care. Qualitative findings confirmed the quantitative results from data collected in the HIT practice survey suggesting that existing information infrastructure facilitated partnership activities and data practices to manage care more easily. The mixed method analysis revealed that FQHCs leveraged state investments in IT through partnerships with community mental health agencies and local health departments to improve communication, care quality, and management.

Chapter 3 focused on the technological capabilities and information infrastructure developed by Michigan FQHCs to support care management activities using patient information. The survey results demonstrated that FQHCs generally used information infrastructure to share patient data with maternal and infant health and behavioral health providers, but rarely had they developed similar technological capabilities with all the social care services investigated. Most

FQHCs in Michigan were not data interoperable with financial assistance, housing and homeless, transportation, child care, employment, and educational providers, and had not developed the capability to exchange patient health information with child welfare and criminal justice systems.

Qualitative findings from the interviews with Michigan FQHCs offered evidence that an overreliance on conventional referral processes (e.g., phone calls, emails, etc.) and incompatible data management systems throughout Michigan thwarted the development of technological capabilities with the social care sector. However, study results from the mixed methods analysis demonstrated that relying on local healthcare and government information infrastructure were a useful strategies for Michigan FQHCs to circumvent unstructured and non-automated types of information sharing. Qualitative results supported by the quantitative findings confirmed that leveraging existing information infrastructure was fundamental to FQHC care management and facilitating data interoperability with partner organizations.

In chapter 4, qualitative methods were used to explore FQHC participation in community-wide activities to build local information infrastructure and address quality care. Results demonstrated that FQHC involvement facilitated SDOH data management, digital information exchange, and care quality improvement efforts. Qualitative findings suggested that even with new payment systems to incentivize care management activities, limited housing services, inadequate psychiatric care, and insufficient substance use disorder programs have created barriers for Michigan FQHCs to treat patient needs in their respective communities. Findings from this study underscore the importance of investing in public health infrastructure, behavioral healthcare, and social services. Properly funding local resources must be a policy priority to expand critical services and safety net programs that can meet patient care needs.

5.1 Promising Strategies for Providing Preventive and Social Care

National policies and programs incentivizing new payment and practice models support FQHCs in financing the delivery of preventive and social care. This research described services, partnerships, and data activities developed by Michigan FQHCs to manage care and improve quality. The findings revealed promising strategies that can offer policy and practice guidance.

Strategies. Strategy for providing preventive care – health care organizations increasingly need to provide services that range from prevention to acute care. Preventive services may be more streamlined by developing collaborations using formal agreements with maternal and infant health, behavioral health, and social care partners to ensure patients access a broad range of specialties, community services, and local resources. Health care organizations can participate in community-wide activities to establish value-based practices and quality care initiatives using shared data and technology,

HIT strategy – health care organizations can leverage public and private investments in IT by sharing information system access with hospitals, community-based organizations, and government agencies to develop and expand local care management information infrastructure. Health care organizations can participate in community-wide activities to address HIT adoption, care quality, and local resources needs.

Financial strategies – health care organizations can develop pay-for-performance quality reporting measures and alternative reimbursement payment schedules using patient SDOH data to finance care and quality activities, as well as seek non-traditional funding to support local workforce development. Health care organizations can also participate in community-wide activities to establish and sustain health equity initiatives and value-based practices for improving care quality and reducing overall costs.

5.2 Implications for Policy and Practice

FQHCs serve as model for other health care organizations. Functioning as distinctive learning health systems, Michigan FQHCs leveraged IT investments to develop data and partnership activities to deliver high-quality care. Study results offered evidence that Michigan FQHCs used information infrastructure to integrate and manage SDOH and other patient data. Data demonstrated FQHCs also used data to finance quality and care management activities to deliver preventive and social care. Results offered evidence Michigan FQHCs conducted advanced data activities, such as predictive analytics, using SDOH information to develop targeted integrations for high-risk patients. Findings suggested that Michigan FQHCs worked with their partners to develop new resources and services to address gaps in care, particularly related to maternal and infant health, behavioral health, and social needs.

Study results also offered evidence that Michigan FQHCs developed technological capabilities to cooperatively manage patient care and community health with state and local partners. Findings suggested that collaborations and available information infrastructure made patient information exchange possible, overcoming the challenges of under resourced, low-tech sectors of care. The strategies identified in this study support the development of local care management infrastructure and partnership activities needed for quality improvement and learning health to occur. However, developing information infrastructure and technological capabilities to manage patient social needs and improve care quality is only the tip of the iceberg for the health care system.

Results of this study revealed major challenges that go well beyond financing care management activities and sharing patient information with state and community partners. With rising violence and suicide rates, a relentless opioid epidemic, and an affordable housing crisis, local health departments and social services are not capable of addressing these problems alone.

Broader societal and structural issues are overwhelming FQHCs, public safety net systems, and communities, imposing tremendous stress on their ability develop vital care activities and technological capabilities to deliver high-quality care. Devoid of major investments in the behavioral healthcare workforce and community services to build a social care infrastructure, patients will go untreated. New national strategies and financial incentives that support the development of care activities and data integration are critical. Large scale policies are also imperative to direct public and private investments in information infrastructure to overcome the challenges of under resourced, low-tech sectors of care.

5.3 Implication for Research and Broader Learning Health System Community

This study provides foundational research to support future investigations of how community partnerships and collaborations can be used to improve care delivery and health outcomes. Study findings might inform a new perspective regarding learning communities. Rather than health systems and networks creating *learning communities* to address root problems or poor outcomes, perhaps it is *communities learning* and working together to develop IT and use data to deliver high-quality care and address health equity. Health care organizations and local partners working together through community-wide assemblages focused on care quality, HIT adoption, and resources needs will support social care information infrastructure development. A change in practice will shift a medical culture focused on treating disease to one which promotes health.

