ABSTRACT

Title of Dissertation:	HOSPITAL CROSS-SECTOR PARTNERSHIPS TO PROMOTE POPULATION HEALTH
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Health reform efforts continue to hold hospitals accountable for the care they provide by connecting hospital payments to hospital quality. With an understanding that there is no one size fits all solution and a long history of operating within the silo of the medical sector, hospitals have slowly begun to look beyond health care and invest in population health strategies. These upstream strategies usually promote health and wellbeing by addressing the social needs of patients and the social determinants of health: the conditions in which we live, work, and play.

The central research question asks if hospital investments in population health strategies improve hospital quality of care. As cross-sector partnerships have long been at the center of solving large population health concerns, this dissertation seeks to assess how hospitals are engaging partners across-sectors, establish a taxonomy of hospital partnership engagement, and examine variation in hospital and community characteristics across the taxonomy in Chapter Two. This taxonomy will then be used to assess the provision of community-oriented health services in Chapter Three and readmission rates in Chapter Four. Data sources include the 2018 American Hospital Association Annual Survey Database, Area Health Resource Files, Minority

Health Social Vulnerability Index, Care Compare data for unplanned readmission rates, and the Centers for Medicare and Medicaid Services' Impact File.

The analysis resulted in a four-cluster taxonomy of hospital partnership engagement (HPE) that ranged from little to no partnerships to many partnerships and often at formal levels of engagement. In general, partnership engagement increased with hospital size, teaching status, nonprofit ownership, multihospital systems, greater proportions of Medicaid discharges, urbanicity, hospital competition, median home value, household income, educational attainment, and non-white population. Partnership engagement declined with the proportion of Medicare discharges, critical access hospitals, and sole community providers shortage area designation, poverty, and elderly populations. HPE was also found to be a significant predictor of the total sum of community health services provided by hospitals, as well as each of those services, even after accounting for state-level effects. Lastly, high levels of HPE were associated with lower 30-day unplanned readmission rates. Results demonstrate an association between HPE and hospital quality, indicating that hospital investments in population health strategies can improve hospital quality.

HOSPITAL CROSS-SECTOR PARTNERSHIPS TO PROMOTE POPULATION HEALTH

by

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Dedication

To doctoral candidates struggling to complete the final steps of their journey and those that fought to study what they want. May you know your research interests are important and that you are capable of contributing new knowledge to your field. You can do this!

Métete en el papel y continúa. Sigue Adelante.

Better days are coming.

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List of Abbreviations

ACO	Accountable Care Organization
AHA	American Hospital Association
ATSDR	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
CHA	Community Health Assessment
CHIP	Community Health Implementation Plan
CHNA	Community Health Needs Assessment
CI	Confidence Intervals
CMS	Centers for Medicare & Medicaid Services
DSH	Disproportionate Share Hospital
HPE	Hospital Partnership Engagement
HRRP	Hospital Readmissions Reduction Program
IRR	Incident rate ratios
OR	Odds Ratio
SD	Standard Deviation
SE	Standard Error
SVI	Social Vulnerability Index

Chapter 1: Introduction

Background

The United States continues to spend more on health care than any other high-income country, despite achieving average population health outcomes.[1,2] This is largely because it is well known that the social determinants of health, defined by the World Health Organization as the determinants and "conditions in which people are born, grow, live, work and age," have a significant impact on health; influence health care access, utilization and outcomes; and thus are major contributors to the persistent and pervasive health disparities present in the U.S.[3] These determinants can either help or harm people as they go about their lives. While some effects may be short lived (e.g., voting, playing in a park, or access to fresh fruit) or long lasting (e.g., education, oral health, or food insecurity), others can shorten one's life (e.g., violence or shift work), even across generations (e.g., broken treaties or adverse childhood experiences). These determinants are largely responsible for health inequities and "are shaped by the distribution of money, power, and resources at global, national, and local levels, which are in and of themselves influenced by policy choices".[4]

