The Parkland Center for Clinical Innovation (PCCI) is an early stage data and technology research and development organization that is an affiliate of Parkland Health & Hospital System in Dallas ("Parkland"). Formed in 2016, PCCI consists of a highly experienced team of data scientists and physicians working together to address pressing health and healthcare issues facing hospitals, clinicians, patients, and communities. PCCI's work centers around three main areas of focus: 1) building and deploying predictive models to proactively identify high-impact patients; 2) establishing *Connected Communities of Care* by linking healthcare providers and community-based social service providers together via a state-of-the-art information exchange platform; and 3) developing and deploying approaches to encourage/enhance patient engagement. Because of the nature of this work and the fact that PCCI is a Bridge Organization participating in CMS's Accountable Health Communities (AHC) model, PCCI is intimately familiar with the challenges and opportunities of collecting and using measures of social determinants of health (SDOH) in research and development initiatives. We bring to this discussion a global perspective of how others in the healthcare industry are using SDOH as well as how community-based social service organizations, large and small, are viewing the heightened focus on SDOH. With this perspective, we provide the answers below to the questions posed in this Request for Information.

Q. Are social risk data being used to target services or provide outreach? If so, how?

Yes. PCCI has used three approaches to gather, analyze, and target outreach.

1. Accountable Health Communities (AHC): Determination of Target Zip codes for Model Demonstration

The AHC work is designed to improve the health of our community and reduce the cost and utilization of unnecessary care. Over four years, 75,000 beneficiaries must be screened and 3,000 navigated annually. We currently have four large health systems participating and over one hundred community-based service providers in the network and we will be adding another two hundred over the next few years.

We have used a variety of data sources to discern the best estimates of the population in the geographic area to meet the key milestones specified in the AHC program. These include:: 1) data provided by our health system and community-based service provider partners; 2) de-identified data from the Dallas Fort Worth Hospital Council (DFWHC); 3) census data; and 4) social sector data from our previous and existing collaborative projects.

PCCI identified the type and concentration of social risk needs in the areas with high penetration rates of AHC eligible beneficiaries through analysis of data and information gleaned from the following sources:
- Community Needs Assessment conducted for Dallas County
- Surveys from patients, residents, and health and social service providers in the Dallas metropolitan area
- A report from the Center for Nonprofit Management and the Communities Foundation of Texas. Seventeen of the 84 zip codes within Dallas County covered by the AHC program

include the zip codes with the highest concentrations of beneficiaries with unmet social needs.

2. Community Wide Data Initiative

In a collaboration with the Dallas branch of Texas Health and Human Services Commission, the University of Texas, Dallas – Institute for Urban Policy Research, and the Dallas Fort-Worth Hospital Council Foundation, we have begun ingesting diverse sources of social risk data into our cognitive computing platform to provide community and city leaders with real time data-driven insights to alleviate poverty and to improve the quality of life and the environment in the community. The data assets we are using to drive dynamic heat maps of social needs are:

- American Community Survey- Census Data
- 311 Service Requests
- 911 Crime and Safety reports
- Area Deprivation Index
- Housing and Transportation datasets
- Kindergarten readiness and school performance
- Dallas Central Appraisal District financial reports
- Food Insecurity- Feeding America reports
- Childcare availability reports
- Dallas Fort-Worth Hospital Council healthcare data sets

3. Community Needs Assessment

We also recently completed a comprehensive Community Needs Assessment with an emphasis on poverty for Dallas County. The sources of information included:

- Existing secondary databases/historical data
- Surveys of residents
- Surveys of service providers from five sectors
- Interviews with elected officials and other community leaders
- Focus group sessions with community residents

Q. How are beneficiaries with social risk factors identified?

PCCI has designed a standard operating protocol, currently in the pilot phase, to identify Medicare and Medicaid beneficiaries with health-related social needs presenting for health care at Dallas major providers (includes large volume ERs, Children's Hospital and a Medicaid mental health provider) serving community dwellers living in high social need areas defined previously in answer to question one. The anchoring tool for social risk is the CMS field-tested and validated Health-Related Social Needs (HRSN) Screening Tool.

Q. Are there especially promising strategies for improving care for patients with social risk?

PCCI's *Connected Communities of Care* (*CCC*) platform is designed to accomplish the critical alignment of providers and community-based social service organizations across a community to improve the care of patients. Designed and first implemented in Dallas County, Texas in 2014, the *CCC* platform serves as a comprehensive foundation for partnership between a community's clinical and social sectors and leverages a cloud-based information exchange/case management software platform providing seamless connection, communication, and coordination between healthcare providers and a wide array of community-based social service organizations, criminal justice entities, and various other community organizations, including non-collegiate educational systems.

