Health Informatics Use Case Study:

Leveraging Social Determinant Data to Enable Predictive Risk Stratification and High Impact Interventions

Meredith Milnes
December 2016

Table of Contents

Case Study: Deborah

Here is what Deborah's primary care physician knows about her: she is a 57-year-old female whose blood pressure and cholesterol results put her within, albeit at the upper limit of, the healthy ranges. Her Body Mass Index measure puts her in the overweight category. She usually attends the appointment for her annual physical exam, but often reschedules it once or twice before making it into the office.

Here is what Deborah's primary care physician does not know about her: she lives alone, and has little social support – she has no children, is single, and, due to the busy schedule of working multiple jobs, has few close friends. She lives in a food-scarce environment, doesn't own a car, and the closest grocery store is five miles away, so she often ends up buying food at the convenience store or fast food restaurant on her way home from one of her shifts. There is no nearby pharmacy for her to fill a prescription. Because she walks two miles to catch the bus into the city to see her PCP, her appointment attendance is vulnerable to changes in weather, public transport strikes, general delays, and her ability to walk to and from the station.

The things Deborah's PCP does not know about her may, in fact, have a bigger impact on her health than the medical factors he does know.

Health is often attributed to genetics and, to some extent, lifestyle. We're told that if we eat a balanced diet, exercise with some regularity, and check in with our medical providers, we're likely to maintain good health. It is becoming clear that our health is affected by a complex web of factors ranging from the availability of transportation to our family structure. These factors that extend beyond the traditionally medical are called "Social Determinants of Health" (SDOH) and are increasingly being understood to play a primary role in a person's health, likely accounting for between 60%[1]-80%[2] of health variance across patients.[3] The management and analysis of this data, one of the prospective applications of health informatics, will enable proactive actions and interventions which will leading to

---

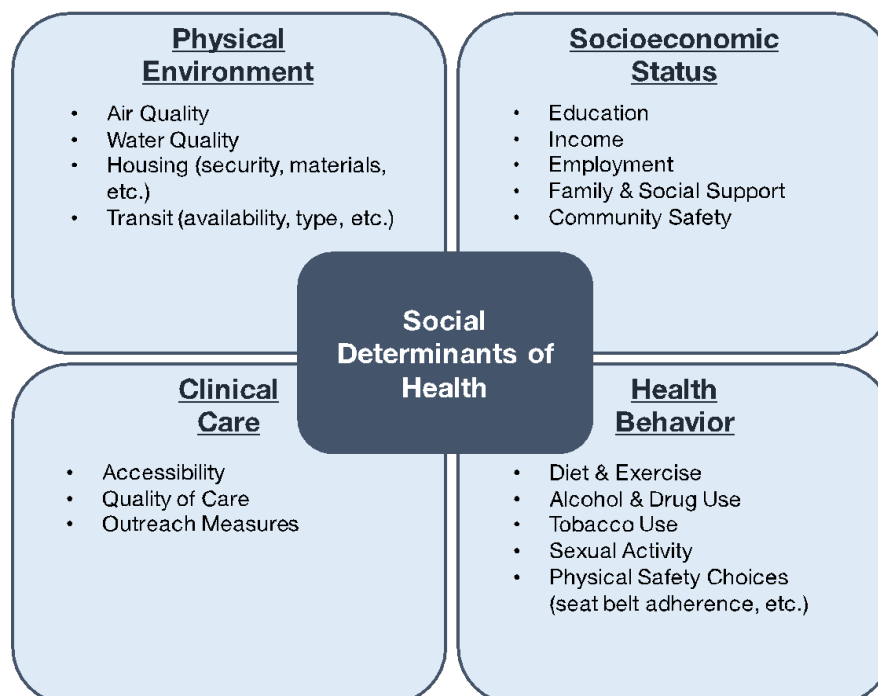[1] "How social factors shape population health: integrating the non-medical sources of health issues," Xerox, 2016
[2] "Our Approach," County Health Rankings & Roadmaps, 2016
[3] "How social factors shape population health: integrating the non-medical sources of health issues," Xerox, 2016

more positive patient experiences of care, improved outcomes, and more efficient resource allocation.