Therefore, to equitably improve population health, interventions must go beyond addressing the social determinants of health to intentionally target them with an aim to eliminate unjust and avoidable health disparities.[5] This work requires a thorough examination of why the conditions in which people live and work are impacting their health and devising interventions that go beyond health care and public health, to stimulate environmental, political, physical, economic, systemic, and social change—the structural determinants of health.[6]

The formation of these structural determinants of health are a *wicked problem* because there is no one size fits all approach to eliminating them, as every solution is interdependent on another, they exist under multiple levels in multiple sectors, and some people have adopted these as the norm; in other words, they are tricky to solve.[7] The only way to effectively work on wicked problems is through a collaborative process where businesses, nonprofits, philanthropies, the media, community, and government organizations work to effectively and humanely tackle the challenges.

Cross-sector partnerships have long been at the center of solving large population health concerns.[7,8] However, national efforts to improve health have largely focused on the health care system, despite evidence linking nonmedical social factors to greater impacts on health than health care services,[9,10] and the federal definition calling for case management services to integrate social services.[11] While most of the literature on cross-sector partnerships focuses on processes to establish and sustain successful partnerships,[12,13] some include health outcome measurements indicating a collaborative cross-sector approach can make strides in solving large population-based problems.[14-17]

The Affordable Care Act included, among others, provisions (i.e., Hospital Readmissions Reduction Program) to hold hospitals more accountable for the care they provide by connecting hospital payments to hospital quality measures.[18,19] This encouraged hospitals to seek out ways to achieve the improve population health[19,20] and achieve the *Triple Aim*: improved patient experiences, improved health (e.g., reduce readmissions), and lower costs.[21] However, research indicates differences in definitions of population health may impact the level at which hospitals engage with partners outside of the medical sector.[22]

Additionally, health reform efforts included revisions to nonprofit hospital tax filing requirements which require nonprofit hospitals to complete a Community Health Needs Assessment (CHNA) every three years, submit an implementation plan, and establish policies on how patients with bad debts will be treated. If hospitals are methodological about their assessments, implementation strategies, and how they invest in their community, they could play a key role in driving population health efforts locally.[23] This is especially true as hospitals tend to be anchor institutions in the communities they serve.[23]

If the true aim of America's health care system is to improve patient experiences, at high quality facilities, at low (at least lower than they are now) costs, then stakeholders from various departments in hospitals must work to improve the social needs of patients and invest in community improvements that can impact the long term effects of the social determinants of health. This can include coordinating care within and across the medical sector, and working to identify and integrate partners outside of the hospital walls that can address the nonmedical needs of patients.[24,25] This may prove to be a difficult task for hospitals depending on commitment to these efforts, relationships with community organizations, and overall resource availability.[16] However, hospital cross-sector partnership networks are not widely understood.

Theoretical Framework of Collaboration

Collaboration is a common practice in life and in business, whether that business is in the public or private sector. It is "*a process in which autonomous actors interact through formal and informal negotiation, jointly creating rules and structures governing their relationships and ways to act or decide on the issues that brought them together; it is a process involving shared norms and mutually beneficial interactions"*.[26,27] Collaboration occurs between people, teams, groups, and institutions as well as the networks they inhabit.[26,28] The collaborative process can

exist under a variety of names such as, partnership, inter-organizational network, collaborative, cooperative, joint venture, franchise, etc.— where some describe a working relationship and others carry legal implications.