Success of a *CCC* depends upon a sustainable technology infrastructure that supports information sharing among the providers and other community partners. PCCI's *CCC* technology partner is Pieces Technologies, Inc. ("Pieces"). Pieces Iris™ software is the cornerstone powering PCCI's *CCC* platform. Similar to an electronic medical record, the Pieces Iris™ software and applications capture, securely store, and appropriately provide access to vital information about individuals and service organization clients in a way that supports the unique, underlying workflows. If all participating organizations are on the *CCC* platform powered by Pieces Iris™, then they all are connected through the innovative closed loop referral system and are thus able to communicate and share information with each other. For organizations on a different platform, Pieces Iris™ offers connectivity through industry standard APIs and HL7 data feeds. PCCI's *Connected Communities of Care* not only connects community-based service providers via a secure, state-of-the–art two-way messaging platform, but *CCC* wraps around the technology a wealth of field-proven and leading clinical and social workflows to make services and coordination of community populations more effective and cost-efficient.

The *CCC* platform facilitates the secure exchange of critical case management information at various steps in the process, such as when an individual first seeks food assistance or requests emergency housing. The *CCC* lays the groundwork for an innovative system of assistance and broader social service delivery and creates a longitudinal record of care via referral tracking and increasing access to a broad array of services to improve individual well-being and community health. Ultimately, the *CCC* streamlines assistance efforts, reduces repeat crises and emergency funding requests, helps address disparities of care, and improves the health, safety, and well-being of the most vulnerable community residents.

Over a 2 ½ year period at Parkland Memorial Hospital, use of the *CCC* platform has resulted in savings of approximately $12 million, driven by a 40% reduction in hospitalizations and a 36% reduction in ED visits, with over 100 community-based social service organizations and over

251,000 unique individuals participating. During this same timeframe, more than 800,000 services were provided, including housing, job training, and food assistance. The current goal of the *CCC* is 300 participating community-based social service organizations

CASE STUDY ONE: Decreasing Socially Driven Readmission with Analytics Informed Transitions of Care Program

PCCI developed real time predictive models to risk stratify patients for 30-day readmission rates. The pivotal finding was that social risk factors contributed strongly to the risk of readmission. For example, patients with multiple home addresses in the last year were statistically more likely to be readmitted within 30 days (p<.05) than individuals with a single, stable home address. Consequently, a Transitional Care Unit was created to proactively prepare individuals at risk upon discharge for successful transition into the community. Case managers received breakdown scores based on common, chronic, high-need conditions, including CHF, AMI, pneumonia, and diabetes. Nurse educators and community navigators then contacted community service providers for warm handoffs post-discharge and continued to follow patients for a specific period of time. PCCI is currently analyzing and evaluating the results of the initiative.

CASE STUDY TWO: Data Across Sectors for Health-Community Chronic Disease support for food insecure diabetic and/or hypertensive patients

PCCI analyzed de-identified data from the *CCC* to determine the number of patients, over a defined time period, who received healthcare from Parkland Memorial Hospital and one of the food pantry participants in this collaborative. In 2014, 4,627 patients used services from both institutions. Of these, 2,700 (58%) patients had two or more ED visits to Parkland Memorial Hospital in 2014, while also receiving services to address unmet social needs provided by the food pantry.

This data informed a pilot project to decrease adverse health events among food insecure and under-resourced populations with hypertension or diabetes in the Dallas metropolitan area. The intervention was designed to improve multi-sector care coordination through data sharing and collaboration between Parkland and hunger relief agencies that regularly serve this population. The *CCC* platform (including its associated workflows) was leveraged to: 1) identify Parkland patients with diabetes and/or hypertension who regularly attend three participating food pantries in Dallas county; 2) provide the food pantries with a single-page health information summary sheet that will inform food bank case managers of any dietary needs of patients, and list current medications and upcoming appointments scheduled at Parkland Memorial Hospital and its affiliated primary care clinics; 3) train the food bank staff to guide patients' food choices based on their current health conditions, remind patients of upcoming appointments, and assess prescription pick-up status and adherence; and 4) provide relevant information back to Parkland case managers, including prescription status, types of food items picked up, and number of times patients visited the food bank in the prior month.

The pilot program resulted in an 8% drop in ED visits vs a 46% increase in the non-intervention group. Ninety percent of program participants agreed or strongly agreed that the program made

them more aware of their illness, better able to manage it, and more likely to keep clinic appointments, fill prescriptions, and adhere to medication orders.

Q. How are costs for targeting and providing those services evaluated? What are the additional costs to target services, such as case management, and to provide additional services (e.g., transportation)? What is the return on investment in improved outcomes or reduced healthcare costs?

