

FINAL REPORT

Public Health IT to Support Chronic Disease Control

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The findings, conclusions, and recommendations presented in this report are those of the authors and do not necessarily represent the views of ASPE.

Chapter 1: Introduction

NORC at the University of Chicago is pleased to present our final report for “Public Health IT to Support Chronic Disease Control” sponsored by the Assistant Secretary for Planning and Evaluation (ASPE) at the United States Department of Health and Human Services (HHS). This report describes collaboration and exchange of information between health care providers and governmental public health agencies (state and local) to reduce the national chronic disease burden through population-level interventions.

The report describes examples of collaboration in which stakeholders share health care data to inform public health action. These actions seek to reduce chronic disease burden through prevention or effective management. We use these examples to help illustrate issues and opportunities for health information exchange (HIE) to support population health objectives. In the sections that follow, we present project goals and methods. We then separate the remainder of the paper into five chapters that readers may use together or independently for different purposes:

- In the first chapter, we define and describe fundamental concepts, including: population health, the role of governmental public health agencies in addressing chronic disease and the role of informatics and health information exchange. This chapter clarifies the rationale and potential benefits for collaboration across sectors in data sharing to support chronic disease control and prevention.
- We then provide three thematic chapters with examples of how health information exchange supports population health priorities: managing and preventing Type 2 diabetes, pediatric asthma and encouraging cessation of tobacco use. These chapters will illustrate the emerging practices in relevant areas.
- Finally, we end with an overall set of lessons learned and conclusions including potential next steps for governmental public health officials and other stakeholders.

Project Motivation and Goals

In recent years, HHS adopted the “three-part” aim to drive major health care initiatives. These aims focus reform efforts on reducing and managing the cost of care, improving health care quality and improving the health of the population.¹ In the United States, chronic diseases figure prominently in the overall cost of health care, morbidity and health-related quality of life. As such, many health care delivery and payment reform efforts focus on prevention and effective management of these conditions.

This report addresses the intersection between reform efforts in health care delivery and financing and the mission of governmental public health agencies. State and local governmental public health agencies assess and monitor the health of the population, assure access to services supporting health, and design and implement policies. We focus on collaboration between health care providers and governmental public health agencies to support shared goals through interventions broadly labeled “population health,” primarily at the local level.

Population health interventions aim to produce improvements in health status and quality of life across a geographic group. Geographic boundaries may include state, county, city, neighborhood or community. In addition to geography, groups may be defined by a combination of disease condition, socio-demographics or other factors. Despite their focus on the “many,” ultimately, population health initiatives must help individuals change health-related behaviors. This focus often requires educational and social support in conjunction with high quality medical services. Additional supports beyond medical care are especially important for vulnerable populations with cultural, language and literacy barriers.

Effective use of clinical information may be the key to effective population health interventions. New models for collaboration and care delivery require stakeholders to measure, track and improve quality of care and effectively deploy interventions addressing social determinants (e.g., access to food, shelter, and jobs conducive to health), health education and support for behavioral change. Many of these new models rely on collaboration and data exchange between a diverse set of service providers.

In this context, providers must address varied and complex drivers of health including medical care, behavioral health, public health services, case management and social services. These interventions require public health and provider stakeholders to use information from electronic health records or other sources to effectively target and deliver supportive services. They also require effective mechanisms for communication and coordination across different organizations contributing to population health.

Today, we see promising examples of the potential benefits from this type of collaboration and information exchange with value on both sides. Most population-level health analyses are conducted using either survey or claims data; however, increasingly data captured during patient encounters with health care providers and other providers (e.g., human services and behavioral health) are used to support analysis and coordination. One example of this trend include automated referrals where primary care providers submit information on specific patients to community organizations such as smoking cessation quit-lines or diabetes educators. These organizations may then send a note back to the clinician

confirming the patient’s participation in the intervention and providing other clinically relevant information.

By describing innovative programs, we hope to reveal opportunities and challenges in chronic disease prevention and control to inform future program and policy decisions. In particular, we will describe how program entrepreneurs overcome barriers to data sharing and collaboration.

Approach

For this study, we summarize and analyze observations from a series of in-person and telephone meetings with clinical experts, public health officials, relevant associations, foundations and others knowledgeable in public health informatics and chronic disease prevention and control. We identified these individuals and potential case examples by reviewing the relevant literature (both peer-reviewed and gray literature) and using a “snowball” technique wherein thought leaders helped to identify practitioners testing and implementing the most promising models. We list the thought leaders and practitioners consulted in Appendix 1.

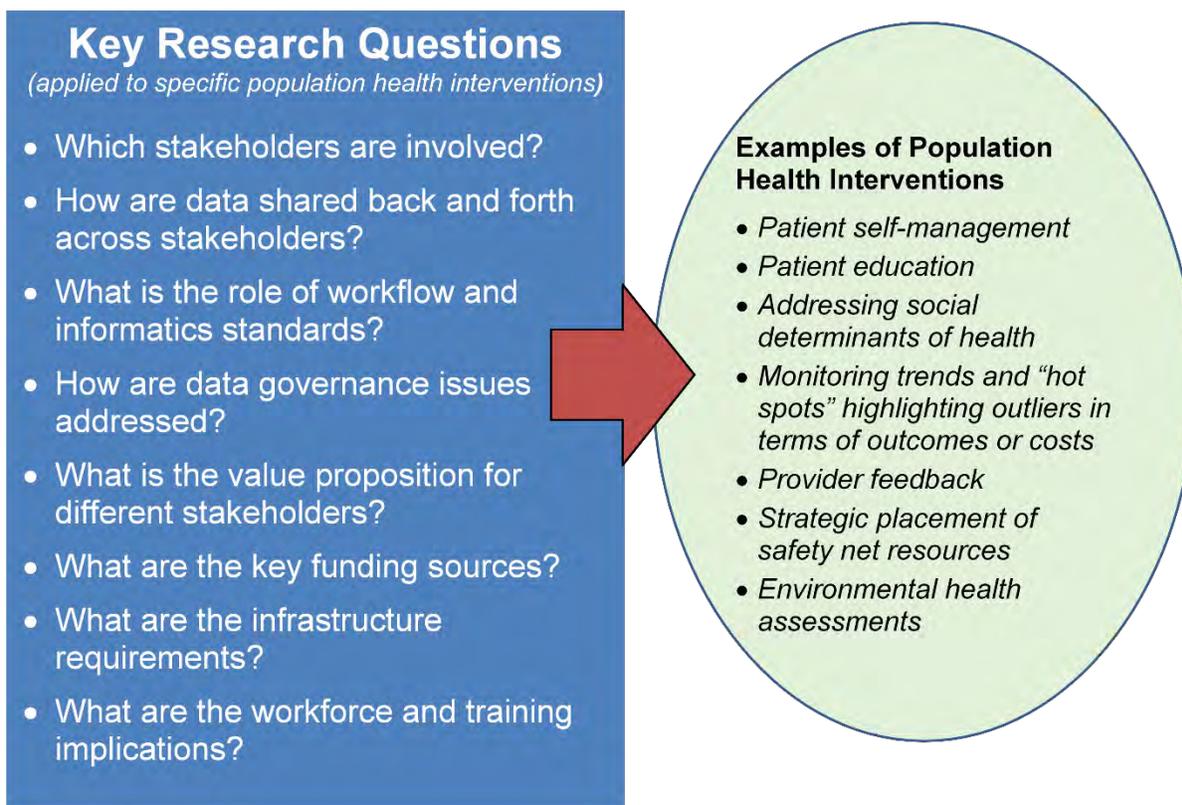
The initial set of discussions helped identify three areas for in-depth investigation: Type 2 diabetes, pediatric asthma and smoking cessation. We selected these areas because of their importance in terms of morbidity, quality of life and cost of health care. Also, based on our initial review, these areas offer examples that demonstrate benefits to be gained from exchange of health information between public health agencies and providers.

Thought leader discussions also helped us identify practitioners involved in innovative programs in each of these three areas as well as research questions to pose to practitioners. We present the framework for key practitioner discussions in Exhibit 1 below. The left side of the exhibit lists different interventions considered population health, a concept we describe in detail in the next chapter. The right side of the exhibit lists different known parameters and barriers associated with these types of interventions.

Depending on the model, interventions may involve patient engagement, identifying social determinants of health, targeting resources, facilitating provider feedback and technical assistance, conducting environmental assessment and other activities. In turn, each of these activities involves or directly leads to “public health action,” which involves an intervention targeted at individuals or providers within a community. In each discussion, we focused on the stakeholders involved in the model, their understanding of the value proposition, workforce and training issues, financial issues and sustainability and other barriers known from prior research.² We focused on projects involving an exchange of clinical

or other health-related data between stakeholders and the governance framework, management practices and infrastructure facilitating that exchange.

Exhibit 1: Framing Research Questions



Following this series of discussions, we convened a group of thought leaders, practitioners and public officials at three one-day technical expert panel meetings at NORC’s office in Bethesda, MD. Each meeting focused on one of our three selected population health priorities. At these meetings, we asked practitioners from three jurisdictions to present their model and engage in discussion with other stakeholders and experts on common barriers. The meeting provided a forum for stakeholders and experts to discuss some of the themes appearing in this paper. We list meeting attendees in Appendix 1.

In the chapter that follows, we describe population health interventions as well as the role of governmental public health and health information exchange. We also describe emerging trends among health care providers and payers that present opportunities to address barriers and motivate greater coordination on population health between public health officials and health care stakeholders.

Chapter 2: Population Health Opportunities in Chronic Disease

To provide context for the project and the discussion of our three priority areas, we first describe important concepts and issues driving this report. In particular, we describe population health as it relates to the mission of governmental public health. We also describe programs encouraging providers and payers to increase their focus on population health and the logic behind collaboration and data sharing across sectors. Finally, we discuss the workflow and data flow required to facilitate this collaboration.

Different Views of Population Health Interventions

Population health is a broad term that can apply to any characterization of health status, health-related quality of life or other health outcomes within and across a group of individuals (often individuals within a specific geographic area). For the purpose of this study, we define a population health intervention as any activity directed at measuring, assessing or taking action to improve health outcomes for all individuals in a geographically defined group. Furthermore, we restrict our focus to activities seeking improvements in health outcomes associated with chronic diseases.

Defined in this way, “population health interventions” may directly address the needs of groups with a specific chronic condition or support change that could help prevent or reduce the burden of these conditions. In the paragraphs below, we describe the overlap between population health interventions and the evolving role of governmental public health practitioners and other stakeholders.

Population Health and the Mission of Governmental Public Health

Governmental public health agencies conduct three core functions: assessment, assurance and policy development.³ We describe each below.

Under assessment, public health agencies maintain the data and analytic resources necessary to characterize health outcomes and health-related factors in a state or local area. To accomplish this mission, public health officials may use surveys or data obtained from health care providers and payers, health inspections and other sources. Examples of this include registries for newborn screenings, immunizations; birth and death records; and surveillance for notifiable conditions. Governmental public health agencies track infectious diseases where state mandates require providers to report disease incidence to public health officials.

As part of assurance, governmental public health agencies work to assure all individuals within a community have access to resources conducive to good health. Public health agencies may directly provide health promotion or health care services, link individuals to different providers, or marshal and coordinate community resources to support patients. In many local areas, governmental public health departments provide essential health care services including preventive care and care for acute infectious diseases such as tuberculosis and sexually transmitted diseases. In many communities, governmental public health agencies also conduct health education activities, manage or participate in health fairs and even provide medical care.

