# Cognizant

**Digital Business**

# The Social Determinants of Health: Applying AI & Machine Learning to Achieve Whole Person Care

Digital tools make it possible, and practical, to integrate social determinants into patient and population health management to improve outcomes and reduce costs. Here's our take on how to turn theory into practice.

April 2019

# Executive Summary

Growing evidence indicates that up to 60% of a person's health status is determined by behavior and social factors, such as socioeconomic status, employment, food security, education, community cohesion and more.[1] Many healthcare organizations recognize the impact of these social determinants of health (SDH) on their patients. They want to capture SDH data and, when necessary, mitigate the effects of SDH on patient populations.

However, until recently, healthcare organizations have found it challenging to identify which SDH are at work and to incorporate this data into their patient care workflows. Another difficulty has been successfully connecting patients with community agencies and then following the results of these referrals.

AI and machine learning (ML) as well as other digital tools promise to alleviate these issues and make it practical for healthcare organizations to incorporate SDH into individual care management as well as population health strategies. AI and ML can use existing data sets to identify patients with adverse SDH. Human-centered design, augmented by digital tools, enables organizations to build efficient workflows for referrals and follow-up.

This white paper explains how healthcare organizations may implement a warm, simplified approach to incorporating SDH factors into whole person care using human-centered design, AI and digital tools.

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# Looking beyond vital signs

During the winter of 2017, 40-year-old Jim became a regular at his local emergency department (ED), consistently presenting with severe asthma attacks. The ED staff wondered what environmental factors were causing the frequency of the attacks but had few resources to investigate further. Yet without understanding the ultimate cause of Jim's attacks, the ED providers could only treat the resulting symptom. Thus, the frequency and severity of the attacks continued to worsen, and Jim's condition became increasingly more complex and expensive to treat.

When his state initiated value-based payment programs, Jim was assigned to a managed care organization (MCO). The MCO care managers interviewed many high users of hospitals and emergency departments like Jim, and observed the daily activities of these individuals to better understand the reasons behind their frequent hospital visits. What they discovered astonished the care managers: Jim had been attempting to manage his asthma while homeless. His lack of consistent shelter and a stable environment exacerbated his chronic asthma, resulting in the severe attacks and frequent ED visits.

The MCO decided to provide shelter to Jim and assigned a care manager to coordinate his health and social needs. Recognizing and incorporating Jim's social and health needs into his care plan resulted in an extremely encouraging outcome. Over the course of the next 12 months, Jim stopped visiting the ED; the severity of his attacks lessened; and he effectively managed his chronic condition.

Jim is not the only individual whose inability to meet basic physical needs leads to overuse of the local ED. In fact, this situation is common across the U.S. Studies have documented that homeless persons have higher rates of ED use and hospitalization as compared to the general population.[2,3]

Homelessness is just one of the social issues driving up healthcare utilization and costs. Safe housing, local food sources, transportation, public safety and many more factors all contribute to a person's health – or lack of it.[4]

Studies have shown that social and environmental factors are much more indicative of a patient's health outcome than initially thought. In fact, 60% of a patient's healthcare outcome is driven by the person's behavior and their social and economic factors (as noted above), 10% by their clinical care, and 30% by their genetics.[5]  These socioeconomic factors, or SDH, are defined by the World Health Organization as the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life[6] (see Figure 1, next page).

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## Social determinants of health

| CATEGORY | SUBCATEGORIES |
|---|---|
| **Economic Stability** | Economic stability<br>Poverty<br>Food security<br>Housing stability |
| **Education** | High school graduation<br>Enrollment in higher education<br>Language and literacy<br>Early childhood education and development |
| **Social & Community Context** | Social cohesion<br>Civic participation<br>Discrimination<br>Incarceration |
| **Health & Healthcare** | Access to health care<br>Access to primary care<br>Health literacy |
| **Neighborhood & Built Environment** | Access to healthy food<br>Quality of housing<br>Crime and violence<br>Environmental conditions |

Figure 1

The latest value-based care models for the first time emphasize SDH. Their premise: If healthcare organizations can identify and incorporate socioeconomic factors into patient care plans to treat the whole person and not just a disease, patient healthcare outcomes should greatly improve.