We are current analyzing cost and utilization data from our AHC model along with other *CCC* Dallas-based initiatives to address the aforementioned questions.

Q. What are the best practices to refer beneficiaries to social service organizations that can address social risk factors?

Several months of pilot trials using the HSRN CMS tool and referral workflows have resulted in the following key learnings. PCCI has presented these learnings to national audiences on several CMMI Cross Model Learning Network webinars over the past few months.

- Establish standardized and effective risk screening
- Review and ensure accurate assessment of screening information
- Assess patient willingness and motivation
- Seek compatibility between patient preferences and available services
- Engage social support and direct encouragement of patients to pursue and engage in services
- Develop and deploy an accurate, up-to-date, robust community resource inventory that includes the following components:
  1. Updated through crowd sourcing and direct contact verification to ascertain contact information, eligibility, scope of services, and any required documentation
  2. Mapping locations of services to assess the coverage capacity for targeted zip codes
  3. Automated output of an applicable service provider list after electronic entry of needs and preferences
- Ensure end-to-end closed loop referral process
- Tracking of social needs at an individual and aggregate level

Q. What lessons have been learned about providing care for patients with social risk factors?

Since starting work with vulnerable and under-served populations in the Dallas metropolitan area in 2014, PCCI has learned a great deal about what works and does not work when it comes to providing care for patients with social risk factors. Among others, the following represent some of the key learnings:

- Accurate and comprehensive determination of the exact needs of patients is essential, as patients have multiple intersecting needs
- Payment systems and metrics for social service providers are not developed so it is often difficult to provide for a patient's social needs, much less measure their impact
- The agendas of social service agencies often differ from those of healthcare providers and payers, thus making alignment difficult or impossible
- Engagement of the patient is critical, especially within these special need populations; however, these individuals are very difficult to engage, especially through traditional healthcare provider channels. Results from PCCI's various studies suggest using local staff at community-based social service organizations, rather than healthcare personnel, to help build engagement among vulnerable, under-served populations.

Q. What are barriers to tailoring services to patients with social risk factors? How can barriers be overcome?

Again, because these populations are difficult to engage and manage, special attention (and funding) must be directed to tailoring services to patient needs and insuring that the tailored services are received by those most in need. Some of the barriers to effectively accomplish this include:
- Inadequate\Inaccurate assessment of social risk
- Community resources are unavailable or have too many eligibility requirements to satisfy needs.
- "Learned helplessness" may prevent patients from engaging with available and known resources; based on repeated unsuccessful attempts to secure services, an individual may feel a sense of powerlessness, passivity, and a lack of belief in personal success and, as a result, the individual will not bother trying to engage resources even though the resources are available and known to the individual.
- Lack of alignment and coordination among community-based social service providers themselves; thus, it is difficult to effectively coordinate delivery of services across multiple areas of need, such as food, housing, transportation, healthcare, etc.
- Lack of payment for many social services
- Difficulties in getting healthcare providers and community-based social service organizations to work together

Q. How can barriers be overcome?

The barriers are substantial but with forethought and perseverance they can be overcome. Based on examples from PCCI's experience working with healthcare and community-based social service organizations, the following are some methods that have proven successful:
- Assess social risk on several levels and at every opportunity using standard assessment tools to facilitate cross-sharing of data
- Establish a community advisory board, chaired by a well-known and respected community-based social service organization, to monitor beneficiary needs
- Align healthcare providers and community-based social service organizations

- Create and develop smart sharing of data from EHRs to social service organizations via closed loop referral systems, such as PCCI's *Connected Communities of Care* platform
- Develop payment systems and policies to support the delivery of critical social services for vulnerable and under-served populations

Q. For patients with social risk factors, how does patients' disability, functional status, or frailty affect the provision of services?

We find that all of these factors worsen acute social risk needs and make the optimal delivery of social services to these subpopulations more challenging. To date, little research has been done on this topic and PCCI is not aware of any learnings from the field that adequately answer this question at the present time.

HHS is requesting information on how providers and health plans are collecting and using data on Medicare beneficiaries' social risk factors:

Q. Which social risk factors are most important to capture?

Based on PCCI's experience in the Dallas metropolitan area we believe these are the most important social risk factors to collect - ranked from most important to least important:

- Health-related social needs (housing, utilities, food, transport, personal safety)
- Socio-economic (education, employment, income/utility assistance)
- Social support (social networks, family structure, friends)
- Disabilities
- Disparities of care

Q. Do you routinely and systematically collect data about social risk? Who collects this data? When is it collected? Is it collected only once or multiple times for a beneficiary? Is it collected consistently across populations (i.e. Medicare beneficiaries, Medicaid beneficiaries, patients receiving specific services, etc.)? What are the burdens of this data collection on plans, providers, and beneficiaries?