Finally, in the area of policy, governmental public health agencies may help identify and establish standards of care and best practices to support health, target community resources to areas of greatest need and influence policy regarding health behaviors in public facilities and spaces. For example, agencies may recommend or evaluate smoking bans in restaurants, taxes on tobacco and alcohol, or nutrition standards for food in public vending machines.

State health agencies (SHAs) have statutory authority to collect public health data. According to recent surveys, 94 percent of SHAs report they conduct chronic disease centered data collection, epidemiology, and surveillance activities.⁴ In the fiscal years of 2008 and 2009, chronic disease constituted the fourth largest expenditure for SHAs in the United States, amounting to \$1.8 billion.⁵ According to recent surveys, about half of all local health departments (LHDs) report having population centered chronic disease prevention programs.⁶ Even fewer LHDs, 44 percent, report conducting epidemiology and surveillance work as a part of their chronic disease portfolio.⁷

State and local public health stakeholders note that these patterns largely reflect the allocation of federal resources for chronic disease control between state and local governments. Another important distinction relates to primary versus secondary and tertiary prevention activities. Primary prevention refers to activities aimed at a broad population to help educate individuals on behaviors leading to disease and overall strategies to prevent onset. Secondary prevention relates to early diagnosis of disease among an asymptomatic group. Finally, tertiary prevention relates to strategies for reducing complications and advance of a disease that is already symptomatic.⁸ While governmental public health is traditionally involved in primary prevention, stakeholders increasingly point to the need for a greater population-level focus on secondary and tertiary prevention strategies as well.

The Public Health Accreditation Board (PHAB) provides a core list of public health activities to address the concerns surrounding chronic disease. The activities include community health assessments, the

investigation of environmental hazards, health education, health promotion programs, health communications, public health law enforcement, preventive care and chronic disease management and the identification of evidence-based and promising practices.⁹

Exhibit 2: Population Health and Public Health Core Functions

Assessment	Assurance	Policy Development
<ul style="list-style-type: none"> • Community health assessments • Investigation of environmental hazards • Inform provider quality improvement work 	<ul style="list-style-type: none"> • Health education • Self-management programs • Preventive care • Connection to social service providers • Convening community stakeholders 	<ul style="list-style-type: none"> • Identify evidence-based and promising practices • Targeting resources to areas / populations of highest need

Exhibit 2 outlines specific examples of population health interventions as defined in this report that fall within each element of the governmental public health mission. While this is not a comprehensive list, it illustrates how interventions relevant to population health and chronic disease may fall within the functions typically ascribed to LHDs and SHAs.

It is important to note that LHDs play a significantly different role than SHAs in the area of population health. LHDs represent the front-line service providers, food and environmental inspectors and public health clinicians. LHD providers directly engage with members of the community, manage cases of notifiable illnesses in conjunction with health-care providers.

In many cases, LHDs do their work as an agent of SHAs who directly receive categorical funding from the federal government. For example, in this capacity LHDs often implement national programs to improve access to maternal and child health services and HIV/AIDS care. In many states, LHDs are the primary agencies responsible for delivering benefits under the Women, Infant and Children (WIC) program. LHDs also play an important role working with schools, other government entities and community-based organizations (CBOs) to support community health and provide health education.

SHAs typically do not provide direct services, although a limited number of states have a centralized public health structure where LHDs are part of the SHA. In most cases, SHAs focus on managing state-wide public health data sources including surveys, registries, notifiable disease surveillance and syndromic surveillance systems. SHAs also work with LHDs to take appropriate action indicated by these

data. Finally, SHAs manage the sharing of data on notifiable conditions and syndromic surveillance with the Centers for Disease Control and Prevention (CDC).

In addition, SHAs manage and distribute funds from the CDC, the Health Resources and Services Administration (HRSA) and the United States Department of Agriculture (USDA). These programs fund many services including maternal and child health services, HIV/AIDS care and preventive care including vaccination. As noted previously, SHAs typically disburse funds to LHDs to implement these programs, set reporting requirements for LHDs and manage reporting on program outcomes back to the federal funder.

Population Health and Health Care Providers and Payers

Following from the discussion above, the success of chronic disease population health interventions relies heavily on the participation of health care providers on the front-lines of prevention, diagnosis and treatment. While providers generally focus on treatment of individuals, increasingly providers have tools and incentives to look at their entire panel of patients as part of quality improvement. Performance-based payment through mechanisms such as Accountable Care Organizations (ACOs) and patient-centered medical homes (PCMHs) encourage providers to address patient needs beyond one-on-one medical care.

As we noted at the beginning of this report, the three-part aim underlying HHS' health care delivery and payment reform initiatives emphasizes population health alongside health care quality and cost control as important goals for those involved in delivering and financing health care. Health care providers and payers manage critical data on risk factors, diagnoses and clinical statuses necessary to support chronic disease population health efforts.

In part, due to incentives and support provided through the Health Information for Clinical and Economic Health Act (HITECH), an increasing number of providers capture and manage these data electronically using electronic health records (EHRs). In some cases, HITECH initiatives such as the State Health Information Exchange Cooperative Agreement Program help establish mechanisms for providers to share data to support population health.

In the case of the Beacon Cooperative Agreement program, HITECH funds support the use of health IT to achieve delivery system reform and population health goals through community wide health information exchange (HIE) and data aggregation and analysis. For example, the Southeast Minnesota Beacon Community uses HIE to give providers at schools, pharmacies, clinics, and hospitals access to comprehensive patient information on pediatric asthma and adult diabetes patients. This initiative, in part,

aims to increase the number of children diagnosed with asthma who have documented asthma action plans.¹⁰

The Patient Protection and Affordable Care Act (ACA) of 2010 also created new opportunities for provider and payer engagement in population health. Through expansion of Medicaid and creation of health insurance exchanges, the ACA aims to increase the number of Americans with insurance. This means health care providers will be asked to prevent and manage chronic disease over a larger insured population. In addition to insurance coverage expansion, the ACA gave providers and communities important tools to achieve the three part aim. These tools include a new set of Medicare and Medicaid demonstration and waiver programs to promote use of payment models that reward providers for coordinating to manage costs and improve outcomes, as well as improve coverage for clinical preventive services and case management.

While limited, we found some examples of governmental public health agency participation in population health management initiatives funded through the ACA. For example, the ACA created the Centers for Medicare and Medicaid Innovation (CMMI) to rapidly deploy and test interventions to achieve the three part aim that cuts across Medicare, Medicaid and privately insured populations. Among the initiatives funded through this new center are a series of Health Care Innovation Awards (HCIAs). The first round of 107 HCIAs was announced in 2012 and CMMI announced another round of 39 awards in 2014. These programs employ workforce training strategies, disease management approaches, care coordination, health education and other mechanisms to demonstrate cost reduction and quality and outcomes improvements. We describe some of these awards, particularly those involving governmental public health agencies, as part of the Type 2 diabetes and pediatric asthma chapters.

Another CMMI initiative known as State Innovation Models (SIM) provides funding that allows state governments to use all of their policy-levers to implement payment and delivery reform innovation. The goal of the program is to reduce

Massachusetts uses SIM to enhance the state's data infrastructure. They will use the award to establish general, vendor-neutral specifications for a public domain version of an e-referral system that would allow bidirectional communication between clinical and community sites.

The system would enable health care providers and community organizations to exchange information on shared clients and more efficiently track services through electronic referrals. For example, although health care providers currently refer patients to CBOs for health education and other services, without a bidirectional system, they do not know whether patients have attended learning sessions or received services. Thus, through systematic "clinical-community" linkages, Massachusetts aims to improve provision of community-level health education and interventions, as well as to promote more coordinated follow-up with providers.

Communication between clinical and community sites will resemble an email system. When a provider seeks to refer a patient for a community-based service, they will obtain and record consent from the patient for inclusion in the system and then send the patient's contact information as a referral from the provider's EHR to the appropriate community-based resource.

long term health risks for beneficiaries of public programs. The program also seeks to demonstrate ways state government can influence private payers through their employee benefits programs, state-run insurance exchanges, employer coalitions and other mechanisms. Many SIM states note coordination with state public health agencies as an important goal for their program. The text box at right outlines Massachusetts' use of SIM to provide information tools facilitating referrals between providers, LHDs and CBOs.

Another outcome of the ACA is a new Internal Revenue Service (IRS) requirement for hospitals operating under 501(c)(3) organizations to conduct a Community Health Needs Assessment (CHNA). The law requires hospitals to define their surrounding community and identify significant health needs for the population they serve, including an explanation of financial barriers to care.¹¹ The law also requires consultation with governmental public health agencies and the development of strategies to address specific health needs raised through their assessment.

The CDC provides online resources to help hospitals meet the requirements of the CHNA. This includes a tool created by Kaiser Permanente, which helps hospitals discover significant health needs in their community.¹² Kaiser Permanente's tool combines hospital driven data, including number of discharges per disease, readmission rates, and lengths-of-stay, with community centered information that can explain why people need care, such as access to nutritious foods, physical activity, and smoking prevalence. Other criteria include demographics, income, insurance status, and access to care.¹³

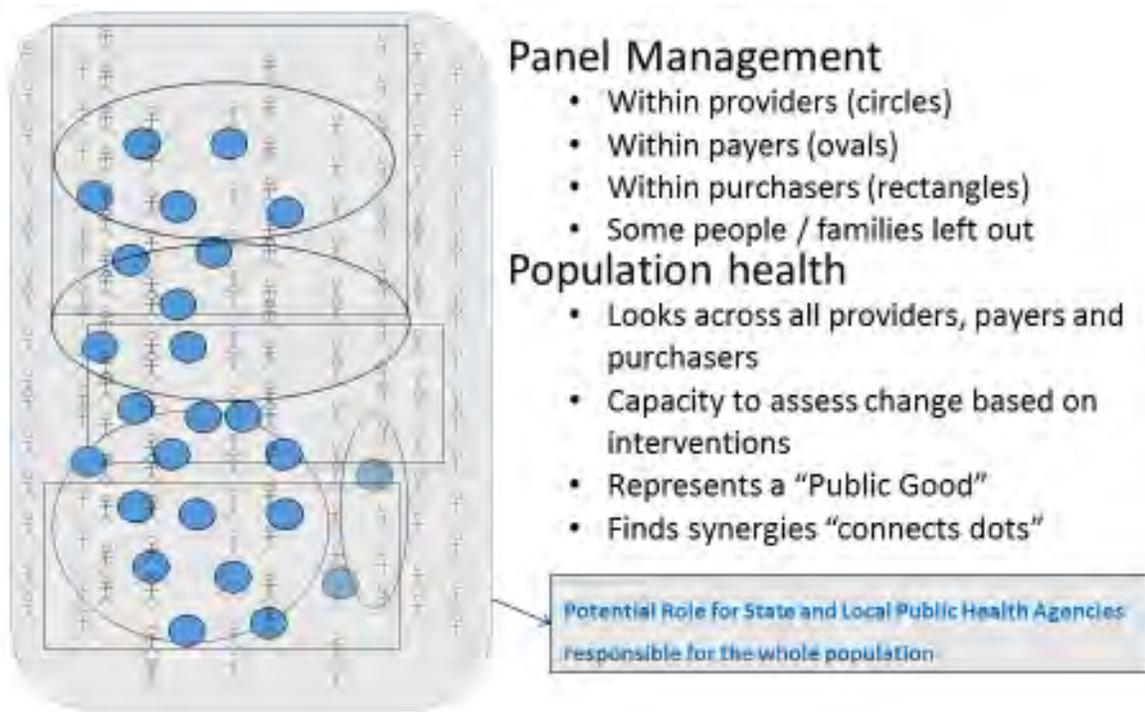
Need for Cross-Sector Collaboration

The capacity to collaborate and share data across health care, public health and other partners becomes important in the context of supporting public health core functions. Although they share an interest in population health, health care providers, payers and purchasers typically focus exclusively on interventions relevant to a specific population they insure or treat (their panel).