Collaboration has been studied by a variety of disciplines, such as public administration, political science, business, organizational management, sociology, economics, psychology, and public health, which have used various theories (e.g., political theory; network theory; institutional theory; microeconomics theory; strategic management theory; communication theory; corporate social performance theory; resource dependence theory; collective action; social network theory; and stakeholder theory) to examine the collaborative process.[27,29,30]

While each discipline brings new approaches, conceptualizations, and a general richness to the field of collaboration research, it has also hindered the rigor of the field as it is flooded with various terms with and without common definitions. For example, cross-sector partnerships and strategic alliances have similar definitions and often are used interchangeably:

- Cross-Sector Partnership: two or more organizations from two or more sectors voluntarily connecting to share ideas, information, data, resources and capabilities to achieve a mutually agreed upon outcome that equally or disproportionately benefits one or both sectors, but could not be achieved by each sector working separately.[31]
- Strategic Alliance: arrangements, though varied in structure and focus, between two or more independent organizations to achieve shared or compatible goals.[32]

Other synonymous terms include intersectoral collaboration,[33] multisector partnership,[24] cross-sector collaboration,[31] strategic partnership,[34] intraorganizational collaboration,[35] public-private partnership,[36] and collaborative partnership.[8]

Regardless of the collaborative theory or operationalized name, a successful collaboration requires skilled leadership and governance; trust and mutual respect; shared vision and common goals; funding/resources; and communication channels.[37] As the focus on health continues to shift from treatment to prevention, from individuals to populations, and individual organizations to interorganizational systems, collaboration is an essential component to improve population health.[22] This study explored collaboration through hospital cross-sector partnerships to identify relationships between partnerships, the social needs and determinants of health, and hospital quality.

Fostering Cross-Sector Partnerships

Cross-sector partnerships have become a staple business practice among public, private, and nonprofit organizations in the U.S. due to changes in regulatory requirements, business needs, and a general desire to create social capital.[38-40] While there are many motivating factors behind a decision to collaborate, partnerships exists because our world is inherently interconnected, thereby creating a need to work across-sectors to achieve a mutual benefit (e.g., streamline processes, reach a broader/target audience, cost savings, resources, etc.).[41,42] Defining the shared vision and mutual benefit(s) is a critical component of success in any partnership because it will highlight the interdependent relationship between the organizations required to achieve their common goal(s) or shared vision providing the motivation and commitment that successful partnerships are built upon.[27,43]

Additionally, the level of partnership engagement varies across a spectrum of collaboration which generally ranges from informal to formal partnerships.[32,44] As partners work together and build trust, they typically shift from informal transactional type of activities (i.e., funding a project, participating on committees, sharing data) to formal transformational

interactions (i.e., leveraging resources, improving processes, higher employee/patient satisfaction).[45,46]

In fact, a when organizations have a history of working together they are more likely to enter a formal partnership because they have a demonstrated history of success.[42,47] This may also be due to the fact that when both organizations are heavily invested in the partnership and the shared vision they're more likely to achieve their sought after outcomes.[42] However, it's important to realize that the collaborative process is iterative and should evolve, building upon trust and reciprocity, therefore formal contracts may hinder partnership growth if implemented too soon.[35,48,49] While organizations are more likely to invest in already established partnerships,[35,48] organizations with a trustworthy reputation known within their social network are also sought after for new endeavors.[43,50]

Community Health Collaboratives

One of the most practice-based approaches to cross-sector partnership development is through community collaboratives, councils, coalitions, or committees, where various organizations from multiple sectors meet to discuss community issues and work together to solve them. Community health collaboratives have been on the rise since 2010,[51] mainly due to local health departments pursuing accreditation and a tax provision in the Affordable Care Act requiring nonprofit (tax-exempt) hospitals to conduct CHNA every three years, which should be done in cooperation with their local public health department and people and groups that represent the broad interests of the community.