Government entities have begun to investigate how to incorporate SDH into their population health efforts. This trend is evident in the more than 19 states that require SDH screening.  Some, including Arizona, Louisiana and Nebraska, are requiring SDH coordination and care in their Medicaid managed care contracts.[7]  In fact, the Centers for Medicare and Medicaid Services (CMS) recently approved a rule expanding reimbursements to Medicare Advantage plans for certain non-health-related expenses for chronically ill members, such as meal delivery and nonemergency transport.[8] The expanded Special Supplemental Benefits for the Chronically Ill will be available to qualified Medicare Advantage recipients starting in plan year 2020.[9]

Gathering and acting on SDH information also could be beneficial for providers and payers.  Healthcare organizations are reporting promising returns from their investments in addressing SDH factors and whole-patient care (see Quick Take page 11). Montefiore Health System calculated a 300% return on its investment in housing units for patients requiring shelter. The shelters reduce ED visits and unnecessary hospitalizations, and at  approximately $140 per night per bed, cost significantly less than an overnight hospital stay.[10]

## Searching out & supporting SDH-influenced patients

Healthcare organizations must first identify patients facing adverse SDH before they can achieve better outcomes. This identification has proved challenging.

The CMS introduced new standardized medical codes for capturing SDH data as part of the ICD-10 code set. However, in our experience, providers have been slow to adopt these codes. One possible explanation: SDH codes are only "reason" codes; providers aren't compelled to include them on claims. As medical coding has become increasingly complex and providers exceedingly time-stressed, many providers forgo the opportunity to look up and submit additional codes for SDH.

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The difficulty we've observed for healthcare organizations is integrating SDH identification and follow-up processes into existing clinical workflows. Care managers and patient navigators refer patients to appropriate agencies, but are unable to close the communications loop and verify patients and agencies have connected, let alone track the impact of services on the adverse SDH.

In addition, determining whether a patient has adverse SDH factors often is a manual and inefficient process. Care managers or patient navigators typically are responsible for identifying patients with SDH risk factors and connecting them with appropriate support agencies and/or remedies. Care managers use cumbersome standard paper questionnaires to tease out SDH factors (see Appendix, page 13).

Given that SDH are often sensitive topics, many patients typically refuse to answer these queries, making it difficult to determine their actual risk. Some studies have indicated only 10-15% of patients with adverse SDH factors request help.[11]

However, recent advancements in AI and ML have created new methods of identifying SDH. These methods leverage existing data in a patient's electronic health record (EHR) as an input for an ML model. The model analyzes the data and predicts the likelihood of a patient's risk for an adverse SDH.

Identification of adverse SDH is only the starting point of integrating these factors into patient and population care. Patients must be equipped with the proper support to overcome adverse SDH factors. The difficulty we've observed for healthcare organizations is integrating SDH identification and follow-up processes into existing clinical workflows. Care managers and patient navigators refer patients to appropriate agencies, but are unable to close the communications loop and verify patients and agencies have connected, let alone track the impact of services on the adverse SDH.

Additionally, because there is no standardized system in the industry for tracking the SDH information along with the appropriate referral, providers along the patient's journey can find it difficult to monitor and recommend necessary services. However, SDH information stored in an EHR can be accessible to providers and agencies across an expanded continuum of care. Further, record-based SDH data makes it possible to integrate technology and information, enabling optimal care plan development and continuous observation of a referral relationship and its impact on a patient's outcome.

Incorporating SDH into care and population management clearly requires more than technology or questionnaires. It's critical to understand the perspectives and workflows of all stakeholders: patients, providers and social agencies. This knowledge becomes the foundation for a human-centric approach to incorporating SDH into care.

# Successful SDH solutions require a human-centric approach

▮ **Phase 1:** Build out a human-centric SDH solution. Human-centered design helps uncover a healthcare organization's unique path to managing SDH. Such design begins with ethnographic studies of patient populations, providers and social agencies to thoroughly understand how these entities interact and experience the care journey. The work reveals friction points and institutional idiosyncrasies, such as vocabulary, processes and geographic influences. In parallel, the studies enable the healthcare organization to assess the scope of SDH needs within its patient populations and their impact on patient outcomes. (For more insights on this topic, read our white paper "Helping People Heal.")

Equipped with this information and insight, the healthcare organization can prioritize which SDH to address first. The study likely will reveal many opportunities; starting with just two or three avoids scope creep. When the initial effort is successful, the organization can scale its strategy to address additional opportunities.

Once the healthcare organization has identified the size and scope of the strategy, it can begin to build its initial solution. Working in phases helps ensure the organization identifies and solves key issues to mitigate their effects on the next set of activities.

