Integrating Community and Clinical Data to Assess Patient Risks with A Population Health Assessment Engine (PHATE)

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Clinicians are concerned about their patients' social determinants of health (SDH); yet, they are unsure how to effectively gather patient-level SDH data and intervene without adding to current administrative burdens. Designed properly, clinical registries offer solutions to integrate neighborhood SDH data with clinical data from electronic health records, enabling the understanding of community factors to guide patient care. Federal and state interest in adjusting reimbursements based on SDH further underscores the need for strategies that integrate SDH and clinical data. The Population Health Assessment Engine (PHATE) exemplifies a registry-based SDH data integration solution that adjusts payments, contributes to public health surveillance, organizes care around hot spots (gaps in quality or uncontrolled disease), assesses patient risk, and connects with community organizations. PHATE also permits residency training to meet community health competency milestones by incorporating the PHATE curriculum. These functions enhance value, and their utility in education and care delivery would benefit from further investigation. (J Am Board Fam Med 2020;33:463–467.)

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Introduction

Variation in social determinants of health (SDH) contributes to pervasive health disparities. Although aware of their impact, clinicians are uncertain how to ask about the SDH needs of individuals, question the accuracy of patients' responses, and lack resources to address identified needs.[1] In response, others have proposed using small-area SDH indices in place of or in addition to individual SDH data.[2]

These neighborhood indices have been conceptually tested as Community Vital Signs (CVSigns).[3]

The Institute of Medicine recommended that neighborhood and clinical data from electronic health records (EHRs) should be integrated in a single or shared platform.[3] The Population Health Assessment Engine (PHATE; pricing information is available at www.primeregistry.org/phate) builds on this recommendation by combining CVSigns and clinical records to define clinical service areas and characterize communities. In the following paragraphs, we describe how PHATE contributes to public health surveillance, helps providers organize care around hot spots, allows for patient risk assessment, and connects practices with community organizations. PHATE's CVSigns is based on ecological SDH organized as a social deprivation index—a small area index associated with poor health outcomes, disease prevalence, and increased costs.[3] This integration provides a reliable first-pass assessment of patient risks based on where they live.

Using PHATE to Practice Community-Oriented Primary Care

The creation of federally qualified health centers can be traced back to community-oriented primary care (COPC), a model that addresses SDH through community engagement and integration of public health and primary care.[4] In addition to a payment system that rewards volume over value, COPC adoption has historically been limited by technological challenges, including inadequate tools and data to define the service areas of practices, the first step in COPC.[4] The Health Resources and Services Administration Uniform Data Set Mapper (www.udsmapper.org) tool successfully overcame these challenges by using geographic retrofitting to identify service areas for federally qualified health centers.[5] PHATE opens up this technology to front-line clinicians at a time when value-based payment models strive to achieve a balance between efficiency and effectiveness while promoting enhanced population health management and systemic reduction of health care costs for both populations and individuals.

A New Paradigm for Care Delivery Built on COPC

PHATE is a tool that allows clinicians to build on COPC principles and forge new models for how care is delivered. Using data from the American Board of Family Medicine's PRIME Registry, PHATE geocodes patient addresses to define a clinic's service area and a patient's CVSigns, directly addressing the National Academy of Medicine's call for inclusion of SDHs into EHRs. PHATE also uses addresses, diagnoses, and quality measures to geospatially identify hotspots of disease prevalence and poor control (Figure 1). Through these functions, PHATE transforms care delivery at several levels [Insert Table 1].

Adjusting Payment and Quality Measures

With the ascension of value-based payment, providers may be reluctant to care for patients with social risk factors. In response, efforts are underway to adjust payment and measurement to account for these risks. For example, at the state level, policy makers in Ohio, Massachusetts, and Minnesota are developing approaches to accomplish this goal. At the federal level, a report from the Assistant Secretary for Planning and Evaluation calls for adjustments in payment that reward achievement or improvement in beneficiaries with social risk factors, although the details for how this will be accomplished have yet to be defined.[6] The CVSign within PHATE could support adjustment, as is done in the United Kingdom and New Zealand.[2]

PHATE could also adjust quality measures. Minorities have poorer outcomes due to higher levels of medical risk, worse living environments, and greater challenges in adherence and lifestyle;[6] at the same time, providers serving these beneficiaries may have poorer performance due to fewer resources, more challenging clinical workloads, and lower levels of community support.[1] Adjusting payments without adjusting measures would put practices with disadvantaged patients at risk for receiving enhanced resources and having have them taken away for poor quality.[2] PHATE supports measure adjustments within PRIME while also identifying equity gaps that need improvement.