Future studies should examine local healthcare information infrastructure and SDOH initiatives designed to address social care and health equity. More studies will reveal evidence of community-wide technological capabilities and partnership activities, which support information exchange, data integration, and advanced analytic techniques used to better manage care and

population health. This knowledge base will inform learning health approaches to deliver high-quality care and reduce costs. Future studies might also investigate patient access to affordable housing and major behavioral healthcare reform. These studies will help identify local resources and new interventions that can address the unmet patient needs identified in this study. Building on the evidence gained from Michigan FQHCs and their partners already developing learning health system approaches provides a clearer understanding of the policy changes and financial investments needed to realize the power of prevention and promise of IT. New policy incentives are also imperative for advancing quality improvement efforts and partnership data activities to transform health and care delivery.

5.4 Conclusion

This study found that Michigan FQHCs developed some technological capabilities to exchange patient information with partners and made quality improvements using SDOH data. It provides a snapshot and exemplifies the siloed sectors of care in the United States that rely on partnerships and collaborations. New information technology is slowly being adopted to link these fragmented sectors of care. At the same time, the human capital to meet patient behavioral health and social care needs remains critical. The social and technical infrastructure will need to be fostered as equal components in the future of better health care for all.

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Appendices

Appendix A – Health Information Technology Practice Survey



Welcome

Introduction.

This survey is being conducted to learn about the **partnerships, activities, and technologies** developed and implemented by Michigan's Community Health Centers to address **social determinants of health (SDOH)** and the social needs that exist outside traditional care.

You will be asked about your **Health Center's cross-sector partnerships, clinical-community linkages, and health information technology (HIT) capabilities** to deliver various services:

- Social care (housing, transportation, food assistance, child welfare, etc.),
- Behavioral health (mental health and substance use disorder), and
- Public health (maternal and infant health).

Answering this survey is voluntary. We expect it will take about 15-20 minutes to complete.

We plan to publish what we learn from this study; however, no identifiable personal or health center information will be revealed without your permission.



We understand it may take more than one person to complete the online survey. To help facilitate this, a PDF version of the survey has been provided by the Michigan Primary Care Association Team via email. **Please submit one online survey per health center.** Each individual contributing to your health center's response will receive a \$25 Visa gift card.

By clicking on the arrow button below you recognize this is a research study and agree to participate.

About the Survey.

Thank you for participating in this study!

We want to know more about you and your Health Center. We will ask you about whether your Health Center provides any of the 13 services listed below.

Services	Examples
Housing & Homelessness	Section 8, home retention, utility costs
Food Assistance	SNAP, WIC, food banks, home delivered meals
Child Care Assistance	State assistance and local non-profits
Financial Assistance	TANF, emergency cash relief, burial costs
Transportation	Medical transport, transit voucher, ride-share, taxi
Child Welfare	Child protective services, emergency and shelter care
Domestic Violence	Counseling, emergency and shelter services
Criminal Justice	Legal aid, parole and probation services
Employment	Unemployment benefits, tuition/vocation support
Educational Support	GED, higher education support, tutoring
Mental Health	Emergency admission, residential treatment, outpatient care
Substance Use Disorder	
Public Health	Maternal and Infant Health

You will then answer 5 sets of questions about topics related to each of the services your Health Center provides. Specifically:

- **Service provision** (1 question)
 - **HIT capabilities** to manage data (3 questions)
 - Patient needs
 - Service referrals
 - Data management and information exchange practices
 - **Use of data** (1 question)
-

About You and Your Health Center

Q1. What response best describes your **position** at your Health Center?

- Quality Improvement Director
 - Practice Manager
 - IT Lead
 - Enabling Services Manager
 - Chief Operating Officer
 - Other, please specify
-

Q2. Has your position been designated as the **lead contact person on SDOH initiatives** by your Health Center? By SDOH initiatives we mean forming partnerships and relationships among clinical, social care, behavioral health, and public health providers to fill gaps in needed services.

- | | | |
|-----------------------|-----------------------|-----------------------|
| Yes | No | Don't Know |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
-

Q2.1. If you answered no, please provide the following information about your Health Center's lead contact for SDOH initiatives. This information will be used to invite other health center personnel to participate in a follow-up interview.

First Name	<input type="text"/>
Last Name	<input type="text"/>
Title	<input type="text"/>
Email Address	<input type="text"/>
Office Phone	<input type="text"/>

Q3. What is the **name of your Health Center**?

SELECT FROM THE LIST PROVIDED

About Your Health Center's Service Provision

Q4. Does your Health Center currently **provide** or **partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider.

Answer **Yes** or **No** for each service. Examples provided in parentheses.

Housing and homeless (Section 8, home retention, utility costs)	<input type="checkbox"/>
Food assistance (SNAP, WIC, food banks, home delivered meals)	<input type="checkbox"/>
Child care assistance (State assistance and local non-profits)	<input type="checkbox"/>
Financial assistance (TANF, emergency cash relief, burial costs)	<input type="checkbox"/>
Transportation (Medical transport, transit voucher, ride-share, taxi)	<input type="checkbox"/>
Child welfare (Child protective services, emergency and shelter care)	<input type="checkbox"/>
Domestic violence (Counseling, emergency and shelter services)	<input type="checkbox"/>
Criminal justice (Legal aid, parole and probation services)	<input type="checkbox"/>
Employment (Unemployment benefits, tuition/vocation support)	<input type="checkbox"/>
Educational support (GED, higher education support, tutoring)	<input type="checkbox"/>
Mental health (Emergency admission, residential treatment, outpatient)	<input type="checkbox"/>
Substance use (Emergency admission, residential treatment, outpatient)	<input type="checkbox"/>
Public health (Maternal and infant health)	<input type="checkbox"/>

4.1. Does your Health Center currently provide any services not included on this list?

Yes	No	Don't Know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.2. Please list those services in the space provided:

We now would like you to answer additional questions about your Health Center's provision of the services you selected.