Given this context, multiple factors may hamper exclusively payer- or provider-driven efforts to implement population health even under a scheme linking payment to health outcomes. For example, because individuals routinely move in and out of treatment by a provider or coverage by a payer, any single provider or payer may not realize the long-term financial benefits that can be accrued from investing in comprehensive population health. Health care providers may not have the capacity, resources, expertise or contacts necessary to support the most effective population health activities or even to link patients to relevant social service providers and community based organizations.

Exhibit 3 illustrates the difference between health care and public health approaches to population health. The left-hand side of the figure illustrates how a population residing in a single geographic area may be split in terms of their affiliation with particular providers, payers or purchasers (e.g., employers). In the context of panel management conducted at the provider, payer or purchaser level, any given individual may be part of several or no panels.

Exhibit 3: Population Health versus Panel Management



Furthermore, the movement of patients across providers and between payers and employers complicates the capacity and incentive for comprehensive and continuous population health management. For example, ACOs that gain financially from improving health outcomes may still not have the best incentive to offer early comprehensive preventive care or chronic disease education, if associated outcomes improvements will manifest only after a long period of time during which they will experience substantial turnover in patients.

Governmental public health agencies address needs across the entire population in a given geographic area. In some cases, governmental public health agencies have played a particularly important role for individuals and families that fall outside of any payer, provider or purchaser panel: the uninsured and

underserved. Public health agencies therefore often provide health education, preventive services, and medical services to those in greatest need.

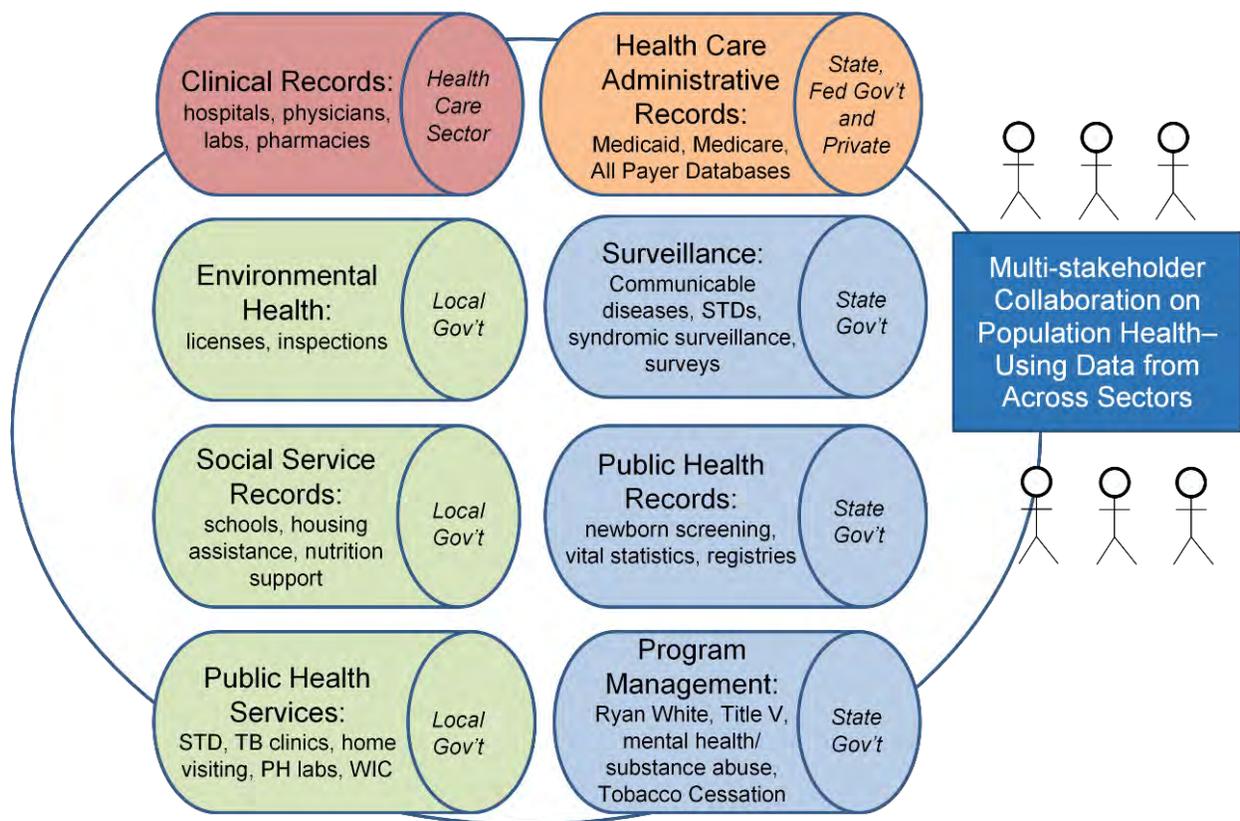
At the local level, the roles, responsibilities, and overlap between the health care, public health and the community at large may vary. For example, while providers may diagnose chronic disease and prescribe medical treatments, they typically can only offer counsel regarding self-care behaviors. On the other hand, LHDs and CBOs may be able to directly provide health education and additional resources (e.g., cooking and exercise classes) to help prevent and control chronic disease. Many LHDs have better capacity than health care providers to connect individuals with resources aimed at social determinants of health including housing, food security, job training and other basic needs. Therefore, we assume an important and ongoing role for governmental public health agencies focused on the entire population within a state or local jurisdiction.

Entities outside these sectors also play an important role in chronic disease population health interventions. In particular, CBOs such as YMCAs, community coalitions, religious institutions, shelters, food pantries and others often provide relevant services. Within government, schools, job councils and local agencies providing housing or heating assistance engage individuals in ways that can support population health. This reality further highlights the importance of collaboration and information sharing across sectors. There is often an opportunity for public health to facilitate this collaboration by serving as a convener between the for-profit and non-profit sectors and to facilitate connections to other public agencies or even providing support or technical assistance to CBOs.

Exchanging Information Relevant to Population Health

Cross-sector collaboration to support population health relies on effective mechanisms to exchange information on the needs of any individual and share analyses on trends across a community. On the patient-level, providers who identify high-risk individuals and diagnose chronic illness may help improve health outcomes by electronically referring an individual to relevant community-based health education services. Exhibit 4 below illustrates different data sources relevant to population health, further emphasizing the importance of collaboration and data sharing. In this Exhibit, the blue boxes represent data typically managed by state health departments, the green boxes contain data typically managed by local agencies, the red box represents data typically managed by private providers and the orange box represents data typically managed by public and private payers.

Exhibit 4: Data Relevant to Population Health



Of the data sources presented in Exhibit 4, perhaps the greatest value for chronic disease population health interventions can come from better use of clinical data from provider EHRs. EHR data may allow for a more efficient and cost effective approach for tracking chronic diseases, including diabetes and asthma. Population-level data collected from EHRs has the potential to provide important information to both providers and public health officials.

For example, to obtain prevalence estimates for diabetes or asthma within small geographic areas, public health agencies would benefit from the use of de-identified clinical data, which may be more accurate and less costly than surveys; however, de-identified data has its limitations especially in cases for which it is necessary to disaggregate data from multiple sources covering a distinct geographic area. Data from EHRs only reflects the subset of the population seeking health care. This group tends to have more advanced disease than those who have chosen not to seek health care. In addition, data within EHRs is not consistently collected across individuals because degrees of care seeking vary. Still, municipalities such as New York City are testing how health related estimates derived from EHR data covering a large number of providers compare to data collected systematically from a representative sample of residents.¹⁴

Providers, payers and other stakeholders may use population data from EHRs to construct and compare clinical process metrics and outcomes, which allows providers to identify gaps in care and improve workflow to promote better quality. The use of EHRs may also encourage team-based population care by facilitating providers’ referrals to resources at LHDs or CBOs, such as diabetes education or smoking cessation programs. Finally, data from EHRs has the potential to address health disparities in chronic disease by expanding available data for important sub-groups, including children and particular ethnic and racial groups.¹⁵

Overall Challenges and Opportunities

As described above, we see great potential for using electronic data shared between health care providers, governmental public health agencies and other community partners. However, our discussion and earlier research points to important barriers to effective coordination and data sharing to promote population health. These challenges range from the limited mandate for governmental public health agencies in relation to chronic disease, limited public health IT infrastructure and historic lack of coordination between governmental public health agencies and health care providers.

Care Management Information System (CMIS) in North Carolina

Case managers in the state support population health by using this repository of Medicaid claims and encounter data, hospital data on demographics, admissions and transfers and clinical laboratory data. LHDs use these data in “real-time” to refer patients to necessary services and coordinate care across providers. Standardized reports out of CMIS support quality improvement and help track health outcomes for the Medicaid population.

Population health interventions in the area of chronic disease are also relatively new. This means that there are few mandates or consistent practices across jurisdictions. This differs from other public health information exchange use cases such as childhood immunizations and newborn screenings where state laws require reporting. In these instances, providers and public health officials use structured workflows and data flows based on decades of

experience. Without a mandate or clear agreement on the role for either providers or public health officials for chronic disease population health, it is difficult to identify logical data sharing processes or principles that are relevant across jurisdictions.

This paper attempts to shed light on emerging practices around the country to motivate future programming and work towards establishing standards in the area of chronic disease population health. In particular, we focus on the potential role of governmental public health agencies as key data exchange partners for facilitating population health activities. Importantly, we also attempt to describe how current and future interventions may create value for health care providers and governmental public health. This focus guides our selection of case examples and our discussions with experts.

In an environment where policymakers have challenged providers and payers to improve population health, multiple mechanisms might support a cross-sector value proposition. For example, small physician offices may benefit from the capacity to seamlessly refer patients for education, training or human services they themselves cannot provide. ACOs, health systems, health centers and non-profit hospitals may benefit in different ways depending on their participation in specific programs with incentives to demonstrate improvements in health outcomes and health-related behaviors.

Governmental public health agencies may be able to leverage their community connections and population focus to facilitate provider connections. Furthermore, public health agencies may benefit organizationally and financially by using these initiatives to define and establish their role in the area of chronic disease control and justify specific technology investments. Prior research demonstrates the challenges that follow from the current wide variations in how governmental public health approaches information technology investments and chronic disease control initiatives.

For all their potential, using and sharing electronic clinical data to support population health poses substantial technical, operational and legal challenges. In the first instance, each EHR installation will capture and manage data differently. For example, even in cases where multiple providers in a community use a common EHR vendor and product or product-line, each provider may capture data differently. Ultimately this leads to data sets where information is structured and coded differently, resulting in challenges for aggregating, analyzing and even sharing data.

A series of projects using EHR data for advanced surveillance and research address this problem through complex data processing, normalization and modeling.¹⁶ However, turning EHR extracts into analyzable data remains largely the province of leading academic institutions rather than every-day practitioners. New and refined standards for structured data capture, storage and exchange such as those fostered through the Office of the National Coordinators Standards and Interoperability (S& I) Framework may obviate the need for advanced data processing and modeling over time.