Public Health Surveillance

Federal, state, and local public health departments use clinical data to assist in disease surveillance. These partnerships help generate real-time data and small-area estimates. Currently, public health departments use national surveys, such as the Behavioral Risk Factor Surveillance System, to monitor disease and health behaviors, but unfortunately, the Behavioral Risk Factor Surveillance System is limited by cost, reliance on self-report, and telephone access. Registries with tools like PHATE can provide additional public health data, including diagnosis codes, medications, laboratory values, and SDH information.

Organizing Care around Hot Spots

Public health departments are starting to use geographic variation in health care to identify hot spots—clusters of high-need, high-cost patients—and inform targeted interventions. Cincinnati's Community Health Assessment found a 20-year variation in life expectancy across neighborhoods. In response, the Cincinnati Health Department partnered with community organizations to develop strategies for at-risk neighborhoods.[7] Cincinnati pediatricians identified geospatial patterns for hospitalizations, and armed with these data, they reorganized care delivery. Specifically, they received alerts when patients from specific neighborhoods were admitted and deployed comprehensive care teams to address social needs and transitional care support.

Figure 1. Population Health Assessment Engine (PHATE) uses patient addresses, diagnoses, and quality measures to geospatially identify hotspots, or clusters, of disease prevalence or poor disease control. This is a heatmap of individuals not up to date with depression screening, from the PHATE Demo Dataset.
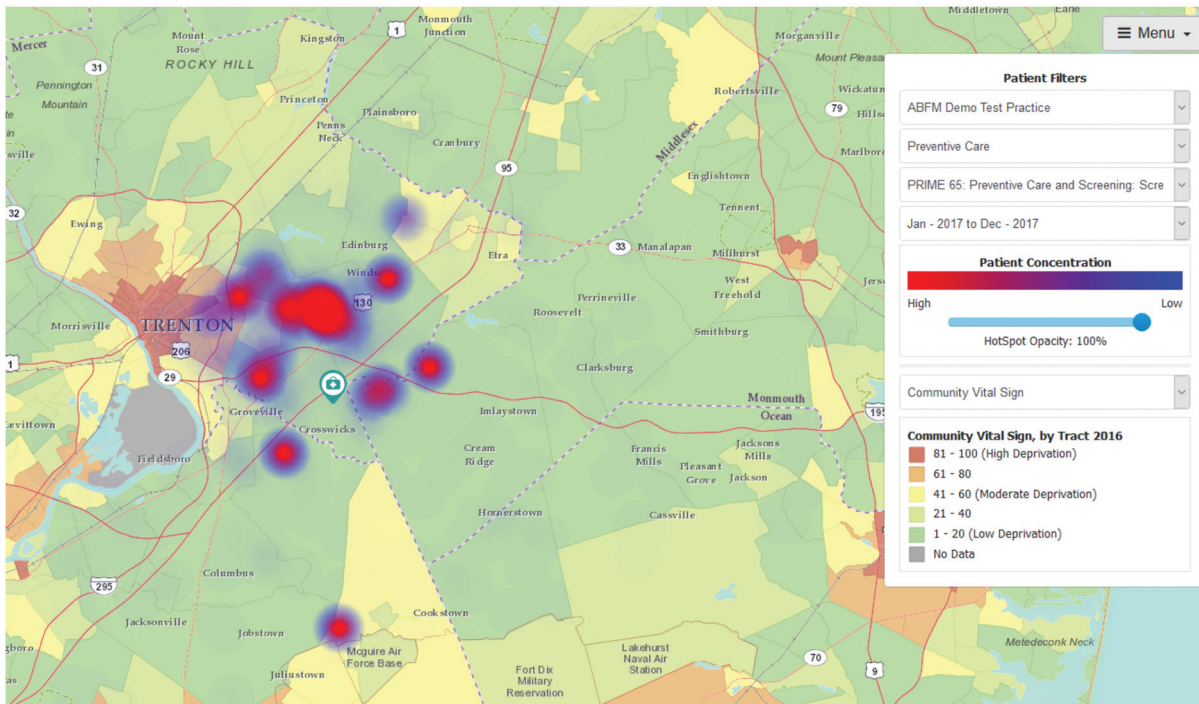
By identifying disease and poor-quality clusters, PHATE allows primary care teams to similarly reorganize care to address hot spots.