To help you navigate this document, page numbers for each service are listed below:

<u>Survey Questions</u>	<u>Services</u>	<u>Page Numbers</u>
QHH-5.1 to 5.5	Housing and Homeless	6-8
QFA-6.1 to 6.5	Food Assistance	8-10
QCCA-7.1 to 7.5	Child Care Assistance	10-12
QFINA-8.1 to 8.5	Financial Assistance	13-15
QTR-9.1 to 9.5	Transportation	15-17
QCW-10.1 to 10.5	Child Welfare	17-20
QDV-11.1 to 11.5	Domestic Violence	20-22
QCJ-12.1 to 12.5	Criminal Justice	22-24
QEMP-13.1 to 13.5	Employment	24-26
QEDU-14.1 to 14.5	Educational Support	26-29
QMH-15.1 to 15.5	Mental Health	29-31
QSUD-16.1 to 16.5	Substance Use Disorder	31-33
QPH-17.1 to 17.5	Public Health	33-36
Staff Information for Gift Card Processing		36-38

QHH-5. Please answer the following questions about your **Health Center's provision of HOUSING AND HOMELESS SERVICES.**

Q5.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Section 8 - Rental Assistance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home retention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utility costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **housing and homeless needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

5.2.2. Does your Health Center do any of the following to manage housing and homeless referrals? [Select all that apply]

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q5.3. Which of the following best describes your data management and information exchange practices with external housing and homeless partners? [Select one response]

- Separate data systems; no shared access
 - Separate data systems; limited shared access
 - Linked data management systems with shared access and some tracking capabilities
 - Linked data management systems with shared access, tracking, and exchange capabilities
 - Integrated information exchange system with formal data management policies and standards
 - Integrated information exchange system with formal data management policies, standards, and accountability measures
 - Other (please specify)
-

Q5.4.

Is data about your Health Center's housing and homeless needs and services used for any of the following? [Select all that apply]

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)

- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q5.5. List any other uses of your Health Center's housing and homeless data in the space provided.

QFA-6. Please answer the following questions about your **Health Center's provision of FOOD ASSISTANCE.**

Q6.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
SNAP - Food Stamps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
WIC - Supplemental Nutrition for Women, Infants & Children	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Food banks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home delivered meals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **food assistance needs data identified through SDOH screening**? Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
 - Paper-based screening only, data manually entered by staff into Health Center EHR
 - Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
 - Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
 - Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
 - Other (please specify)
-

Q6.2.2. Does your Health Center do any of the following to manage **food assistance referrals**?

[Select all that apply]

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q6.3. Which of the following best describes your **data management and information exchange practices** with external food assistance partners? **[Select one response]**

- Separate data systems; no shared access
- Separate data systems; limited shared access
- Linked data management systems with shared access and some tracking capabilities

- Linked data management systems with shared access, tracking, and exchange capabilities
- Integrated information exchange system with formal data management policies and standards
- Integrated information exchange system with formal data management policies, standards, and accountability measures
- Other (please specify)

Q6.4.

Is data about your Health Center's food assistance needs and services used for any of the following? **[Select all that apply]**

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q6.5. List any other uses of your Health Center's food assistance data in the space provided.

QCCA-7. Please answer the following questions about your **Health Center's provision of CHILD CARE ASSISTANCE.**

Q7.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Child care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Support for completing state application for child care services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q7.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **child care needs data identified through SDOH screening**? Examples are provided in parentheses. **[Select all that apply]**

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

Q7.2.2. Does your Health Center do any of the following to manage child care referrals?

Select all that apply]

- Referrals are made by phone or in person
- Referrals are made via fax
- Referrals are made by email
- Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Other (please specify)

Q7.3. Which of the following best describes your data management and information exchange practices with external child care partners? [Select one response]

Separate data systems; no shared access

Separate data systems; limited shared access

Linked data management systems with shared access and some tracking capabilities

Linked data management systems with shared access, tracking, and exchange capabilities

Integrated information exchange system with formal data management policies and standards

Integrated information exchange system with formal data management policies, standards, and accountability measures

Other (please specify)

Q7.4.

Is data about your Health Center's child care needs and services used for any of the following? [Select all that apply]

Patient-panel management

Risk stratification models

Value-Based Care (e.g., risk adjusted payment models)

Population Health

Continuous Quality Improvement

Reporting (e.g., HRSA, State of Michigan, payers, etc.)

None of the above

Q7.5. List any other uses of your Health Center's child care data in the space provided.

QFINA-8. Please answer the following questions about your **Health Center's provision of FINANCIAL ASSISTANCE.**

Q8.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by our Health Center	Yes, service contract	Yes, informal agreement	No
TANF - Temporary Assistance for Needy Families	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency cash relief	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Burial costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q8.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **financial assistance needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system

Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange

Other (please specify)

Q8.2.2. Does your Health Center do any of the following to manage financial assistance referrals? [Select all that apply]

Referrals are made by phone or in person

Referrals are made via fax

Referrals are made by email

Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Other (please specify)

Q8.3. Which of the following best describes your data management and information exchange practices with external financial assistance partners? [Select one response]

Separate data systems; no shared access

Separate data systems; limited shared access

Linked data management systems with shared access and some tracking capabilities

Linked data management systems with shared access, tracking, and exchange capabilities

Integrated information exchange system with formal data management policies and standards

Integrated information exchange system with formal data management policies, standards, and accountability measures

Other (please specify)

Q8.4.