Another challenge to using electronic clinical data stems from the legal responsibilities of covered entities (e.g., health care providers and payers) under the Health Insurance Portability and Accountability Act (HIPAA). To ensure the privacy of health information associated with an individual, HIPAA prohibits disclosure of health data for purposes outside of clinical care, payment or health care operations without a patient's consent. HIPAA does include a public health exemption. However, depending on the jurisdiction and institution, stakeholders may interpret this exemption as applying only to data that providers must legally transmit to public health agencies.

Without consent from patients or an IRB waiver and outside of the context of clinical care, payment or operations, HIPAA allows providers to share health care data only if they are de-identified and aggregated. While de-identified data may support some population health use cases, identifiers are necessary to take public health action to support the needs of individual patients.

Role of Informatics Standards

Under HITECH, HHS established an EHR certification process and requirements for providers to demonstrate Meaningful Use of EHRs. In part, these criteria require the software's compatibility with standards for coding and sharing data. Three sets of relevant standards include content standards that specify the vocabulary used to specify concepts, messaging standards that specify the concepts that must be included in a message that aims to achieve a specific purpose and transport standards that specify the mode of transmission of the message from one user's computer to another.

Effective use of these standards for the purposes outlined in this paper requires general agreement on the workflow and dataflow necessary to accomplish different population health interventions. For example, standards can be applied to scenarios where stakeholders understand exactly where relevant information originates, who needs to share and receive the information, and how they plan on using the information.

The Consolidated-Clinical Documentation Architecture (C-CDA) standard is a series of messaging standard templates endorsed as part of EHR certification. Bodies such as the Public Health Data Standards Consortium (PHDSC) are working to specify how C-CDA templates may be used to support population health interventions. We refer to the C-CDA and associated templates in our discussion of specific cases below. We also identify "Direct" as a transport standard that can support efficient and secure exchange of patient data as potentially relevant to population health interventions.

In the section that immediately follows, we outline an approach to population health management employed in Webster County Iowa. This arrangement provides a relatively comprehensive example for the overall set of issues and opportunities we address in this paper.

Webster County, Iowa

Webster County is a rural county with a population of approximately 37,000 located in central Iowa.¹⁷ The Webster County Health Department in Iowa partnered with Trinity Pioneer ACO that champions a community based approach to population health. The partnership was built through a Community Transformation Grant from the Iowa Department of Health, establishing a relationship that would improve coordination among the Pioneer ACO's five priorities for public health: "promote and maintain

health, prevent illness and disability, provide coordinated care experiences, manage population health, and support choice through the lifespan.”¹⁸

The health department and ACO collaborated to form a referral system, in which a referral is triggered by the primary care provider for a patient in need of a public health service. These referrals flow through a “tri-navigational” triage process where providers refer specific cases for medical, behavioral health or public health follow-up. Public health follow-ups may include child/maternal health home visiting, chronic disease self-management, home-health programs and smoking cessation counseling.

To streamline the flow of information for the referral process, Webster County uses one of the C-CDA templates known as the Continuity of Care Document (CCD) that includes important patient data related to the smoking cessation intervention, such as course enrollment and completion date, as well as additional referral recommendations. Currently the CCD forms (referrals) are sent via fax, but both parties are hopeful that the CCD form will eventually be embedded into the hospital EHR.

The Health Department uses an EHR called “CHAMPS” to track patient data from the various public health interventions. The database is customized to capture patient screenings, assessments, and programming in addition to immunizations, and displays patient data in a “My Care Profile.” The Health Department is in the process of figuring out a way to give an Emergency Room case manager and physician access to the CHAMPS system; and the Public Health Department plans to expand provider access the system. Additionally, the Public Health department has access to a read-only view of the patient EHR from the hospital.

The public health and ACO partnership, although successful, encountered several challenges that impacted its implementation. Initially, the ACO viewed the Public Health Department as an organization that could substitute for their own services instead of as a resource playing a different function. Once the potential for collaboration was realized, both parties needed to agree on what information needed to be shared between ACO providers and the Public Health Department.

In implementing this program, one Webster County official pointed out the limitations of the CCD.

Although the current form facilitates successful exchange from providers to public health using vocabularies for medical terminology (e.g., ICD-9 codes and SNOMED codes), the form does not easily handle text entered by or relevant to the public health practitioner. To make use of the CCD to effectively exchange information in narrative form, the CHAMPS system used by Webster County and the EHR

software used by the ACO providers need to be modified. To date, agreements have been made to facilitate these modifications, but details about the nature of the agreements have not been released.

Third, the ACO has achieved promising levels of profit sharing, but has yet to reach full profit sharing potential due to the up-front IT expenditures needed to establish the Pioneer ACO. Lastly, state legislation is unable to keep up with technological advances. As a result, the Public Health Department is regularly contacting the state about updating legislation to accommodate the advances in the electronic records systems and information exchange platforms.

Webster County stakeholders noted that, moving forward, demonstrating the economic value of bidirectional exchange will be critical to the sustainability and growth of their program. The Public Health Department is in the process of collecting cost information to demonstrate value of this initiative. Already, there have been a number of success stories that have demonstrated the potential positive impact of information exchange on disease management and long-term health care costs. Webster County highlights several patient case studies in their 2014 Community Care Coordination Report that have projected significant cost savings as a result of the Community Care Team intervention. For example, one patient with mental health issues utilized the emergency department 15 times in two and a half months and was admitted to an inpatient psychology unit for two weeks before being referred to the program.¹⁹ After referral to the program, the patient was admitted to home care and the patient did not visit the Emergency Department or inpatient care, saving an estimated \$37,750.²⁰ The greatest estimated cost saving among featured case studies totaled \$309,750 for one patient.²¹ In the chapters that follow, we explore additional opportunities and challenges in detail in the context of the three population health priorities identified in the introduction to this report: Type 2 diabetes, pediatric asthma and tobacco cessation.

Chapter 3: Focusing on Diabetes

In the United States, 29.1 million children and adults have diabetes (Type 1 or Type 2), representing 9.3 percent of the population. Of this affected group, only 21.0 million people have received diagnoses with the disease, leaving 8.1 million people undiagnosed. The populations affected by diabetes for people 20 years of age and older include 7.6 percent of non-Hispanic whites, 9.0 percent of Asian Americans, 13.2 percent of non-Hispanic blacks, and 12.8 percent of Hispanics. In addition, approximately 86 million people in the United States 20 years of age and older have pre-diabetes.²²

Diabetes has a significant impact on health outcomes and creates a substantial economic burden for individuals, health care organizations, and businesses. In 2010, diabetes was the primary cause of 69,071 deaths and contributed to an additional 234,051. Financially, the total cost of diabetes in the United States was \$245 billion in 2012, with \$176 billion attributed to direct medical costs. Diabetes also impacts the productivity of workers, and resulted in a \$69 billion loss in 2012. Overall, diabetes patients on average have 2.3 times the amount of medical expenditures than do those without diabetes.²³

Exhibit 5 below describes the relationship between diabetes control and population health interventions as described in this report. Specifically, there are a series of diabetes-related factors addressable through population health interventions including diet, exercise, activity level and social determinants.

Exhibit 5: Population Health Opportunities for Type 2 Diabetes

- Identifying / addressing risk factors

- Activity level
- Diet
- Genetics
- Smoking cessation
- Social determinants

- Post-diagnosis focus

- Diet and exercise
- Glucose monitoring
- HbA1c, BP, and Lipid tracking
- Medication management
- Foot and eye exams
- Social determinants

Population health activities:

- Epidemiologic assessment
 - Benchmarking
 - Tracking trends
 - Needs assessments
 - Hot-spotting
- Assurance
 - Telephone counseling
 - Education, self-management
 - Case management
 - Technical assistance

Public Health Initiatives in Type 2 Diabetes

Many local health departments address diabetes using the core public health functions of assessment, assurance and policy development. Specific initiatives include diabetes prevention and diabetes self-management. The Community Preventive Services Task Force recommends combined diet and physical activity promotion programs to prevent Type 2 diabetes among people at increased risk of the disease.²⁴ The Community Preventive Services Task Force also suggests that stakeholders implement diabetes self-management programs in community centered locations for adults suffering from Type 2 diabetes, as well as homes inhabited by children and adolescents suffering from Type 1 diabetes.²⁵

Given that 95% of all persons living with diabetes have Type 2 diabetes and Type 2 accounts for the majority of diabetes-related morbidity, mortality, and costs, many diabetes-related population health efforts focus on the population with Type 2 diabetes and those at increased risk. NACCHO defines diabetes self-management as “a collaborative process through which people with or at risk for diabetes gain the knowledge and skills needed to modify behavior and successfully self-manage the disease and its related conditions.”²⁶

LHDs around the country use diabetes self-management models, to support their work. Some of these programs are recognized or accredited by national organizations such as the American Diabetes Association or the American Association of Diabetes Educators. Many LHDs use the Stanford Diabetes Self-Management program (DSMP). The DSMP is Type 2 diabetes specific and focuses on improving health by concentrating on healthy behaviors, self-efficacy and improving glycosylated hemoglobin (HbA1c) levels. Additionally, the program works to decrease emergency room visits and reduce healthcare expenditures.

DSMP values “preventing, detecting, and treating acute and chronic complications,” as well as implementing goal-focused approaches to improving physical and mental health. The program runs in six week cycles offering a total of 15 hours of instructions, or 2.5 hours per week. The program caps instructional sessions at 16 people taught by two instructors, with one of the teachers having Type 2 diabetes.²⁷

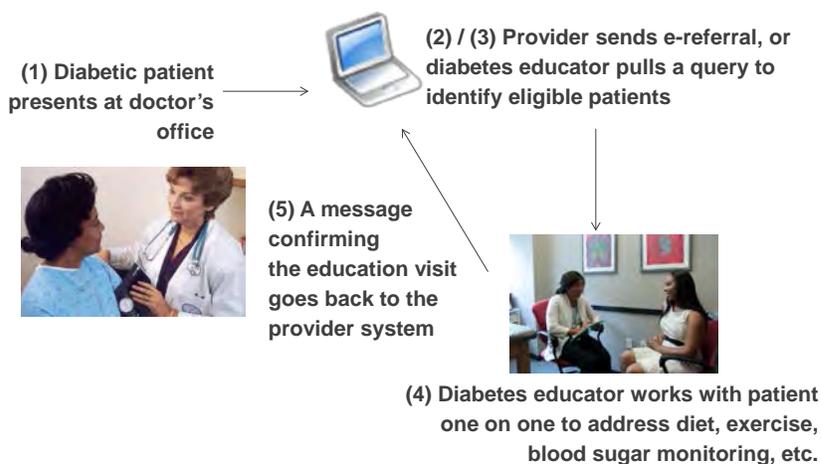
The ACA also resulted in some specific implications for diabetes population health interventions. As part of the ACA, Congress authorized the CDC to oversee the National Diabetes Prevention Program that included “a grant program for model diabetes prevention sites, diabetes prevention program recognition, training, and evaluation.” Government bodies, community-based organizations, health care organizations

and insurance companies, employers, and academic professionals collaborate on this program to “prevent or delay the onset of Type 2 diabetes among people with pre-diabetes in the United States.”²⁸

The initiative emphasizes lifestyle change programs that are based very closely on the NIH-sponsored Diabetes Prevention Program, a randomized controlled trial that provided definitive proof that lifestyle change, leading to a 7% change in weight, could significantly reduce the risk of diabetes in individuals with pre-diabetes.²⁹ Lifestyle coaches, trained by organizations that use a CDC-approved curriculum, work in small groups to implement a “1-year lifestyle change program,” which operates on a weekly basis for 16 sessions, and concludes with six monthly sessions.³⁰ The intervention focuses on physical activity, a healthy diet, and emotional well-being to achieve 5-7% weight loss which can reduce the likelihood of obtaining Type 2 diabetes by about 60 percent for those with pre-diabetes.³¹

The National Diabetes Program works in tandem with health care providers to refer potential candidates to a variety of locations throughout the community or organizations that offer the program. The CDC also encourages local governments to include lifestyle change programs as a benefit to public workers. Exhibit 6 below shows a model for how bidirectional exchange of health data can support referral to diabetes education programs.