What are Social Determinants of Health?

According to the World Health Organization, social determinants of health are "the conditions in which people are born, grow, live, work, and age."[4] These factors are divided into categories that include physical environment, socioeconomic environment, clinical care environment, and health behavior environment.

Physical Environment
- Air Quality
- Water Quality
- Housing (security, materials, etc.)
- Transit (availability, type, etc.)

Socioeconomic Status
- Education
- Income
- Employment
- Family & Social Support
- Community Safety

Social Determinants of Health

Clinical Care
- Accessibility
- Quality of Care
- Outreach Measures

Health Behavior
- Diet & Exercise
- Alcohol & Drug Use
- Tobacco Use
- Sexual Activity
- Physical Safety Choices (seat belt adherence, etc.)

Data Source: County Health Rankings & Roadmaps, WHO

While experts rank the impact of these environments differently according to the priorities of their communities, it is widely recognized by global[5], national[6], and local health organizations that these environments are crucial to the health of both individual patients,

---

[4] "What are social determinants of health?" World Health Organization, May 2012
[5] "The health impact assessment: The determinants of health," World Health Organization, 2016
[6] "NCHHSTP Social Determinants of Health," Centers for Disease Control and Prevention, March 2014

at the micro level, and, on a more macro scale, the overall population.

These broad factors are comprised of more granular inputs. "Housing" is not only a question of whether or not the patient has secure, reliable housing, but also must take into account the characteristics of their housing including: monthly cost (which may impact the available remaining financial resources used on other factors such as diet or access to quality of clinical care), housing occupancy (which, when abnormally high, may result in higher levels of anxiety and aggression in adolescents),[7] and housing conditions (homes which are unsafe or violate building codes putting residents at risk for lead poisoning, asthma, allergies, and accidental injury).[8]

In What Ways can Social Determinants of Health be Used?

Social Determinants of Health are indicators of larger trends. By analyzing large sets of population data, analysts can identify trends within a community and among patient populations. The trends are used to track and improve community-wide health, often via proactive interventions for individuals.

Driven by the Affordable Care Act and its associated mandates for value-based care, community-wide health initiatives are increasingly in the spotlight. In an attempt to reduce care inequity[9] and its associated costs, collaboration among health systems, community coordinators, and patients could enable the collection of disparate data across organizations to develop a more comprehensive and holistic view of the patient record.[10]

As population data are collected, analysts can run reports that assess the "vital signs" of the community as a whole. Analysts, depending on the setting and purpose, may be looking at the aggregated population characteristics of a hospital, Accountable Care Organization (ACO), county, state, or nation, and as such will have an eye towards different types of

---

[7] "The impacts of affordable housing on health: A research summary," Center for Housing Policy, April 2015

[8] "Healthy, safe housing linked to healthier, longer lives: Housing a social determinant of health," The Nation's Health (APHA), September 2016

[9] "Social Determinants of Health Equity," American Journal of Public Health, 2014

[10] "Using social determinants of health data to improve health care and health: A learning report," Robert Wood Johnson Foundation, July 2016

trends and outcomes.