Because we understand the importance of social determinant data, PCCI routinely collects data on social risk factors in all the projects we undertake beginning with our center-piece project the AHC. In the AHC protocol all beneficiaries presenting to partner healthcare entities for care are screened using the standard CMS HRSN tool. There is no limitation for number of screens over a time period, so beneficiaries are screen at each presentation to a participating healthcare facility or provider's office. The screen information is captured in PCCI's *Connected Communities of Care* platform. The screening protocol takes time and is an additional burden in already complex and lengthy workflows for providers. From the beneficiaries' standpoint, they are typically required to spend additional time during their healthcare encounter answering additional questions that they may or may not deem of importance to them at the time.

Q. Would standardized data elements for EHRs help you to collect social risk data? If so, how could these data elements be standardized?

PCCI believes strongly that uniformly standardizing social risk data across the United States would be a major step forward in making the collection and use of social determinant data more acceptable and value-added. There are multiple frameworks available, published by national and state agencies that can be a starting point for creating a standardized taxonomy to capture these data elements. A few examples are:

- Framework contained in CMS AHC Screening Tool
- Social Determinants contained in the Leading Health Indicators (LHI) framework of Healthy People 2020 (https://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-of-health).

Standardization can happen organically, especially if one of the large payers such as CMS working with an organization such as the National Quality Forum, creates a consortium of stakeholders to establish standardized measures and then requires some or all of these measures as a condition of participation. At the same time, the payer should endorse the value of the social determinant measures by funding delivery of services aimed at addressing social needs, risk and disparities of care

Q. What are barriers to collecting data about social risk? How can these barriers be overcome?

Barriers to collecting data about social risk fall into three categories. These include:
1. Workflow Tool Barriers- Primary workflow tools are designed to capture clinical risks – risks that can be addressed by some sort of clinical intervention (medication, procedure etc.). Tools that collect social risk are not commonly found in clinical settings. This barrier can be overcome by designing workflow tools that are specifically focused on capturing social risk of individuals.
2. Cultural and Training Barriers: Talking about social risks and social conditions is typically not part of a routine office visit. Since providers don't typically have social intervention options available to them (how many healthcare organizations have "food" as an order set in their EHR), social risk is not assess and captured. This is a harder barrier to overcome since cultural reorientation takes time. Many medical schools have started changing their programs to train new physicians and nurses regarding the importance of social risk factors. A number of healthcare organizations have also started partnering with food pantries so that providers can generate a "referral" to a food pantry or other social service (transportation, housing, etc.), as is the case here in Dallas at Parkland.
3. Scope and Scale Barriers: Most of the datasets that capture social risk data on neighborhoods are not very granular, and thus, not very useful in assessing an individual's social risk. Data at county level and zip code level is far too variable to apply to individuals and households. At the same time, effort involved in measuring those factors at the block or block group level is very time consuming and labor intensive. PCCI believes that this and other barriers mentioned above can only be removed when communities, providers, and payers start to better understand the implications of social

determinant data and how that data can portend risk and don't perceive this effort to be an expense but an investment that will help make their communities and the individuals in them healthier.

Q. What do you see as promising future opportunities for improving data collection? For using existing or future data to tailor services?

PCCI sees at least four promising opportunities for future data collection. These are:

- *Improving quality of primary data regarding patient's socio-economic environment.* This will happen because workflow tools like EHRs (and their corresponding patient facing applications) and social services applications will have more sophisticated and targeted questionnaires and patient entered data related to that domain.

- *Better extraction of social risk proxies from data that we collect currently*. This will happen when more sophisticated machine learning techniques can extract meaningful signals from free text, and generate more precise proxies from clinical and claims data.

- *Better and more precise understanding of an individual's physical environment and neighborhoods.* We will have a substantially better and more real time understanding of what an individual's environment looks like based on more precise understanding of their location. We will augment publicly available datasets such as census data, 911 data, 311 data with real time IoTs that will give us an understanding of environmental conditions, access to resources such as transportation, etc.

- *Use of social media data.* Within the appropriate boundaries of patient privacy rights, there will be opportunities to use publicly available social media data to assess quality of neighborhoods more quickly than survey based data such as census. That will allow communities and governments to respond more quickly to potential future issues. For example, Instagram data has geocoding embedding in it. Using deep neural networks, we can analyze photographs originating from a specific neighborhood to assess if that neighborhood has sidewalks that are in disrepair, housing stock that might be getting blighted etc. We can compare those photographs over time through machine learning and even predict the rate of deterioration.