14

Is data about your Health Center's financial assistance needs and services used for any of the following? **[Select all that apply]**

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q8.5. List any other uses of your Health Center's financial assistance data in the space provided.

QTR-9. Please answer the following questions about your **Health Center's provision of TRANSPORTATION.**

Q9.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Non-emergency medical transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Transit voucher	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ride-share (Uber, Lyft, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taxi	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q9.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **transportation needs data identified through SDOH screening**? Examples are provided in parentheses. **[Select all that apply]**

- Paper-based screening only, data not transferred to Health Center EHR
 - Paper-based screening only, data manually entered by staff into Health Center EHR
 - Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
 - Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
 - Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
 - Other (please specify)
-

Q9.2.2. Does your Health Center do any of the following to manage **transportation referrals**?

[Select all that apply]

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q9.3. Which of the following best describes your **data management and information exchange practices with external transportation partners**? **[Select one response]**

- Separate data systems; no shared access
- Separate data systems; limited shared access
- Linked data management systems with shared access and some tracking capabilities
- Linked data management systems with shared access, tracking, and exchange capabilities
- Integrated information exchange system with formal data management policies and standards
- Integrated information exchange system with formal data management policies, standards, and accountability measures
- Other (please specify)

Q9.4.

Is data about your Health Center's transportation needs and services used for any of the following? [Select all that apply]

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q9.5. List any other uses of your Health Center's transportation data in the space provided.

QCW-10. Please answer the following questions about your **Health Center's provision of CHILD WELFARE SERVICES.**

Q10.1. Does your health center provide or partner with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Child protective services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency and shelter care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q10.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **child welfare needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

Q10.2.2. Does your Health Center do any of the following to manage child welfare referrals?

[Select all that apply]

- Referrals are made by phone or in person

- Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q10.3. Which of the following best describes your data management and information exchange practices with external child welfare partners? **[Select one response]**

- Separate data systems; no shared access
 - Separate data systems; limited shared access
 - Linked data management systems with shared access and some tracking capabilities
 - Linked data management systems with shared access, tracking, and exchange capabilities
 - Integrated information exchange system with formal data management policies and standards
 - Integrated information exchange system with formal data management policies, standards, and accountability measures
 - Other (please specify)
-

Q10.4.

Is data about your Health Center's child welfare needs and services used for any of the following? **[Select all that apply]**

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q10.5. List any other uses of your Health Center's child welfare data in the space provided.

QDV-11. Please answer the following questions about your **Health Center's provision of DOMESTIC VIOLENCE SERVICES.**

Q11.1. Does your health center provide or partner with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Counseling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency and shelter services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q11.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **domestic violence needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system

- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
 - Other (please specify)
-

Q11.2.2. Does your Health Center do any of the following to manage domestic violence referrals?
[Select all that apply]

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q11.3. Which of the following best describes your data management and information exchange practices with external domestic violence partners? [Select one response]

- Separate data systems; no shared access
 - Separate data systems; limited shared access
 - Linked data management systems with shared access and some tracking capabilities
 - Linked data management systems with shared access, tracking, and exchange capabilities
 - Integrated information exchange system with formal data management policies and standards
 - Integrated information exchange system with formal data management policies, standards, and accountability measures
 - Other (please specify)
-

Q11.4.

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Is data about your Health Center's domestic violence needs and services used for any of the following? [Select all that apply]

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q11.5. List any other uses of your Health Center's domestic violence data in the space provided.

QCJ-12. Please answer the following questions about your **Health Center's provision of CRIMINAL JUSTICE SERVICES.**

Q12.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. [Select all that apply]

	Yes, provided by our Health Center	Yes, service contract	Yes, informal agreement	No
Legal aid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Parole and probation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q12.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **criminal justice needs data identified through SDOH screening**? Examples are provided in parentheses. **[Select all that apply]**

- Paper-based screening only, data not transferred to Health Center EHR
 - Paper-based screening only, data manually entered by staff into Health Center EHR
 - Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
 - Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
 - Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
 - Other (please specify)
-

Q12.2.2. Does your Health Center do any of the following to manage **criminal justice referrals**? **[Select all that apply]**

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q12.3. Which of the following best describes your **data management and information exchange practices** with external criminal justice partners? **[Select one response]**

- Separate data systems; no shared access
- Separate data systems; limited shared access
- Linked data management systems with shared access and some tracking capabilities

- Linked data management systems with shared access, tracking, and exchange capabilities
- Integrated information exchange system with formal data management policies and standards
- Integrated information exchange system with formal data management policies, standards, and accountability measures
- Other (please specify)

Q12.4.

Is data about your Health Center's criminal justice needs and services used for any of the following? **[Select all that apply]**

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q12.5. List any other uses of your Health Center's criminal justice data in the space provided.