Exhibit 6: Managing Referrals to Diabetes Education



Health Care Provider Focused Diabetes Initiatives

Given the high cost of diabetes, health care providers and payers have long focused on prevention and active disease management. CMS encourages active approaches to diabetes management in multiple ways. For example, Medicare’s Quality Improvement Organizations (QIOs) conduct national diabetes

self-management evaluations (DSMEs) to “improve the effectiveness, efficiency, economy and quality of services delivered to Medicare beneficiaries.”³²

QIOs are private, generally not-for-profit organizations with CMS contracts to evaluate medical care and improve the quality of care for Medicare beneficiaries.³³ CMS implemented the first DSME program in August 2008, which ran until July 2011 in Maryland, Washington DC, Louisiana, Georgia, New York, and the U.S Virgin Islands. The second phase operated from November 2009 through July 2011 and focused on the state of Mississippi. The third phase took place in Texas, and was active from September 2010 until July 2012.³⁴ In September 2012, CMS launched the “Everyone with Diabetes Counts (EDC)” program, which was an extension of the DSME model.

Currently, the program is active in New York, Texas, and West Virginia and focuses on Medicare beneficiaries within African American, Hispanic and minority communities as well as undeserved rural populations. The EDC initiative monitors how well patients believe they can care for themselves after receiving community-centered DSME, and the clinical status of the patient to gauge the effectiveness of the program. The intervention holds sessions on a weekly basis and runs for a total of 6 to 10 weeks. Led by a certified diabetes instructor, the class focuses on nutrition, exercise, self-monitoring, diabetes medications and community resources and support. The class is free for eligible beneficiaries.³⁵

Regional Case Examples

We now turn to a series of case examples describing models used for managing and controlling population health through collaborative interventions involving data sharing or exchange.

Durham and Cabarrus Counties, North Carolina

In the prior chapter, we identified HCIA as a program with some population health components originating out of the ACA. One of this program’s awardees, Duke University, supports integrated teams implementing a model for improving health outcomes and quality of life for those with Type 2 diabetes in four Southeastern counties, two of which are in North Carolina. The innovation program, the Southeastern Diabetes Initiative (SEDI) is using HCIA funds to capture EHR, demographic, and environmental data from each county to create a comprehensive, integrated data warehouse to accurately reflect the risk of hospitalization or death facing persons living with diabetes at the individual, neighborhood, and community level.

This spatially-enabled informatics system allows for the implementation of targeted interventions for people at different levels of risk. These interventions include an intense clinical intervention from a multi-

disciplinary team that provides care to the highest risk patients living with diabetes as well as additional individual and neighborhood interventions to moderate and low-risk patients and neighborhoods. Additionally, the data warehouse provides real-time monitoring of individuals and populations with Type 2 diabetes and serves as the basis for decision support and evaluation of the interventions. Much of the compiled EHR data are sourced from federally qualified health centers.

New York City

The New York City Department of Health and Mental Hygiene (DOHMH) uses bidirectional information exchange between public health and health care to support population health management. Two examples of the department's use of bidirectional information exchange, the Primary Care Information Project (PCIP) and the HbA1c registry, are described below.

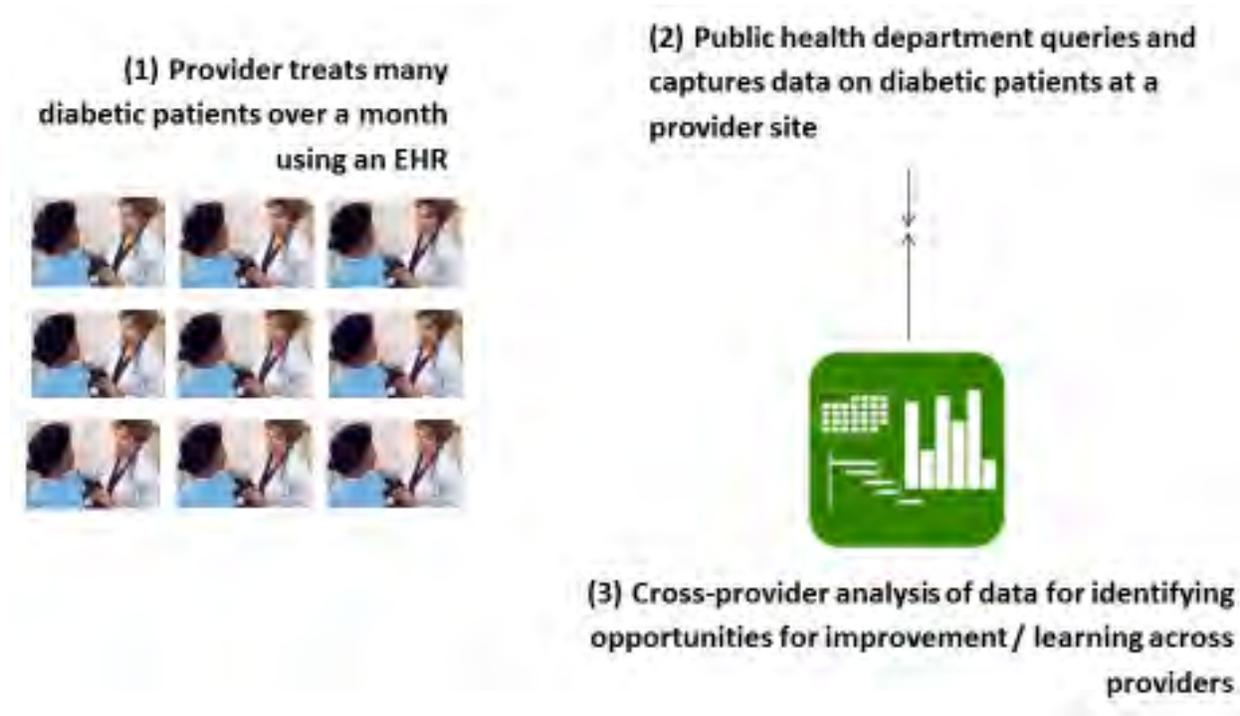
Primary Care Information Project (PCIP)

The DOHMH's PCIP captures EHR data from a large percentage of primary care providers in New York City and uses these data for a variety of purposes including benchmarking and facilitating quality measurement on the care for chronic illnesses such as diabetes control, hypertension control, and tobacco cessation.

For many years, PCIP has helped NYC providers adopt the eClinicalWorks (eCW) EHR and has operated a hub that allows DOHMH to dynamically push out EHR database queries, which in turn are reported back as aggregate count data. The Health Department transforms this EHR data into visual dashboards illustrating each provider's performance on quality measures compared with the PCIP practice average or evidence-based guidelines.

Over the past two years, providers have received the quality dashboards monthly via email. DOHMH delivers technical assistance to providers to improve performance on measures. The dashboards and accompanying assistance represent a large-scale approach to public health's use of EHR data to indirectly support access to high quality primary care.

Exhibit 7: Collaborating with Providers on Quality Improvement



More recently, DOHMH has used EHR data to identify community needs. By targeting specific areas and populations, public health officials can better focus its resources as well as inform larger programmatic efforts across other agencies. For example, in 2014, DOHMH targeted diabetes and promoted its Diabetes Prevention Program (DPP). The department uses EHR data to identify medical practices that may be good partnering sites to promote clinical referrals to DPP. DOHMH teams then deliver technical assistance to those practices to raise awareness about DPP and encourage clinicians to make referrals to the program. Clinicians may set alerts in their EHRs to refer patients at high risk of a diabetes diagnosis and may implement a trigger system for electronically filling out a referral form at the time of the alert.

HbA1c Registry

To further respond to the increasing burden of diabetes on public health, the DOHMH stores HbA1c data from laboratories with patient demographic information in a single “HbA1c registry.” The department uses the registry data in conjunction with GIS analytics to identify high density areas of poorly controlled diabetes at the neighborhood block level. The health department has been using this data to build maps of diabetes hot spots, with overlays of public housing data and available community partners and resources. This effort shows a “proof-in-concept” for data sharing and creating analytic resources using HbA1C data; however, stakeholders concede facing challenges in using the registry to inform and improve upon effective public health action.

Chapter 4: Focusing on Pediatric Asthma

Asthma is a chronic lung disease that affects 7.1 million children in the U.S., representing 9.3 percent of the pediatric population. Of these children affected by asthma, 4.1 million suffered from an asthma attack or episode in 2011.³⁶ This chronic condition can be complex and difficult to manage, leading to poor medication adherence and disparities in outcomes.

Currently, asthma is the third leading cause of hospitalization among children under the age of 15. In 2010, approximately 640,000 emergency room visits were due to asthma in children under 15.³⁷ Costs associated with asthma increased from approximately \$53 billion in 2002 to \$56 billion in 2007. Over that time period, the annual cost of asthma (for adults as well as children) averaged about \$3,300 per person in terms of health care expenditures, missed school and work days, and early deaths.³⁸

Exhibit 8 below illustrates the relationship between asthma control and population health interventions as described in this study. Asthma-related risk factors can be addressed through population health interventions that focus on environmental triggers and social determinants and promote more effective disease management after diagnosis.

Exhibit 8: Population Health Opportunities for Pediatric Asthma

- **Identifying risk factors for exacerbation:**

- Exposure to environmental triggers
- Social determinants

- **Ongoing measures:**

- Basic education
- Medication management
- Referral for home based trigger reduction
- Social services

Assessment:

- Benchmarking provider quality
- Tracking needs across community
- Hot-spotting needs across a community

Assurance:

- Self-management
- Case management
- Home visiting
- School-based interventions

Public Health Initiatives in Pediatric Asthma

Population health initiatives, such as hot-spotting and home visiting, present valuable opportunities for the involvement of public health departments in addressing asthma in the community. However, findings from national surveys indicate that most governmental health departments do not provide services specific to asthma. Only 19 percent of local public health departments reported helping patients and families manage and avoid complications associated with asthma.

While 43 percent of state health agencies report providing asthma prevention services, only 15 percent and 7 percent perform asthma screenings and treatment services respectively.³⁹ To encourage asthma control in communities, the CDC has run the National Asthma Control Program (NACP), which funds state health agencies to improve asthma treatment, management, and control across the nation. Currently, 36 NACP grantee states (including the District of Columbia and Puerto Rico) are involved in efforts to improve asthma surveillance, conduct training for health professionals, offer education to individuals with asthma and their families, and promote communication about asthma to the public.

Hot Spotting (Geocoding)

Hot spotting uses data mapping to locate areas in the community that have high medical expenditures or incidence of disease.⁴⁰ This mechanism targets areas with patients that have chronic conditions and are frequent visitors of hospitals and health care clinics. Hot spotting provides the opportunity to identify areas with a high prevalence of asthma and determine the environmental or socioeconomic factors that are associated with higher rates of disease.

The burden of asthma in a community can be reduced by more effectively coordinating care and tailoring interventions to specific groups who would benefit from social services as well as other supplemental activities. By targeting specific areas and populations, public health departments can better focus their own resources and inform larger programmatic efforts across other agencies. Hot spotting using clinical data can be useful to share knowledge and validate trends. However, some note that efforts that use socioeconomic status or other indicators may be just as effective for targeting resources as those relying on de-identified clinical data.