Assessing Patient Risk

PHATE's merger of EHR and neighborhood data allows for the incorporation of geography to improve risk assessment for patients. For example, Lichkus references PHATE's applicability in identifying the geographic distribution of patients who screen positive for food insecurity.[8] PHATE, therefore, allows for a better understanding of neighborhoods with greater risk of food insecurity and other risks in local communities. A good understanding of risks will allow providers and public health officials to investigate why some locations experience a differential burden; it will also encourage collaboration with local organizations to improve access to services.

Connecting with Community Organizations

PHATE coordinates work at patient and community levels, fulfilling the National Academy of

Table 1. How the Population Health Assessment Engine Can Be Used to Improve Health

Level	Function	Example
System level	Adjust payments	Massachusetts and Minnesota adjust Medicaid reimbursements based on SDHs
	Contribute to public health surveillance	Macroscope (New York City) and the electronic medical record Support for Public Health (ESP; Massachusetts) use EHRs for public health surveillance
Practice level	Organize care around hot spots	The University of Cincinnati's comprehensive care team aims to reduce hospital admissions for children coming from high poverty neighborhoods
	Assess patient risk	QRISK uses geographic data to calculate risk for cardiovascular disease in the United Kingdom
	Connect with community organizations	Community Rx uses diagnosis codes and links patients to relevant community resources

SDH, social determinants of health; BRFSS, Behavioral Risk Factor Surveillance System; NAMCS, National Ambulatory Medical Care Survey; EHRs, electronic health records; QRISK, cardiovascular disease risk algorithm, ESP, Emergency Service Program.

Table 2. How the Population Health Assessment Engine Can Be Used to Meet Training Milestones

Attainable Family Medicine Milestones Using PHATE	Example
Identifies specific community characteristics that impact specific patients' health.	PHATE can be used as a primary screening tool to identify patients at risk for adverse health outcomes; once identified, patients can be further screened to determine the effect their SDH have on their health outcomes. For example, knowing that a given community has a high crime rate can prompt a physician to ask patients about the level of safety they experience in their homes.
Collaborates with the participants necessary to address important health problems for both individuals and communities.	PHATE helps identify community partners like food banks, housing and transportation services, and education resources.
Mobilizes team members and links patients with community resources to achieve health promotion and disease prevention.	Community health workers and case managers can connect patients with unmet social needs with community resources through Aunt Bertha.
Lists ways in which community characteristics and resources affect the health of patients and communities.	Clinicians can look at maps of their service areas, which help them have a visual representation of the neighborhood deprivation within the local community.
Recognizes inefficiencies, inequities, variation, and quality gaps in health care delivery.	The hot spotting tool displays, geospatially, clusters of patients with gaps in quality or poor disease control.
Integrates practice and community data to improve population health.	Once clusters are identified, PHATE helps clinicians identify risk factors that can account for or address hot spots.

PHATE, Population Health Assessment Engine; SDH, social determinants of health.

Medicine's call to integrate primary care and public health. More specifically, clinics can use PHATE to help public health officials identify high-risk populations and allocate resources. PHATE can also be used as a visualization tool to incentivize third parties like insurance companies to invest in community improvement projects. Aunt Bertha—a free, online national directory of community resources—is integrated into PHATE, thereby allowing practices to make community connections.

Preparing the Workforce for a New Paradigm

Teaching the next generation of clinicians to succeed in addressing patients' SDH will require training. The Robert Graham Center and HealthLandscape developed a curriculum to help learners understand how to bring together community data, clinical data, and community resources by using PHATE. Relatedly, residencies lack strategies for meeting population health training milestones. PHATE can transform the delivery of care and how trainees learn about population health [Insert Table 2].

Conclusions

PHATE provides an innovative way to integrate neighborhood and EHR data, allowing users to adjust payment, contribute to public health surveillance, organize care around hot spots, assess patient risk, and connect with community organizations. PHATE is a tool that can reduce clinical burden, support intrinsic interest in addressing SDH, and train the next generation of clinicians. Working across various registries and EHRs, PHATE would benefit from further evaluation of its utility for education and clinical care.

To see this article online, please go to: http://jabfm.org/content/33/3/463.full.

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