QEMP-13. Please answer the following questions about your **Health Center's provision of EMPLOYMENT SERVICES.**

Q13.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by our Health Center	Yes, service contract	Yes, informal agreement	No
Unemployment benefits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tuition support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vocational support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q13.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **employment needs data identified through SDOH screening**? Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

Q13.2.2. Does your Health Center do any of the following to manage **employment service referrals**? **[Select all that apply]**

- Referrals are made by phone or in person
- Referrals are made via fax
- Referrals are made by email
- Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Other (please specify)

Q13.3. Which of the following best describes your data management and information exchange practices with external employment service partners? [Select one response]

Separate data systems; no shared access

Separate data systems; limited shared access

Linked data management systems with shared access and some tracking capabilities

Linked data management systems with shared access, tracking, and exchange capabilities

Integrated information exchange system with formal data management policies and standards

Integrated information exchange system with formal data management policies, standards, and accountability measures

Other (please specify)

Q13.4.

Is data about your Health Center's employment needs and services used for any of the following? [Select all that apply]

Patient-panel management

Risk stratification models

Value-Based Care (e.g., risk adjusted payment models)

Population Health

Continuous Quality Improvement

Reporting (e.g., HRSA, State of Michigan, payers, etc.)

None of the above

Q13.5. List any other uses of your Health Center's employment data in the space provided.

QEDU-14. Please answer the following questions about your **Health Center's provision of EDUCATIONAL SUPPORT SERVICES.**

Q14.1. Does your health center provide or partner with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
GED - General Educational Development / Diploma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Higher Education Support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tutoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q14.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **educational needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system

Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange

Other (please specify)

Q14.2.2. Does your Health Center do any of the following to manage educational support referrals? [Select all that apply]

Referrals are made by phone or in person

Referrals are made via fax

Referrals are made by email

Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Other (please specify)

Q14.3. Which of the following best describes your data management and information exchange practices with external educational support partners? [Select one response]

Separate data systems; no shared access

Separate data systems; limited shared access

Linked data management systems with shared access and some tracking capabilities

Linked data management systems with shared access, tracking, and exchange capabilities

Integrated information exchange system with formal data management policies and standards

Integrated information exchange system with formal data management policies, standards, and accountability measures

Other (please specify)

Q14.4.

Is data about your Health Center's educational needs and services used for any of the following? [Select all that apply]

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)
- Population Health
- Continuous Quality Improvement
- Reporting (e.g., HRSA, State of Michigan, payers, etc.)
- None of the above

Q14.5. List any other uses of your Health Center's educational support data in the space provided.

QMH-15. Please answer the following questions about your **Health Center's provision of MENTAL HEALTH SERVICES.**

Q15.1. Does your health center provide or partner with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. [Select all that apply]

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Emergency admission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Residential treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outpatient care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q15.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **mental health needs data identified through SDOH screening**? Examples are provided in parentheses. **[Select all that apply]**

- Paper-based screening only, data not transferred to Health Center EHR
 - Paper-based screening only, data manually entered by staff into Health Center EHR
 - Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
 - Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
 - Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
 - Other (please specify)
-

Q15.2.2. Does your Health Center do any of the following to manage **mental health referrals**? **[Select all that apply]**

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q15.3. Which of the following best describes your **data management and information exchange practices with external mental health partners**? **[Select one response]**

- Separate data systems; no shared access
- Separate data systems; limited shared access

- Linked data management systems with shared access and some tracking capabilities
 - Linked data management systems with shared access, tracking, and exchange capabilities
 - Integrated information exchange system with formal data management policies and standards
 - Integrated information exchange system with formal data management policies, standards, and accountability measures
 - Other (please specify)
-

Q15.4.

Is data about your Health Center's mental health needs and services used for any of the following? **[Select all that apply]**

- Patient-panel management
 - Risk stratification models
 - Value-Based Care (e.g., risk adjusted payment models)
 - Population Health
 - Continuous Quality Improvement
 - Reporting (e.g., HRSA, State of Michigan, payers, etc.)
 - None of the above
-

Q15.5. List any other uses of your Health Center's **mental health data** in the space provided.

QSUD-16. Please answer the following questions about your **Health Center's provision of SUBSTANCE USE DISORDER SERVICES.**

Q16.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Emergency admission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Residential treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outpatient care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q16.2.1.

Please answer the following questions about your **Health Information Technology Capabilities**.

Does your Health Center do any of the following to manage **substance use disorder needs data identified through SDOH screening**? Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

Q16.2.2. Does your Health Center do any of the following to manage **substance use disorder referrals**? **[Select all that apply]**

- Referrals are made by phone or in person
- Referrals are made via fax
- Referrals are made by email
- Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)

Other (please specify)

Q16.3. Which of the following best describes your data management and information exchange practices with external substance use disorder partners? [Select one response]

Separate data systems; no shared access

Separate data systems; limited shared access

Linked data management systems with shared access and some tracking capabilities

Linked data management systems with shared access, tracking, and exchange capabilities

Integrated information exchange system with formal data management policies and standards

Integrated information exchange system with formal data management policies, standards, and accountability measures

Other (please specify)

Q16.4.

Is data about your Health Center's substance use disorder needs and services used for any of the following? [Select all that apply]

Patient-panel management

Risk stratification models

Value-Based Care (e.g., risk adjusted payment models)

Population Health

Continuous Quality Improvement

Reporting (e.g., HRSA, State of Michigan, payers, etc.)

None of the above

Q16.5. List any other uses of your Health Center's substance use disorder data in the space provided.

QPH-17. Please answer the following questions about your **Health Center's provision of PUBLIC HEALTH SERVICES.**

Q17.1. Does your health center **provide or partner** with an external organization to deliver the following services? By partner we mean through a service contract or informal agreement with another organization or care provider. **[Select all that apply]**

	Yes, provided by employees of our Health Center	Yes, service contract	Yes, informal agreement	No
Maternal and Infant Health	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q17.2.1.