Social Determinants of Health: Common Data Inputs and Sources
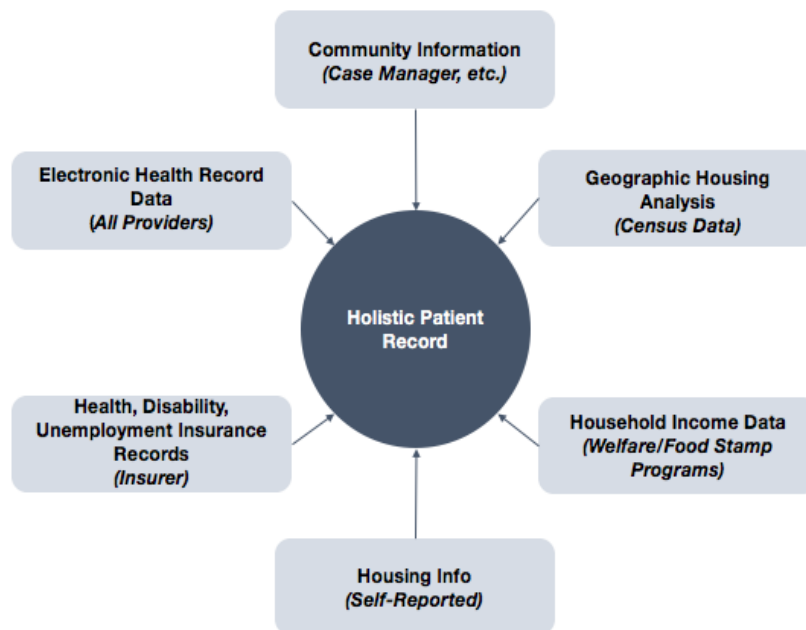
Data Source: Robert Wood Johnson Foundation

In the case of large-scale analysis in a greater context, such as looking across counties in the United States, analysts may measure the prevalence of certain risk factors (for example, reported heavy drinking, as in the image below) across counties in the United States, in order to identify populations at high risk of future illness, disease, complication, or injury.[11]

System-level analysis of populations may focus more on optimization of care, measuring risk of re-admission and highlighting potential co-morbidities of populations. By constructing a more comprehensive understanding of a population, and by placing the population in the context of larger trends, providers may intervene proactively to reduce risk, in many cases achieving the "triple aim" of improving the experience of care (both in terms of quality and satisfaction), reducing the per-patient cost of care (through proactive intervention), improving overall population health.[12]

---

[11] "Social Determinants of Health Visualization," Institute for Health Metrics and Evaluation, 2015
[12] "The IHI Triple Aim," Institute for Healthcare Improvement, 2016

Analysis may also focus on an overall assessment comprised of resource utilization, admissions and tracking organization-wide health initiatives. The dashboard below, for example, tracks the 30- and 90-day re-admission rate for heart failure patients, measuring interventions compliance, as in simple follow-ups across the organization.[13]
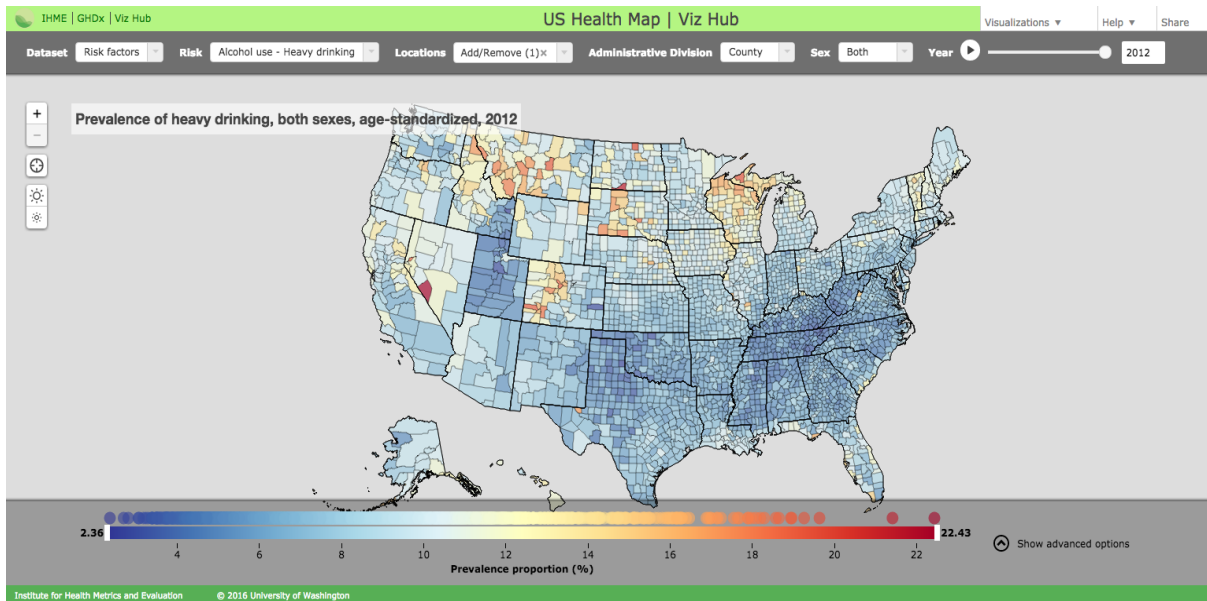