▮ **Phase 2: Develop the SDH identification, integration and observation strategy.** This includes developing a vision and roadmap to determine how to identify patients affected by SDH factors, how to integrate the identified SDH and referral information into the EHR, how to connect patients to appropriate support services, and finally, how to observe the impact of those services on patient outcomes.

Customized strategies must be designed to encompass the technology's use by clinical staff as well as referral management processes to address friction points revealed in the initial study. Tailoring the

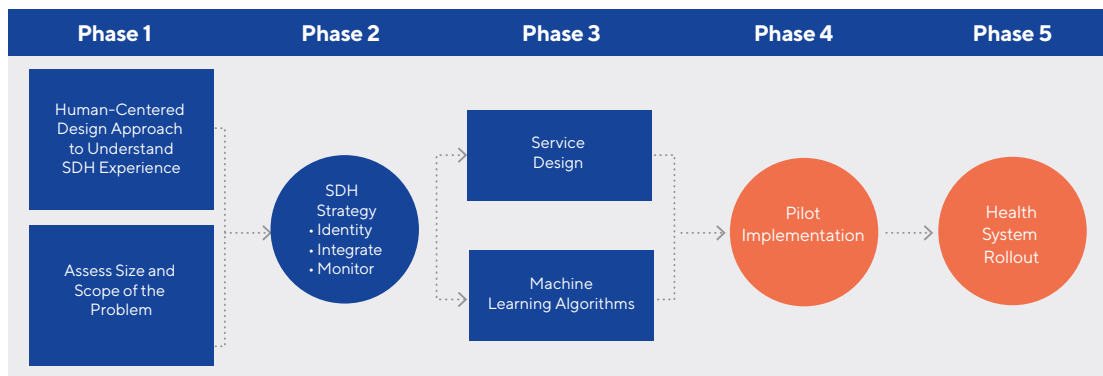## Stepping through a successful SDH strategy



Figure 2

Customized strategies must be designed to encompass the technology's use by clinical staff as well as referral management processes to address friction points revealed in the initial study. Tailoring the algorithm and its ontology to the environment will result in greater accuracy in detecting patients at risk.

algorithm and its ontology to the environment will result in greater accuracy in detecting patients at risk. Seamless integration of the algorithm and its findings into the clinical workflow is critical to fully leveraging the technology's capabilities throughout the entire care journey. Doing so ensures providers will have the necessary data to tailor care plans to address SDH factors, while clinical staff can follow up and monitor referrals to SDH support services.

Therefore, all stakeholders across the care journey must be included in the strategy and development phase to understand and leverage the technology and the information it provides.

**▌** **Phase 3: Build the identification algorithm and incorporate the SDH solution into the clinical workflow.** Developing the algorithm will include identifying all key data sources, training the algorithm and fine-tuning the SDH ML model. In addition, it's important to identify if the model will be tightly integrated within a health system's EHR or if it will be a stand-alone programming interface within the healthcare organization's ecosystem. Integrating the SDH solution into the EHR enables better care coordination and information flow. In turn, those capabilities will help the organization achieve the industry's "triple aim" of reducing costs, improving population health and enhancing patient experiences.

In parallel, the organization must design its SDH service by considering how the algorithm will be used in the clinical setting, how it will fit in the larger care journey, and how referral relationships will be observed and monitored. Tracking and managing the communication of the findings throughout the care journey will be critical to the program's success.

**▌** **Phase 4: Create a pilot program that includes events across the value chain.** Success here depends on all the stakeholders, and so they should be well trained in how to use the solution. As new insights and processes are implemented, it is crucial to understand what is working and what's not. Whether it is adjusting the technology to better fit within the clinical workflow, or better tracking the community resources and their referrals, this will determine whether this model can be scaled to a larger population or opportunity space. Success factors to evaluate include:

> Level of accuracy in identifying patients at risk of adverse SDH factors.
> Ease of referring patients to appropriate community resources and tracking patient outcomes to evaluate which resources are best equipped to mitigate SDH effects.
> ED utilization and readmission rates among patients with SDH risks to gauge improvement in outcomes for this group.
> Patient satisfaction scores to see if these reflect a customized, informative and supportive care journey experience.

**▌** **Phase 5: Scale the program far and wide.** Finally, once the pilot phase has been implemented and deemed successful, the program can be scaled to reach the entire health system. As the program is scaled, it is important to incorporate key learnings and findings from the pilot program to ensure continuous improvement.