Please answer the following questions about your **Health Information Technology Capabilities.**

Does your Health Center do any of the following to manage **maternal and infant health needs data identified through SDOH screening?** Examples are provided in parentheses.

[Select all that apply]

- Paper-based screening only, data not transferred to Health Center EHR
- Paper-based screening only, data manually entered by staff into Health Center EHR
- Electronic screening (using an EHR template, patient portal, office kiosk or tablet). Results stored in Health Center EHR
- Electronic tracking of data using the Health Center EHR system, practice panel, population-based registry, or referral system
- Electronic data exchange (EHR system, health information exchange, care management system) with other practices or submitted to third party organizations including insurers, providers, local health information exchange
- Other (please specify)

Q17.2.2. Does your Health Center do any of the following to manage maternal and infant health referrals? [Select all that apply]

- Referrals are made by phone or in person
 - Referrals are made via fax
 - Referrals are made by email
 - Referrals are exchanged electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Referral status is tracked electronically through a secure data system (e.g., EHRs, Health Information Exchanges, care management and referrals systems, etc.)
 - Other (please specify)
-

Q17.3. Which of the following best describes your data management and information exchange practices with external maternal and infant health partners? [Select one response]

- Separate data systems; no shared access
 - Separate data systems; limited shared access
 - Linked data management systems with shared access and some tracking capabilities
 - Linked data management systems with shared access, tracking, and exchange capabilities
 - Integrated information exchange system with formal data management policies and standards
 - Integrated information exchange system with formal data management policies, standards, and accountability measures
 - Other (please specify)
-

Q17.4.

Is data about your Health Center's maternal and infant health needs and services used for any of the following? [Select all that apply]

- Patient-panel management
- Risk stratification models
- Value-Based Care (e.g., risk adjusted payment models)

- Population Health
 - Continuous Quality Improvement
 - Reporting (e.g., HRSA, State of Michigan, payers, etc.)
 - None of the above
-

Q17.5. List any other uses of your Health Center's maternal and infant health data in the space provided.

Staff Information for Gift Card Processing

Q18.1. Please enter your **contact information** in the fields provided below. This information will be kept separate from your other survey responses and will be used to process the Visa Gift cards to those who responded to this survey.

Name (First & Last)	<input type="text"/>
Home Address	<input type="text"/>
Home Address 2	<input type="text"/>
City	<input type="text"/>
State	<input type="text"/>
Postal code	<input type="text"/>
Email Address	<input type="text"/>
Office Phone	<input type="text"/>

Q18.2. If other staff have assisted you in completing the survey, please provide the following information for us understand their contributing role and to compensate them for their time. You can provide up to 3 additional people in fields provided below.

Name (First & Last)	<input type="text"/>
Title	<input type="text"/>
Home Address 1	<input type="text"/>

Home Address 2

City

State

Postal Code

Email Address

18.3. Please provide the following information for us understand their contributing role and to compensate them for their time.

Name (First & Last)

Title

Home Address 1

Home Address 2

City

State

Postal Code

Email Address

Q18.4. Please provide the following information for us understand their contributing role and to compensate them for their time.

Name (First & Last)

Title

Home Address 1

Home Address 2

City

State

Postal Code

Email Address

Q19. We are planning to conduct follow-up interviews. Are you and/or others named above willing to participate?

Yes

No

Q20. Is there anything about Health Information Technology and/or SDOH your Health Center would like to share with us (e.g., strengths and challenges of your work, promising practices or policies, etc.)?

Appendix B – Interview Guide

Project: Responding to Patient Social Needs in the Digital Era: A Study of the Cross-Sector Partnerships and Health Information Technology Capabilities of Michigan’s Federally Qualified Health Centers

Partners: MPCA & UofM

INTERVIEW PROTOCOL

A. ZOOM HEALTH INTERVIEWS WITH MICHIGAN’S FEDERALLY QUALIFIED HEALTH CENTERS (N=11)

1) Who would we be interviewing?

We are interviewing staff from Federally Qualified Health Centers (FQHCs) that have agreed to participate in an interview. Interested staff were identified through the previously administered Health Information Technology (HIT) capabilities survey. Interviewees will range in staff roles from direct care, data and quality improvement to practice management and executive leadership. It is conceivable that we interview multiple staff from FQHCs who have expressed interest in an interview to gain a much broader perspective of the health center’s ability to address social needs and manage population health.

2) What do we want to learn from these interviews?

- a. What clinical-community collaborations, technology and resources have been useful in meeting patients’ behavioral health and social needs? Why?
- b. What are staffing and technical barriers to connecting with behavioral health and social care service providers? Why?
- c. What has been challenging surrounding the integration of behavioral health/social care and SDOH data into practice? Why?
- d. How has your health center navigated different levels (coordinated, collaborative, integrated) of cross-sector care?
- e. What data infrastructure, policies and governance structures has your CHC developed and implemented to collect, track, exchange, and monitor data in partnership with service providers, and local and state agencies?

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Partners: MPCA & UofM

B. INTERVIEW GUIDE

Abbreviated Consent: Have you seen the consent form? Do you agree to be in the study?

Interviewer Note: If the participant has not seen the consent form. Read the full consent below:

Thank you for your willingness to participate in this study. This interview is being conducted to learn more about your health center’s activities to address community-wide barriers to SDOH and responding to the social needs that exist outside of traditional care. We will discuss your health center’s active involvement in capacity building and data-driven activities to improve care coordination and better manage chronic disease and population health.

Your participation in this interview is voluntary. We expect it will take about 50-minutes to complete. The interview is being recorded and transcribed for data collection and analysis. We plan to publish what we learn from this study; Yet no identifiable personal or health center information will be revealed without your permission.