Image Source: Institute for Health Metrics and Evaluation

While many models for risk stratification have been developed, there is no consensus on the ideal model, in large part due to the variation of metrics and priorities among settings. Research has shown that Adjusted Clinical Group (ACG) models are better for predicting resource utilization, thereby enabling cost savings, but all risk stratification models enable improved care coordination.[14]

---

[13] "How to Reduce Heart Failure Readmission Rates: One Hospital's Story," Health Catalyst, 2016
[14] "Risk-Stratification Methods for Identifying Patients for Care Coordination," American Journal of Managed Care, September 2013
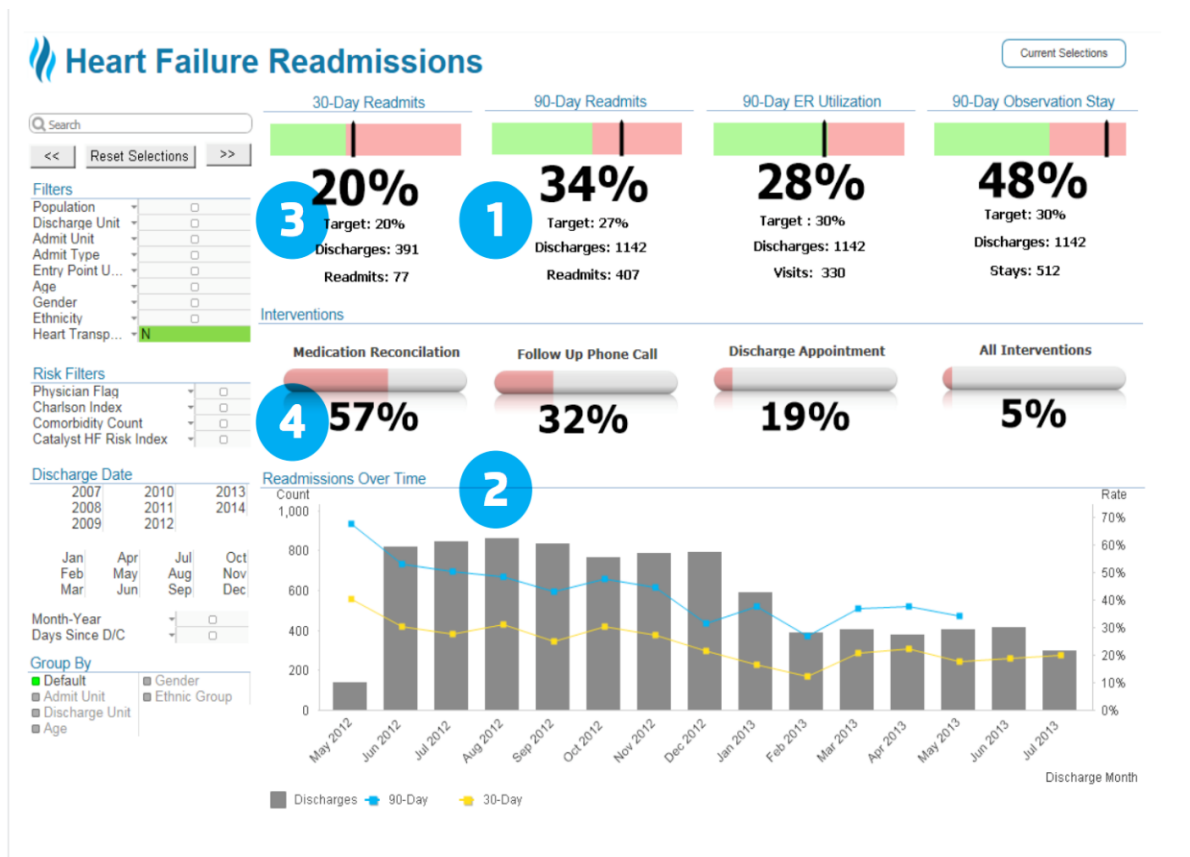
Image Source: Health Catalyst