Home Visits & School-based Initiatives

Home-based interventions allow health care professionals to identify potential triggers and offer solutions to families who may otherwise not have known or been able to remove environmental triggers from the home. The Community Preventive Services Task Force recommends the use of home-based multi-trigger,

multi-component interventions with an environmental focus to combat pediatric asthma.⁴¹ These interventions typically include assessment of the home environment, making changes to reduce exposure to asthma triggers and education about indoor allergens and irritants.⁴² In addition, these efforts are supplemented with non-environmental activities that include training and education to improve asthma self-management, general asthma education, social services and support, and care coordination.⁴³

The Task Force, as well as other organizations including the Heart Lung and Blood Institute, the Seattle-King County Healthy Homes Project and the Environmental Protection Agency have recommended home-based interventions proven to mitigate asthma triggers, thereby improving the quality of life and health of asthma patients. For pediatric asthma, home-based interventions resulted in asthma symptom-days decreasing by 21 days out of the year, missed school days decreasing by 12 days, and doctor visits decreasing by .57 days.⁴⁴

The primary actors for implementing home-based interventions are health departments, health plans, housing authorities, and nonprofit organizations. In many communities, health departments are the best equipped to conduct this type of initiative, given their experience with other programs that use home-based interventions. The Asthma Regional Council reports that “programs in which health departments play a lead role have begun to yield impressive results, reducing asthma symptoms as well as utilization of health care services.”⁴⁵

In addition to home-based outreach, school-based asthma programs have sought to better manage and control students’ asthma. Given the impact of asthma on the pediatric population, the American Lung Association’s Open Airways for Schools (OAS) is a widely recognized curriculum that educates children about the warning signs of asthma and trigger avoidance. The CDC supports OAS among other school-based resources to help students better manage their asthma and reduce school absenteeism.

EHRs and Patient Portals

One of the policy priorities of recent federal legislation including HITECH and the ACA is to increase patient engagement through EHRs and portals. EHRs can improve the quality of care for asthma patients through clinical decision support (CDS) which assists providers with identifying patients in the population who have asthma. In addition, CDS tools in EHRs guide appropriate assessment and treatment by prompting health care providers with reminders for influenza and pneumococcal- immunizations. EHRs can identify whether patients follow through with medication fills and prescriptions and alert primary care providers when their patients have a hospitalization or ED visit for asthma.⁴⁶ Further, patient-facing portals such as My Asthma Portal (MAP) facilitate patient engagement and self-

management by allowing patients to access labs and medication lists as well as targeted educational materials.⁴⁷

Exhibit 9: High-level Overview of Asthma Home Visiting

(1) Provider diagnoses patient with asthma and records in EHR



(2) Diagnosis triggers referral to home visiting program

(3) Home inspector contacts patient to initiate inspection and provide recommendations

(4) Notification of visit and findings goes back to provider EHR



Regional Case Examples

We now turn to a series of case examples describing models used for managing and controlling asthma in children through collaborative interventions involving data sharing or exchange.

Rhode Island

The Rhode Island Department of Health is using health IT in their programmatic efforts to improve pediatric asthma control and management in the community. Officials from the Rhode Island Department of Health described various examples of data exchange or potential for collaboration between public health and health care to support the care of children with asthma.

With CDC and CMS HCIA funding, the Rhode Island Department of Health has been working with Rhode Island’s Children’s Hospital to establish a home-visiting referral mechanism. The program targets children between the ages of 2 and 8 who visit the emergency room with an asthma-related condition. The

emergency room visit triggers a referral to the Home Asthma Response Program, which prompts home-visiting services. With parental consent, the home is visited three times by a certified asthma educator and community health worker. The Health Department receives patient-level data (e.g., provider visits, emergency room visits, and medication claims data) from health plans in order to evaluate the program and is in the process of analyzing the data.

The Health Department also runs KIDSNET, an integrated child's health information system that connects with authorized users in the community, such as early childhood programs like Head Start, early intervention, WIC, and primary care users. The data coming out of KIDSNET is from the Health Department, and the only information the department receives from providers is immunization data. Bidirectional exchange is being piloted in the cities of Providence and Woonsocket through the Health Department's Breathe Easy at Home Project, which utilizes KIDSNET for electronic referrals from pediatricians to environmental health inspectors. Inspectors conduct inspections in rental housing for pediatric asthma patients, searching for sanitary code violations that could be asthma triggers. The results of the housing inspection and actions taken by inspectors and the landlord are sent back to the provider.

North Carolina

Carolinas Healthcare System (CHS) in Charlotte, NC was awarded an Agency for Healthcare Research & Quality (AHRQ) grant to identify best practices for improving health outcomes for patients with asthma using comparative effectiveness research. CHS leadership described their work in comparing different asthma management approaches among asthmatic patients who received care within the system. One approach was to enhance the existing school-based care asthma management program by providing a school-based EHR system and facilitating electronic communication between school nurses and students' primary care providers.

School nurses across 156 Charlotte-Mecklenburg schools used the Health Office EHR for asthma case management of nearly 500 students. In particular, CHS aimed to case manage all students with asthma following a hospital stay from Levine Children's Hospital. Over the course of the grant, school nurses accessed 33 students' health records via the Cerner EHR and sent messages to their providers as follow-up to their asthma-related hospitalizations. Messages from nurses to providers reported student's availability and use of medications at school, correct technique used last hospitalization, Asthma Control Test score, peak flow reading, activity tolerance, unmet needs and school nurse contact information.

School nurses were employed by the Mecklenburg County Health Department, which was managed by CHS. Since public health nurses and primary care providers were part of the same entity, CHS was able to

overcome legal challenges associated with data sharing. CHS found that the school-based approach to asthma management improved health outcomes for students. Students who received asthma case management services had a lower readmission rate and less need for outpatient oral steroids compared to students who did not receive case management services.

Cincinnati Children's Hospital

The Cincinnati Children's Hospital used hot-spotting techniques to study pediatric asthma hospitalizations in Hamilton County, Ohio and documented significant disparities by neighborhood. The project revealed that children living in low-income areas within the county were at a much higher risk for hospitalization. Children from low-income neighborhoods were 88 times more likely to be admitted into the hospital for emergency treatment of asthma than children in affluent areas. In response to these findings, Cincinnati Children's Hospital has partnered with the Cincinnati Health Department to conduct home inspections and assist families and landlords in remediating risks. The hospital has also built a legal aid collaboration to advocate on behalf of families living in noncompliant buildings.^{48 49}

Nemours Foundation

The Nemours Foundation is an integrated pediatric health system that provides both hospital-based and clinic-based care to children in the state of Delaware. Using HCIA funds, Nemours is enhancing family-centered homes by adding services for children with asthma and developing a population health initiative in neighborhoods surrounding targeted primary care practices. The overarching goal of this project is to integrate medical care with community based population health, with a focused intervention on asthma in three Delaware communities.

Nemours tracks "high risk" pediatric asthma patients through an asthma registry, which is embedded in the EHR system. Each child in the registry identified as "high risk" is assigned a Community Health Worker who is responsible for connecting the family to clinical and social resources and self-management support. The clinical care teams at the participating sites use the asthma registry to flag patients that require more intense clinical care management. The information collected by CHWs during home visits and the Nemours clinical care teams at the participating Nemours pediatric clinics, such as the asthma action plan, asthma control test, parental confidence assessments, asthma quality of life and other assessments are recorded in the EHR system. The EHR system is also capable of generating dashboard reports that are used by the care team to review information on a population or panel of patients. Nemours also has an existing program called the School Health Collaborative, which allows participating school nurses to access the Nemours EHR system.

Chapter 5: Focusing on Tobacco Cessation

Smoking is one of the greatest public health hazards facing society today, as approximately 42 million adults in the United States smoke cigarettes.⁵⁰ The economic costs of smoking total approximately \$300 billion per year, with medical expenditures amounting to \$130 billion. Additionally, the effects of smoking cause a loss of productivity equaling \$150 billion per year.⁵¹ About 16 million Americans are currently living with a disease caused by smoking. Smoking is one of the leading causes of cancer deaths, responsible for approximately a third of all cancer fatalities⁵²; “in the United States, smoking causes 87 percent of lung cancer deaths, 32 percent of coronary heart disease deaths, and 79 percent of all cases of chronic obstructive pulmonary disease (COPD).”⁵³ Further, smoking is also responsible for causing liver and colorectal cancer, as well as dramatically diminishing a patient’s prognosis for survival.⁵⁴ In addition to serving as a primary agent for causing serious conditions, “cigarette smoking diminishes overall health status, impairs immune function, and reduces quality of life.”⁵⁵

Several groups in the United States are more likely to smoke than the population as a whole, including Medicaid enrollees⁵⁶ and Veterans;⁵⁷ subsequently, these groups have a greater likelihood of acquiring a smoking-related disease. Mental illness is another risk factor associated with increased smoking. There is also a lower likelihood that mental health patients will quit smoking⁵⁸; reasons include “higher levels of nicotine addiction among this population and less access to cessation treatment, which may result from a lack of financial resources, a lack of health insurance, or a general reluctance of mental health care providers and facilities to address tobacco use in their patients.”⁵⁹

Population Health and Public Health Opportunities for Tobacco Cessation

Smoking creates one of the greatest threats to a person’s health today. As the leading cause of preventable diseases and preventable deaths in the United States, there is an opportunity to significantly reduce the disease burden that smoking causes, thereby improving the population and economic health of society. According to the U.S. Department of Veterans Affairs, “quitting smoking is the single most effective thing you can do to improve your health.”⁶⁰ Quitting smoking before the age of 35 years greatly diminishes the risk of death resulting from a smoking related disease; however, quitting at any age confers health benefits.⁶¹ Several population health efforts aim to reduce smoking. These include increased tobacco taxes, anti-smoking media campaigns, and smoke-free policies. In addition, there is a growing effort for employers to offer smoking cessation services and counseling as a part of employee health plans.

State tobacco control programs, typically placed within the state's public health department, play an important role in tobacco prevention and control. The CDC reports that state tobacco control activities should include “state and community interventions, mass-reach health communication interventions, cessation interventions, surveillance and evaluation, [and] infrastructure, administration, and management.”⁶² Tobacco control programs can also play a critical role in interventions to promote tobacco cessation, including promoting health systems changes to make tobacco use screening and counseling part of routine care, expanding health insurance coverage of proven cessation treatments, and supporting state quitline capacity.⁶³ As part of these efforts, state tobacco control programs may include efforts to work with health care providers to “integrate tobacco dependence treatment into electronic health records and workflows.”⁶⁴

The CDC's *Best Practices for Comprehensive Tobacco Control Programs* state that health systems should strive to “ensure that every patient is screened for tobacco use, their tobacco use status is documented, and patients who use tobacco are advised to quit.”⁶⁵ Further, tobacco users should be offered smoking cessation medication and additional aid, such as quitline referrals and counseling. *The Treating Tobacco Use and Dependence 2008 Update* summarizes the best approach for providers to address smoking as the “5 As (Ask, Advise, Assess, Assist, and Arrange)”.^{66 67} This approach helps identify smokers who have a desire to quit and ensures that clinicians provide patients with the means to achieve their goal, including follow-up visits with patients to oversee the cessation process.