We understand it may take more than one person to successfully answer all the interview questions. Therefore, we might invite additional staff to participate in a similar interview. Everyone who participates in an interview will receive a \$25 Visa gift card for their participation. By taking part in the interview today, you recognize this is a research study and agree to participate.

[START VIDEO RECORDING: Select “Record to the Cloud”]

We will start the interview by discussing what your health center does to manage the social needs of patients.

Interviewer Note: All interviewees will be able to answer the questions in this section.

1. Please describe what your health center has done to identify the social needs of patients?

Screening, community referrals, risk stratification, Azara data analytics

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Partners: MPCA & UofM

2. Describe what your health center has done to connect the social needs of patients to services?

Who are the staff involved? What are their roles and responsibilities? Who are the partners involved?

Process. Planning/execution are random or systematic; priority driven; strategic planning and execution; focus on care that is more easily integrated; provider availability; capacity for responding to care; action supported by technology

3. Are there social needs of your patients that are unmet?

What social needs? What services would you like to provide to meet these needs? What service providers would you like to work with? Why?

4. What challenges has your health center encountered trying to establish partnerships to meet these unmet [respondent identified] social needs?

5. Which external service provider(s) does your health center work well with to meet patient social needs?

If you could spotlight your partnership with one external service provider, who would that be? Why?

Housing & Homelessness, Food Assistance, Child Care Assistance, Financial Assistance, Transportation, Child Welfare, Domestic Violence, Criminal Justice, Employment, Educational Support, Mental Health, Substance Use Disorder, Maternal and Infant Health

Now, we will discuss your partnership(s) with [respondent-specified] provider(s).

Interviewer Note: All interviewees will be able to answer the questions in this section.

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6. Please describe your health center's partnership(s) with [specified] provider(s)?

*Your partnership activities? Your health center's roles & responsibilities? Your partners' roles & responsibilities?
Other participating organizations' roles & responsibilities? Can you tell me about how leaders are involved? Who?
Their roles and responsibilities?*

7. How did your health center come to partner with [specified] provider(s)?

What motivated your health center to partner with [specified] provider(s)?

Priorities, initiatives, and resources. Your health center's priorities? Partner/community priorities? Funding?
Technology? Quality improvement initiatives, Person-centered medical homes, HRSA/NACHC/MPCA

External policies, regulations or mandates, financial incentives, medical guidelines and/or recommendations.
What Federal, state, or local policies influenced your health center's decision to partner with [specified] providers?
Reimbursement schedules? Public or benchmark reporting? Medical guidelines? or Other national initiatives?

8. What are the barriers and facilitators to having a successful a partnership with [specified] provider(s)?

What is working? Major milestones? Key accomplishments? What is not working?

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Now, we will discuss the data infrastructure (technology, data systems, standards & policies) used to support your work with [specified] providers.

Interviewer Note: This section is appropriate for the following staff roles: data and quality improvement, practice management, and executive leadership. Most direct care and supervising staff will also be able to answer these questions. If not, skip to the next section.

9. What information do you share with your [specified] partner(s)? How do you share it?

*Technology used, data systems & standards, data reporting guidelines, performance measures, MiHIN
SDOH standards: PRAPARE, Accountable Health Communities, other*

10. Describe the rules and procedures that guide data [access and] sharing with [specified] providers?

*How do you protect your data? Who permits access to [specified] data? Who controls the use of the [specified] data?
Where did the rules and/or procedures originate? HRSA? 42 CFR Part 2 – substance use disorder. Why?*

Organizational [governance] structures, policies, and procedures. Formal or informal partnership agreements, clinic policies and procedures, data access permissions, data use agreements, lead agency model with data stewards, committees, community assemblages, data networks or consortiums, government quality measures

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Partners: MPCA & UofM

11. What are the barriers and facilitators to using the technology and data systems [data infrastructure] that support your work [specified] providers?

Organizational priority, leadership engagement, staff technical expertise, changes to workflow, supportive learning climate, data standards, data policies, data use agreements, access and sharing permissions, patient privacy

Now, we will discuss your health center’s use of the information exchanged with [specified] providers.

Interviewer Note: This section is appropriate for interviewees in the following staff roles: data and quality improvement, practice management, and executive leadership. Most direct care and supervising staff will also be able to answer these questions. If not, skip to the next section.

12. Describe what your health center has done with the patient data from your [specified] provider(s) to improve care coordination?

Populate the EHR; Make referrals; Create cohorts of patients for targeted interventions; monitor patient progress; Use for team treatment and service planning; predictive analytics

13. Describe the barriers your health center has faced internally using the patient data and information obtained from your [specified] providers?

*Organizational priority, **leadership engagement**, staff technical expertise, limited practice resources, challenging workflow changes, technological issues and limitations*

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Now, we will discuss your health center’s use of the patient information exchanged with your [specified] providers to improve panel and population health management.

Interviewer Note: This section is appropriate for the following staff roles: data and quality improvement, practice management, and executive leadership. Some direct care and supervising staff will also be able to answer these questions. If not, skip to the next section.

14. Describe the technological challenges to using the data exchanged with your [specified] providers to improve panel and population health management?

Technological expertise, vender and platform selection, funding for technology, lack of common data standards, incentives for data sharing and technology adoption

15. Describe the workforce challenges to using the data exchanged with your [specified] providers to improve panel and population health management?

Professional knowledge and expertise, community capacity, internal staffing, practice workflow, opinion leaders, leadership engagement, technical expertise. Are you having difficulties hiring people with technological or technical expertise?