Examples of Communities Analyzing SDOH to Improve Care

Orange County: 2014-16 Health Improvement Plan

In 2012, the Orange County Community Health Planning Advisory Group (OCCHPAG), made up of the Orange County Health Care Agency and Public Health Services, identified four areas of health that were a priority for the community: infants and children, older adult health, obesity and diabetes, and behavioral health. They identified 200 SDOH-linked metrics including "adults with health insurance," "7th grade students who are physically fit," and "food insecurity rate." OCCHPAG has built a dashboard that reports the Orange County absolute value and directional trend of these metrics, as well as their value relative

to other California counties, the state of California, and the US.[15]

Through a series of "Promising Practices" tailored to each of the four priority areas, the Orange County Healthier Together initiative has seen improvement. The "Promising Practices" Pasos Adelante program is an intervention program that promotes improved nutrition and increased walking activity in US-Mexico border communities through culturally-tailored education and empowerment. This program incorporates community-specific factors and tracks the associated indicators. Participants in the program have seen statistically significant improvements in body mass index, cholesterol, and blood pressure.[16]

WYHealth ER Appropriate Care Program

WYHealth, Wyoming's Medicaid Care Management Program, set out in 2012 to reduce high emergency department (ED) utilization and to identify potential gaps in care by analyzing Wyoming's Medicaid Management Information System. Leveraging a combination of closely-monitored data analytics and high-touch patient engagement, WYHealth was able to prevent costly and unnecessary ED admissions. Interventions included a 24/7 nurse advice phone line (where patients could receive counsel and filtered out ER admittance for non-time-sensitive issues), consistent outreach to frequent ER users (particularly those whom are admitted 10+ times per year), provider conferences (to educate clinicians on complex cases and high ER users), and promotion of less-costly resources for healthcare in the community.[17]

Combined, these interventions, resulted in ED cost reductions by more than 20% per member per month, and an overall estimated cost savings of $1.8 million.[18]

What Does This Trend Mean for Healthcare?
The implications of an increasing focus on SDOH are two-fold, rooted in the data collection and analysis respectively: first, the process of data collection will require a deep

---

[15] "OC Dashboard," Orange County's Healthier Together, December 2016
[16] "Pasos Adelante: An Evidence-Based Practice," Orange County's Healthier Together, December 2016
[17] "Annual Report: July 2013-June 2014," WYHealth, 2015
[18] "How social factors shape population health: integrating the non-medical sources of health issues," Xerox, 2016

and far-reaching collaborative effort between health care systems and community organizations. As health systems continue to come up the curve of EHR implementation, there will be an increasing demand to enable interoperability between EHRs and databases within other organizations. Data collection and data sharing among insurers, community health organizations, governmental programs, and other community stakeholders will be crucial in order to develop robust datasets that can drive productive insights.

Second, a greater focus on SDOH will have significant ramifications on future employment opportunities within health systems. Persons having database development, system development, data analysis/assessment, data visualization, and business intelligence expertise will be crucial and in-demand as health settings shift towards a population health perspective. Those individuals who have the aforementioned clinical and technical skills, combined with softer skills such as collaboration, project management, critical thinking, and emotional intelligence will be best-positioned to secure leading positions.

Ultimately, this broadening scope of healthcare signifies a shift towards a proactive and preventive model of care delivery. Driven by data and impacting all corners of patients' lives, interventions enabled by SDOH risk stratification have a measurable impact on cost, patient outcomes, and patient satisfaction. Healthcare is at a historic inflection point in which, driven by data and actionable insights, we all have the potential to benefit.