Relevance to HIT and Population Health Interventions

The ACA and HITECH create an opportunity to expand the role of health information technology in the provider's approach to offering smoking cessation. Meaningful Use Stage 1 calls for physicians to track smoking status for 50 percent of their patients and Stage 2 calls for this proportion to increase to 80 percent. Further, an optional measure for stage 2 Meaningful Use asks physicians to report the Outpatient Tobacco Clinical Quality Measure, which is “the percentage of patients aged 18 years and older who were screened for tobacco use one or more times within 24 months and who received tobacco cessation counseling intervention if identified as a tobacco user.”⁶⁸ A similar HEDIS measure to document screening and treatment for tobacco use could help health plans monitor and encourage delivery of cessation services. However, these are still process outcomes and ultimately the development of a measure that tracks quit rates is needed to track outcome data.

Quitlines offered in all fifty United States and the District of Columbia represent one of the major evidence-based tobacco cessation interventions, while also offering a promising outlook for bidirectional

exchange between health care providers and public health departments.^{69 70} Tobacco cessation quitlines offer services that may include telephone counseling, internet-based programs (e.g. self-directed web-based interventions), text messaging support, cessation medications, and tobacco cessation resources for health professionals or other callers who are not users.^{71 72}

The Community Preventive Services Task Force identifies three specific interventions that increase the traffic of quitlines: “(1) mass-reach health communication interventions that combine cessation messages with a quitline number; (2) provision of free evidence-based tobacco cessation medications for clients interested in quitting; and (3) quitline referral interventions for health care systems and providers.”⁷³ The CDC’s *Quitline FAQs for Health Care Providers* recommends that providers refer patients who are ready to quit by (1) giving the patient the quitline number during the medical visit; or (2) sending a referral with the patient’s contact information by fax or EHR to the state quitline’s referral system.⁷⁴

According to the CDC’s *Best Practices for Comprehensive Tobacco Control Programs*, “many state quitlines are developing the capacity to accept e-referrals directly from patients’ EHRs and to electronically send patient reports to the referring provider/health care organization.”⁷⁵ Through EHRs, providers can exchange data with state and local public health departments, prompting the identification of patients that should be connected to a quitline based on the patient’s smoking history and their expressed interest to quit. EHRs can also alert providers when to check for tobacco use, offer cessation advice, make referrals to quitlines and set up cessation counseling for their patients.⁷⁶ Data from EHRs can populate performance measures documenting a clinician’s impact on a patient’s tobacco cessation effort.⁷⁷

Regional Case Examples

In this section, we describe several examples of communities using population health interventions to address tobacco cessation.

Roswell Park Cancer Institute

Roswell Park Cancer Institute (RPCI) administers the New York State Smokers’ Quitline (NYSSQL) and offers an array of free, evidence-based quitline services including cessation coaching, nicotine replacement therapy (NRT), web-based and text messaging services, triage to health plans, and a health provider referral program. Thirty one percent of NYSSQL participants report being Medicaid members and 24 percent report being uninsured. Nearly half report a household income below \$15,000 and over half report having a high school education or lower. For privately insured tobacco users, the NYSSQL provides cessation services and also assists participants with identifying and accessing smoking cessation

coverage and programs provided by their health plan. In 2103, the NYSSQL serviced 75,233 tobacco users and distributed 68,413 NRT starter-kits.⁷⁸

Opt-To-Quit™, a provider referral program developed by RPCI, is available for hospitals and other health care providers through the NYSSQL. The Opt-To-Quit™ model begins with the adoption of an organizational policy that systematically identifies all tobacco using patients and then refers each to the NYSSQL to be contacted and re-contacted to engage in the quit process unless he or she opts out. Interested ready to quit patients are enrolled in the coaching and NRT program and for those referred patients not ready to quit, the NYSSQL continues to reach out over time to offer services and encourage engagement in making a quit attempt. This approach builds connectivity to the services while addressing the chronic nature of the quit process involving multiple quit attempts and relapses prior to success.

Opt-To-Quit™ currently accommodates four methods of data exchange with varying degrees of electronic capability: automated data exchange (most preferred), online referral and reporting, file exchange, and fax-paper based handling (least preferred).⁷⁹ The automated option transfers data directly from the providers' data system to the NYSSQL's data system. An online referral and reporting method allows for quick implementation and involves manual data entry by the provider. The file exchange system operates through a secure FTP site, where providers are given a username and password to upload and view electronic profiles and aggregate data. RPCI also provides technical assistance to sites to help determine the feasibility of an automated data exchange as the method of choice.

The Opt-To-Quit™ model benefits tobacco users by connecting them to evidence-based quitline services, facilitating access to health plan and other resources and offering interval outreach to stay quit or engage in a quit attempt. For hospitals and healthcare facilities, Opt-To-Quit™ offers a continuum of care, acts as a component of comprehensive cessation services and can support efforts to reduce tobacco related hospital readmissions. In addition, the individual patient and aggregate outcomes Opt-To-Quit™ provides can be used to monitor and facilitate quality improvement efforts.

Denver Public Health

Denver Public Health is currently constructing the Quitline Linkage and Information Network for e-Referral (Q-LINE), an integrated electronic tobacco registry and referral solution. This Colorado Health Observation Regional Data Service (CHORDS)-based project combines data from multiple health care providers and EHR systems to create a public health surveillance tool.⁸⁰ Using an existing data model (i.e., HMO Research Network - Virtual Data Warehouse),⁸¹ CHORDS collects individual level tobacco use status. When data from multiple providers are combined, a geographic and population view may be

created. Using the same federated query tool that is used to monitor hundreds of millions of Americans by the FDA and was more recently adopted by the Patient-Centered Outcomes Research Institute (PCORI) (i.e., PopMedNet), the EHR-based estimates of smoking rates by neighborhood can then be compared to the National Jewish Health QuitLine (Colorado's quitline) smoking referral rate.⁸² With these measurements, public health would have neighborhood smoking rates and rates of referral. If disparities are identified, targeted interventions might then be designed to address them.

The Quitline is working with community partners to determine and then generate a standard message template using C-CDA formatting to adapt this public health-based exchange between the quitline (a non-Meaningful Use recipient) and providers using meaningful use e-referral standards. This method should allow for smooth bidirectional messaging between provider and quitline; return C-CDA formatted messages from the QuitLine will provide status information to the referring provider (e.g., acknowledge of receipt, ability to reach, start date, call frequency, medication prescribed, smoking and completion status). In parallel, Quitline then may report aggregate outcome data.

Establishing the right environment for a community of virtual data warehouses is essential. As there is utmost priority of confidentiality and privacy protections, any protected or sensitive health information requires mutually determined data use agreements and/or business associate agreements. Each vendor has deployed its own version of the C-CDA which have initially been all inclusive summary documents. This use case does not require all sensitive information be transmitted. Defining the scope of information to share in the C-CDA, and how it will be integrated back into the EHR are current initiatives. At present, the Denver-based collaborative has established six provider data use agreements with five sites building their virtual data warehouse for federated query.

Chapter 6: Cross-Cutting Findings

Although examples of health care and public health collaboration are limited, findings from this project demonstrate both the potential for enabling collaborative population health through exchange of health data as well as challenges for stakeholders to realize this potential. We organize our findings around (1) opportunities for demonstrating value; (2) key characteristics of current public health and health care collaborators that facilitate their use of bidirectional exchange; and (3) potential enablers of information exchange.

Opportunities for Demonstrating Value

Without a value proposition for HIE between health care providers and public health agencies, potential collaborators may not have the incentive to mobilize. Below we describe opportunities to demonstrate the value of information exchange to health care providers and public health departments.

Health Care Providers

By establishing electronic information exchange capabilities with public health departments, providers can refer patients externally for services that are otherwise time consuming, low paying, beyond the expertise of providers and amenable to patients with social, language, and literacy barriers. In turn, providers can operate more efficiently by referring patients to services at the community level that have a strong evidence base, are standardized and practice continuous quality improvement.

Although some services are non-medical, they can have a significant impact on provider performance measurement because of the critical role behavior change has on managing chronic conditions. For example, motivational interviewing conducted by lay health workers may help establish a basis for behavior change. As providers assure patient support outside of clinical settings and share clinical information to inform population health interventions, they demonstrate their commitment to the broader community in addressing chronic disease.

Public Health Departments

Governmental public health departments can more rigorously monitor and respond to population health needs by gaining access to electronic health records data. Such data can help departments better understand population health needs and develop more targeted responses that support chronic disease management outside of the clinical setting. In addition, establishing the capacity for electronic referral exchange allows public health departments to maximize use of their resources. These initiatives may help

public health departments think beyond the services in their traditional assurance scope. They may also prompt departments to establish additional strategic information exchange partnerships that connect providers and patients to the community organization best equipped to deliver a particular service. By establishing concrete roles for public health in addressing clinical and community chronic disease management, agencies can better identify and implement best practices to prevent and manage chronic disease.

Characteristics of Current Collaborators

Population health interventions are most effective when they take advantage of information and resources across different sectors within a community; however, the methods for applying this broad principle effectively will vary. In part because governmental public health agencies lack a mandate and a specific, formal role in the area of chronic disease, their capacity for assessment, assurance and policy development in this area varies. Other areas of variation include the presence of community-based organizations with relevant information and resources and their willingness to coordinate with other stakeholders; the capacity of health care providers in the area to capture and share data electronically; and community perspectives on sharing patient-level information on chronic illness to facilitate benchmarking, targeting referrals and tracking outcomes and quality of care at the community level.

Below we describe key characteristics of health care providers and public health agencies currently collaborating. Although information exchange with CBOs is not in the scope of this paper, these organizations can provide information and services that can be utilized by public health agencies and health care providers.

Health Care Providers

Health care providers currently involved in information exchange activities with public health departments are typically primary care providers with leadership committed to population health. Some are community physician champions oriented to the concept of medical homes, but most are the following types of organizations:

- Managed Care Organizations such as Kaiser Permanente, which contributes to a tobacco registry to assess population and geographic-based referral rates for their patients to the Colorado-sponsored Quitline.
- Accountable Care Organizations such as the Pioneer ACO in Webster County Iowa, which has partnered with the County's public health department to create a referral system that allows primary

care doctors to refer patients to public health services and receive notifications from the service administrator on the patient's progress.

- Academic Health Centers such as Duke University, which has partnered with county health departments and health systems to collect EHR data for geospatial analysis to target individuals at various levels of diabetes risk.

It is also important to note, that in many instances, providers and payer organizations can benefit from leveraging their own clinical and administrative data to promote population health interventions on their own. Although this report focuses on engagement between public health agencies and health care providers, many health care organizations, including staff model managed care organizations may be in a good position to implement these measures on their own. The caveat is that initiatives internal to a specific health care organization often only benefit a subset of the relevant population in any area.

Public Health Departments

Public health departments engaged in bidirectional exchange with providers have visionary leaders who see a role for their agency in chronic disease prevention and control. These health departments recognize that support of direct patient engagement and linkage to chronic disease related services may help cultivate these services and maximize provider reach. Whether chronic disease services are directly offered (e.g., state sponsored quitline services) or they are services offered through well-established partner networks (e.g., YMCA), the opportunity for and benefit from bidirectional exchange increases likelihood of referral and follow-up.

Additionally, current collaborators view EHR data surveillance as an opportunity for identifying disparities and targeting resources. With increasing coverage of preventive services at the provider level, reporting can allow for data-driven public health detailing. To ensure greater use of effective interventions, especially for vulnerable populations, data exchange supports the public health assurance function regarding access to care, care management, care quality and utilization.

Potential Enablers

We found that the following enablers may support current or future provider/public health department partnerships and bidirectional information exchange efforts.