Now, we will discuss your health center’s participation in SDOH initiatives and activities to help shape policies, laws, regulations, and investments (public & private) in the community related to population health.

Interviewer Note: This section is appropriate for the following staff roles: data and quality improvement, practice management, and executive leadership. Some direct care and supervising staff will also be able to answer these questions. If not, skip to the next section.

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16. Describe partnerships, groups, networks, or data consortiums your health center is involved with to promote policies and activities that facilitate SDOH data exchange and interoperability?

Who are the key stakeholders? How are the groups structured? What are group priorities? What are the group goals? Initiatives? Community activities? Major milestones? Key accomplishments? MiHIN & MQIN

Now, we will discuss your health center’s involvement in activities that promote new financing strategies and other capacity building initiatives to address health and social needs.

Interviewer Note: This section is appropriate for the following staff roles: data and quality improvement, practice management, and executive leadership. Some direct care and supervising staff will also be able to answer these questions. If not, skip to the next section.

17. Describe payment models or other financing strategies implemented by your health center or in your community to address social needs and manage population health?

Payment models that incentivize collaborations; CQI initiatives; Community assessment of assets & resources; State Innovation Model (SIM) & Community Health Innovation Region (CHIRs)

18. Describe practice models or workflow changes implemented by your health center or in your community to address social needs and manage population health?

Team planning; new care coordination models; CHW program – value-based contracts for SDOH; care delivery

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Finally, we will discuss how your health center has incorporated SDOH data into patient care.

Interviewer Note: This section is appropriate for the following staff roles: data and quality improvement, practice management, and executive leadership. Most direct care and supervising staff will also be able to answer these questions. If not, skip to Question 22.

19. Describe how your health center’s chronic disease management programs (e.g., diabetes, hypertension) have responded to patient SDOH needs?

Which programs use SDOH data to coordinate care? Which programs use SDOH data for panel and population health management?

20. How is the SDOH screening and referral data shared with these programs?

21. What drove your health center’s decision to incorporate SDOH data into these programs?

Policy and incentives; external mandate; patient needs; performance measures; CQIs; health center priority / supportive culture

Process. Planning/execution are random or systematic; priority driven; strategic planning and execution; focus on care that is more easily integrated; provider availability; capacity for responding to care; action supported by technology

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That concludes the interview questions.....

22. Is there anything else you would like us like us to know about your health information technology capabilities or partner activities to address SDOH?

Thank you for participating in the interview. We value your response. The gift card will be processed and sent to your home address. If you have any questions about the study, please don't hesitate to contact me.

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C. INTERVIEW SITE – HEALTH INFORMATION TECHNOLOGY CAPABILITIES SCORE CARD

Clinical-Community Linkages and Services

 **HIT Capabilities**  **No HIT Capabilities**

Sector	Delivery System	Service 1	Service 2	Service 3	Service 4
Social Care	Housing & Homelessness	Section 8	Home retention	Utility costs	Other
	Food Assistance	SNAP – Food stamps	WIC	Home delivered meals	Food banks
	Child Care Assistance	Support for completing state application	Child care (local)	Head Start	Other
	Financial Assistance	TANF	Emergency cash	Burial costs	Other
	Transportation	Non-Emergency medical transport	Transit voucher	Ride-share	Taxi
	Child Welfare	Child Protective Services	Emergency care	Shelter care	Other
	Domestic Violence	Crisis Counseling	Emergency care	Shelter care	Other
	Criminal Justice	Legal aid	Parole services	Probation services	Other
	Employment	Unemployment benefits	Tuition assistance	Vocation support	Other
	Educational Support	GED	Higher Ed support	Tutoring	Other
Behavioral Health	Mental Health	Emergency admission	Residential Tx	Outpatient care	Other
	Substance Use Disorder	Emergency admission	Residential Tx	Outpatient care	Other
Public Health	Maternal & Infant Health	In-home services	Immunizations	Perinatal screenings	Other

Health Information Technology Used to Screen, Track, and Exchange Data

HIT Capability	Screening	Tracking	Data Exchange
Data Type	Patient needs	Needs & services	Needs & services
Technology	EHR template	EHR interface	EHR system
	Patient portal	Practice panel	HIE
	Office kiosk	Pop-based registry	Pop-based registry
	Office tablet	Referral or care management system	Referral or care management system
No Technology	Paper-based	Manual processes (e.g., Excel file)	Phone, fax, email

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Data Use

HIT Capability	Risk Adjusted models	Value-Based Care	Population Health Initiatives	Continuous Quality Improvement	Reporting & Reimbursement
Data Use	Risk stratification & panel management	Risk adjusted payment models	Multi-sector prevention & community capacity building	Improve service & patient outcomes	Third party reporting
Data Type	SDOH/medical data	SDOH/medical data	SDOH/community data & claims data	SDOH/community data & claims data	SDOH & claims data
Technology	EHR product “add on”				
	Azara - Data Reporting and Analytics				
	Other commercial software				
	Tools of a secure data network				
	Other – TBD from survey				

Data Management Practices & Policies

HIT Capability	Data Management and Information Exchange Practices and Policies		
Data systems	Separate data systems	Linked data systems	Integrated information systems
Practices	No shared access	Shared access and some tracking capabilities	Formal data management policies
	Limited shared access	Shared access, tracking, & exchanging capabilities	Formal data management policies, standards, and accountability measures
Policies & Incentives	Data access policies (screening & tracking)	Data management policies (tracking & exchanging)	Information exchange & data use policies
			Established measures, reporting and analytics