# Steps toward SDH and whole person care

Emerging technology and frameworks enable healthcare organizations to incorporate SDH factors into care plans more efficiently. These are the initial steps to take:

I **Understand patient populations in relation to SDH factors.** Identify the population that most needs SDH solutions, as well as which SDH factors are most pressing. Dual Medicaid/Medicare recipients often face a variety of SDH factors that drive up the cost of care. Identify which SDH factors appear to lead to high costs and poor outcomes that can be remediated cost-effectively. These may be starting points for Phase 1 of a pilot program.

I **Identify available data lakes to leverage in identifying SDHs and patients at risk for them.** Potential sources include clinical notes, SDH survey information, and care manager EHRs.

I **Inventory community resources and partnership opportunities.** Care managers should have a strong understanding of available community resources and their quality.

I **Review technology resources to leverage.** These may include such services as NowPow and Aunt Bertha that maintain databases of community agencies and resources for an array of SDH.[12,13]

# Looking Forward

Addressing SDH will be critical for healthcare organizations operating under value-based reimbursement models. "Treating" SDH factors should reduce the overall cost of care by helping patients gain a better quality of life while avoiding disease progression, ED visits and hospital admissions.

SDH solutions must be woven into the industry's reimbursement schema to become widely adopted. Some evidence indicates movement toward that goal. The CMS is exploring reimbursing for non-clinical SDH-related interventions, such as housing, nutrition, transportation, etc., through the CMS Innovation Center's Accountable Health Communities Model.[14]

Using AI and ML can streamline the process of uncovering SDH in patient populations, while digital tools make it easier to connect patients to services and monitor the services' impact. Healthcare organizations may test these technologies with relatively small sets of EHRs, patients and providers. This step will enable healthcare organizations to understand the challenges SDH pose – and the opportunities these factors represent for improving and sustaining outcome quality in their patient populations.

# Quick Take

# SDH identification & integration: The foundation for whole-person care

As the industry adopts value-based care and outcome-based reimbursements, healthcare organizations are revisiting the concept of whole-person care to reduce costs and improve outcomes. Whole-person care connects the dots between healthcare and social services and integrates social diagnosing and social prescribing into the patient journey. Identifying adverse SDH and integrating these within the EHR and clinical workflows is essential to delivering whole-person care at the patient level, the health system level and the community level.

Social diagnosing and social prescribing call for creating a comfortable environment in which a patient and provider can speak freely about the patient's SDH challenges. The algorithmic identification of potential SDH factors can help spark these conversations; providers still will need training in how to address SDH topics. With SDH factors identified and discussed, the care provider may then prescribe the appropriate social services along with medical care.

Health systems must manage these referrals and monitor patients' progress. Integrating SDH programs directly into EHRs and clinical workflows transforms health systems' ability to do so effectively. SDH integration with EHRs enables more accurate data capture and the ability to evaluate the impact of various interventions and services on the patient's health.

Finally, for referrals to be effective, communities must support the needs of their members. Some communities and cities are investigating how their physical design could contribute to better health and wellness.[15]  Healthcare organizations are also addressing community-level challenges. For example:

▎ Kaiser has pledged $200 million to address housing challenges in its service areas.[16]
▎ In Pennsylvania, Geisinger is addressing food insecurity to help diabetic patients better manage their blood sugar levels.[17]

- United Healthcare plans to offer millions of grant dollars to community initiatives targeting specific social and health needs, such as food security and pediatric patient access.[18]
- Humana similarly announced it will invest $7 million in nine organizations that address food security, social connections and financial stability.[19]
- As part of its goal to find innovative ways to manage chronic conditions, CVS plans to invest $100 million over the next five years toward improving community health.[20]

Mitigating the many different adverse SDH factors requires comprehensive networks of providers, payers and social agencies. With SDH data integrated into EHRs and clinical workflows, these networks will have the information they require to collaborate on and evaluate solutions. That cooperation will help facilitate the industry's shift from expensive disease-focused episodic care to cost-effective, health-enhancing whole-person care.

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# Appendix

Today's current methods of identifying whether a patient is at risk for an SDH are often ineffective because they are paper–based, intrusive and difficult to incorporate into clinical workflows.  Common tools include:

▮ The Accountable Health Communities Health–Related Social Needs Screening Tool developed by the CMS.