Workflow and data flow analysis should help guide health IT and electronic exchange. Increased availability of electronic clinical data to support population health initiative creates new opportunities for exchange. However, many public health agencies are not yet in position to benefit from use of these data.

To make the most of investments in systems and processes to exchange data electronically, public health agencies may benefit from a detailed analysis of how the information will support public health action. The requirements for workflow and information to enable this action, as well as the possible actions themselves, will vary depending on community resources and needs. Adopting systems to meet these needs post-implementation often poses substantial challenges and additional costs.

Existing standards can play a role. A common goal in informatics is to define data sharing standards for specific uses. For example, upon discharge from a hospital, a standard could identify the information that needs to be shared with a patient's primary care provider. The standard would map out the "who, what, when and where" for any data created by the hospital and shared with the primary provider. Specifics within the standard might include the list of fields or data elements that need to be shared (patient name, medications, diagnosis, etc.) as well as the codes or language used to populate each field. In many cases, messaging standards that identify relevant fields include a surfeit of data elements and an "implementation guide" for a specific use of the standard identifies the fields relevant for the particular use and the rules for filling them in.

There are two existing messaging standards that may support collaboration between public health, CBOs and health care providers on population health interventions. First, the Consolidated Clinical Document Architecture (C-CDA) is a set of templates for supporting complex messaging that the National Coordinator for Health Information Technology (ONC) has recently endorsed through the Meaningful Use process. C-CDA templates include a "continuity of care document (CCD)," which providers can use for referrals as well as a "progress note" that the population health service provider may send back to the provider's clinical record. Aside from the content and structure of the message, there are transport standards for the secure exchange of data. Direct is a set of standards and services to transport health information point-to-point through a secure, fast, and inexpensive "push" model, thereby creating an additional method for HIE.⁸³ This approach sends information to/from a provider's via a secure messaging system similar to email. Support for Direct standards is a requirement for EHR vendor certification under stage 2 Meaningful Use; therefore, vendors are now moving towards integrating Direct into their platforms in order to become certified vendors under stage 2 meaningful use.

Standard developers key their activity on specific and repeated use cases. For example, standards for newborn screening or immunizations would support exchange of data between providers and public health agencies that occurs the same way repeatedly and in all states as mandated by law. In the case of chronic disease and population health, we found no evidence that data are exchanged for a common

purpose in multiple jurisdictions. We found limited examples of public health involvement in exchange of data with providers in the area of chronic disease.

Public health departments and health care providers may need concrete incentives to collaborate.

Some stakeholders see a very limited potential role for public health agencies in helping to address chronic disease due to, in part, to funding and shifting priorities. The variation in public health agencies' capacity and programming in this area also contributes to the limited scope of collaboration. As providers receive new incentives through payment models that support population health goals, this may change. Either providers will establish new services as part of the health care enterprise or work with community-based organizations, public health agencies or others to make population health services available to their patients. Our findings suggest that specific incentives to work with public health agencies may help support most efficient and effective delivery of population health services.

Measuring the impact of population health interventions. In order for incentives to produce effective population health services, we need measures that define success in this area. Currently, many provider quality measures link to reduction in health care utilization, improvements in processes of care or improvements in clinical outcomes. In some cases, measures appropriate to population health services may focus on different concepts. For example, in some areas it may be relevant to measure individuals' continued participation in interventions aimed at behavior change over a long period of time in addition to behavior change itself.

Academic health centers and federally qualified health centers may serve as the best starting point.

While we looked for collaboration with public health agencies across all provider types, we found the most promising results with academic health centers. Relative to other providers, we found academic medical centers had the informatics capacity and focus on partnership necessary to facilitate community-based population health interventions. Also, academic medical centers are better equipped to pursue grants that support community-based population health. Federally qualified health centers also represent a natural provider setting for integration with public health agencies and population health, although we did not find examples of this type of collaboration beyond data sharing.

Ultimately, resources for sustainability may need to come through health care payment policies.

Currently, successful efforts are time and resource intensive and participants see limited windows into sustainability since most initiatives are supported by grants and providers' existing IT resources. Health care payment policies that incentivize shared responsibility among public health departments and providers of the health of populations may facilitate more collaboration, and help to sustain current

bidirectional exchange. This aim may be achieved through enhanced coordination between HITECH and ACA investments focused on care delivery improvement and population health. In the meantime, more effective use of grant dollars for information exchange activities may be made possible by funders having a clearer sense of the models worth funding and characteristics of candidates that are likely to form strong partnerships for collaboration.

Conclusion

In the ACA and post-HITECH environment, health care providers and public health agencies face new opportunities and incentives. HITECH has motivated increases in adoption of EHRs by inpatient and outpatient providers. Furthermore, providers involved in ACOs, PCMHs and other value-based purchasing programs, must demonstrate quality using performance measures. Some of these measures relate more directly to patient behavior and capacity to change than they relate to medical decisions. In many cases, providers do not have the necessary time or expertise to address the complex factors underlying poor outcomes on these measures.

Governmental public health agencies, on the other hand, are searching for a proper role in fulfilling their assessment, policy and assurance functions as they relate to chronic disease. As fewer Americans go uninsured and as regulation requires insurers to cover preventive services, many public health agencies are moving away from providing safety-net health care services. However, they may be in a position to contribute to population health through care coordination and case management.

The need for population-level interventions to address the burden of infectious disease is well-understood, reflected in law, and effectively covered in most jurisdictions. To date, a small number of communities have established uniform population health interventions focused on chronic disease. This report looked at examples where communities have been able to use recent policy initiatives to establish a chronic disease control role for public health agencies by leveraging exchange of electronic health care data.

This report also identified communities where public health agencies work closely with health care providers and initiate population health services. This occurs through referrals or triggers gathered from health care data (clinical or administrative). The role of bi-directional electronic exchange of health data in these cases varies. In most cases, stakeholders have worked hard to develop improved communication and the workflow needed to most effectively serve patients. Our discussants discovered there is a significant gap between having health care data in electronic form and being able to share it effectively to support population health.

To date, EHR vendors have not devoted significant attention to how to exchange data for chronic disease population health. The basis for developing standards exists through commonly accepted standards such as C-CDA messaging templates that may be used for referrals (CCD) and consultation reports.

Furthermore, transport standards such as Direct may be used to exchange a wide range of messages in a secure, cost effective manner. However, the field needs to complete the work related to defining business

requirements, standardizing workflows, and designing technical solutions that meet population health use cases specifications. Training and workforce readiness activities can facilitate progress. In many ways, stakeholders must address challenges associated with demonstrating value and helping public health, health care providers and community-based organizations collaborate before making effective use of standards.

This report outlines key findings from relevant case studies. However, given the variation in resources and approach across jurisdictions, as well as the early nature of this work, we are unable to point to a uniform set of best practices with guidance on when and how they should be employed. As all elements of the equation, from informatics science, payment reform and public health infrastructure continue to evolve dynamically, we see a need for additional research. This includes additional case studies of the kind outlined here as well as detailed evaluations looking at the effectiveness of different approaches to employ bi-directional exchange for population health purpose.

In summary, although greater electronic clinical data exchange between public health and health care providers may ultimately improve chronic disease control, achieving meaningful exchange is currently difficult. Public health agencies need to identify which connections, resources and/or expertise can help providers achieve better outcomes. Beyond direct delivery of services, public health may find they play a valuable role in coordinating referrals to appropriate human service providers and CBOs.

Providers can further collaborate and coordinate by recognizing medical intervention alone will not improve outcomes; in many cases, this acknowledgement and use of community-based resources will improve population health outcomes. Funders of programs targeting either health care providers or public health agencies may consider requiring collaboration between the two on population health initiatives. Finally, local communities can maximize the impact of federal and state support by establishing a consistent health informatics strategy that cuts across all available funding streams.

Attachments

- Telephone Discussants
- Agenda, Attendees, Materials from TEP Meeting

Appendix 1: Experts and Stakeholders Consulted

NAME (First, Last)	ORGANIZATION
Abel Kho	Northwestern Medicine
Akaki Lekiachvili	Centers for Disease Control and Prevention
Arthur Davidson	Denver Public Health
Barbara Yawn	Olmsted Medical Center
Brandie Adams	National Association of County and City Health Officials
Cathy Bailey	Centers for Disease Control and Prevention
David Ross	Public Health Informatics Institute
Dona Goldman	Rhode Island Department of Health
Donna Metz	University of Southern California
Elbert Huang	University of Chicago
Elizabeth Herman	Centers for Disease Control and Prevention
Elizabeth Walker Romero	Association of State and Territorial Health Officials
Ellen Amore	KIDSNET, Rhode Island's Integrated Child Health Information System
Fred Johnson	Duke University
Gillian L. Schauer	Centers for Disease Control and Prevention
James Jellison	Public Health Informatics Institute
Jennifer Fritz	University of Minnesota Institute for Health Informatics
Jim Daniel	Office of the National Coordinator for Health Information Technology
Joseph Allen	Harvard School of Public Health
Joseph Gibson	Health and Hospital Corporation of Marion County
JP Leider	De Beaumont Foundation
Kari Prescott	Webster County Health Department
Kea Turner	Assistant Secretary for Planning and Evaluation
Kenneth Kizer	Institute for Population Health Improvement at University of California-Davis
Laura Nasuti	Massachusetts Department of Public Health
Lloyd Michener	Duke Center for Community Research
Marcus Cheatham	Mid-Michigan District Health Department
Martin Love	Humboldt-Del Norte Independent Practice Association
Marty LaVenture	University of Minnesota Institute for Health Informatics
Matt Stiefel	Kaiser Permanente
Michael Barr	National Committee for Quality Assurance
Michael Dulin	Carolinas Healthcare Systems
Michael Millman	Assistant Secretary for Planning and Evaluation
Nancy Sutton	Rhode Island Department of Health
Nedra Garret	Centers for Disease Control and Prevention
New York State Department of Health Asthma and Tobacco Program Staff	New York State Department of Health
Patricia Bax	Roswell Park Cancer Institute
Patrick Lenihan	University of Illinois at Chicago School of Public Health
Paul Kuehnert	Robert Wood Johnson Foundation
Paula Soper	Association of State and Territorial Health Officials

NAME (First, Last)	ORGANIZATION
Peter Briss	Centers for Disease Control and Prevention
Philip Alberti	Association of American Medical Colleges
Prashila Dullabh	NORC at the University of Chicago
Rachel Hess-Mutinda	Maryland Department of Health and Mental Hygiene
Richard Brown	University of Wisconsin School of Medicine and Public Health
Richard Platt	Harvard Pilgrim Health Care Institute Department of Population Medicine
Rosemary Duffy	Centers for Disease Control and Prevention
Sarah Shih	NYC Department of Health and Mental Hygiene
Sayone Thihalolipavan	NYC Department of Health and Mental Hygiene
Stacey Chacker	Health Resources in Action Environmental Health Department and the Asthma Regional Council of New England
Steven Teutsch	Los Angeles County Public Health
Susan Fleck	Centers for Medicare & Medicaid Services Health Disparities Program
Susan Queen	Assistant Secretary for Planning and Evaluation
Suzanne Beavers	Centers for Disease Control and Prevention
Tom Land	Massachusetts Department of Public Health Bureau of Community Health and Prevention
Trina Histon	Kaiser Permanente
Trumenda Green	National Association of County and City Health Officials
Walter Suarez	Kaiser Permanente Information Technology
Wayne Giles	Centers for Disease Control and Prevention
Will Ross	Redwood MedNet
Winfred Wu	NYC Department of Health and Mental Hygiene
Young J. Juhn	Mayo Clinic

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