▮ The Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (PREPARE) Tool: This may either be a paper version of an SDH questionnaire or a questionnaire within the EHR.

▮ Customized surveys developed by the care team, which are often created specifically for their patient cohorts, which means they aren't translatable.

▮ Door-to-door surveys (if patient touchpoints are inaccessible).

▮ ICD-10 diagnosis codes (Z codes).

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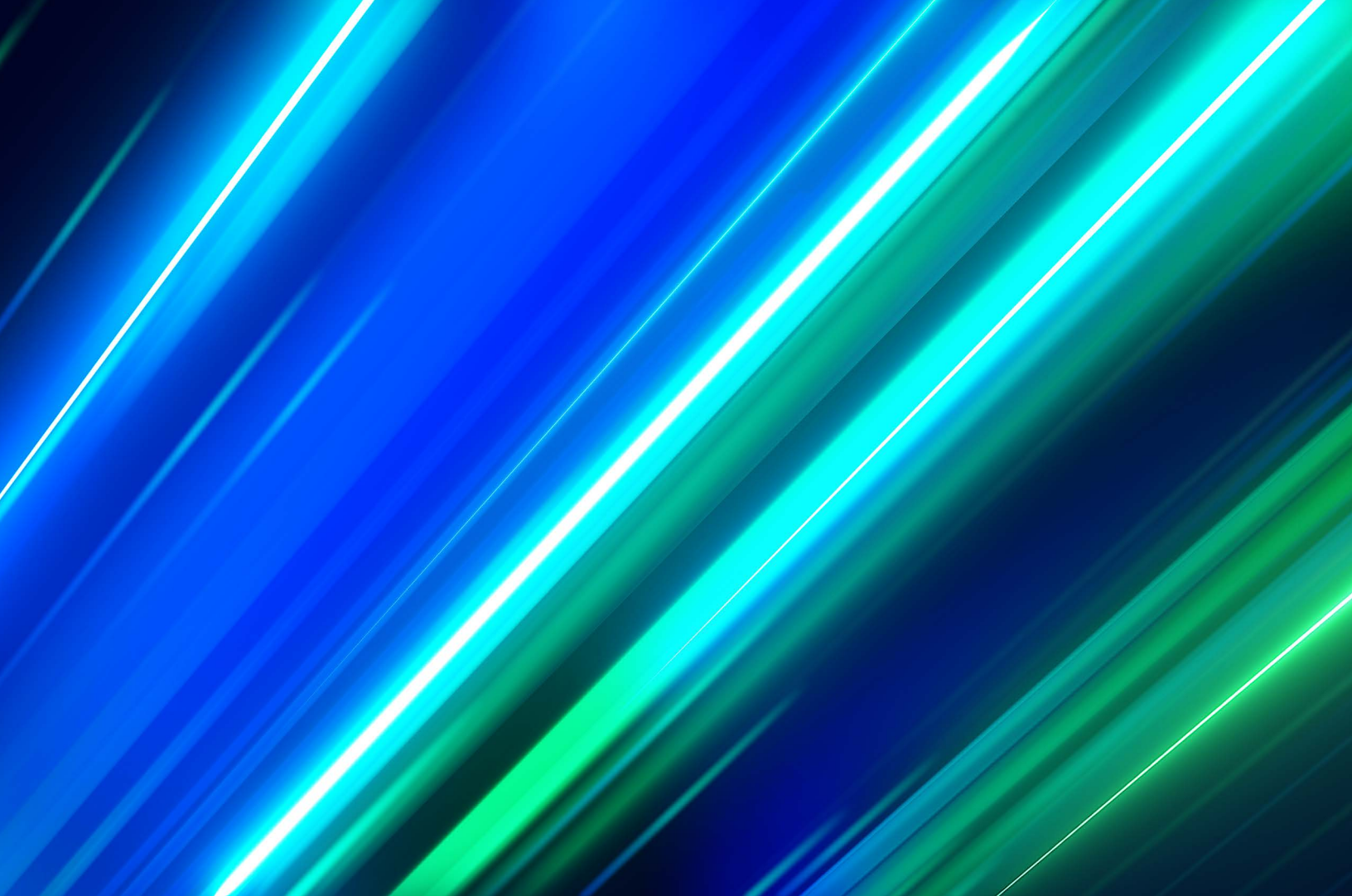**Manager, Healthcare Practice, Cognizant Consulting**

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