For example, the Central Oregon Health Council (COHC) oversees the health assessment and health improvement process, works to create sustainable financing mechanisms for investments towards community health improvement, and acts as the governing body for the

region's Coordinated Care Organization.[52] The COHC was established in 2011 by state policy "to promote the health of the region's residents and seeks to achieve the Triple Aim of improving health outcomes, increasing satisfaction with the health system, and reducing cost," though they began as the board of directors for a health integration project to reduce readmissions.[21,52]

In 2015, 69% of hospitals were participating in a health-related community collaborative made up of multiple sectors,[53] where the public health department is often the backbone organization.[54-56] These collaboratives vary in size and objectives but have been shown to help foster other cross-sector partnerships.[54] This is largely due to the Public Health Accreditation Board requirements for a Community Health Assessment (CHA) and Community Health Improvement Plan (CHIP) as core pieces of the accreditation process. This requirement pairs nicely with the CHNA nonprofit hospitals are required to produce to maintain their tax-exempt status, along with an implementation strategy.[57,58]

In a 2016 study, Jane Erickson, et.al. from ReThink Health and support from the Robert Wood Johnson Foundation, analyzed 237 health-related collaboratives working in 42 states which covered about 33% of the U.S. population. They found that 36% work in two to three areas of focus, while 34% spend more than half their time in one area and 29% distribute their time and efforts across multiple areas.[51] Further analysis of those collaboratives that focused on a single area showed a tendency to work on healthcare access, quality, or cost (18%), followed by health behaviors and risk factors (9%), social, economic, and educational conditions or services (5%), and physical built environments (2%). After analyzing the sectors that work in these partnerships, those that focused on multiple areas had more sectors involved, an average of 11 sectors, while partnerships that focused on just one to three areas averaged about 9 sectors. Research states that sectors are more likely to partner with homogeneous sectors rather than

across-sectors,[59,60] which may explain why single focused partnerships were most likely to work in health care or health behavior areas.

These collaboratives tend to be relatively inclusive. Two separate recent studies identified the top five partners of these collaboratives to be public health departments, medical care delivery, government and elected officials, social services, and education.[51,54] They also found that unions, media, military, law enforcement, and health insurance were the sectors least likely to be members. These two studies comprise 399 multi-sector partnerships and have a lot of overlap in their findings. Both studies discuss the need to engage with additional sectors, however, having too many partners from various sectors may create barriers to identifying shared goals among collaborative members.[61] These studies also cited the collaborative as a source for building other partnerships within the group. In fact, all partners were equally likely to form other partnerships, but non-profits had the highest number of partnerships.[54]

The success of these partnerships has been measured in various ways, such as their connectivity (i.e., membership, organizational structure, relationship building, frequency of interaction, trust, reciprocity),[13,39,47,55,56,62,63] governance (i.e., leadership, anchor institution, reporting, decision making),[47,64] and productivity (i.e., outcomes, achieving goals, partnership value).[8,33] Several reoccurring factors standout as key factors to success in the existing literature, such as trust, value among members, and resource investment.[61] While measuring the actual success of these collaboratives is difficult because of the various ways success can be captured and the lack of comprehensive [and longitudinal] studies, these factors are important to note because they address the challenges with collective action (i.e., free-riders, moral hazard, prisoner's dilemma).[65]

Hospital Cross-Sector Partnerships

Hospitals have historically established most of their partnerships within the healthcare sector (i.e., other hospitals, clinics, providers, insurers) with a limited number of nonmedical partners.[30,66] However, due to changes in policy, payment mechanisms, and reimbursement schemas related to the Affordable Care Act, and guided by the growing body of evidence linking health outcomes to the social determinants of health, there has been a rise in hospitals partnering in nonmedical sectors.[67]

The American Hospital Association (AHA) started collecting national data on hospital cross-sector partnerships in 2014 and included that information in their propriety dataset in 2017. The survey asked hospitals to "Describe the extent of your hospital's current partnerships with the following types of organizations for community or population health improvement initiatives" and proceeded to list 10 broad partnership sectors. The "describe" options included: (1) not involved (2) collaboration (3) formal alliance. Refer to Appendix 1 for definitions provided in the AHA annual survey.

However, the AHA collected additional data on hospital cross-sector partnerships in a supplemental population health survey sent off in 2015. The survey asked about 36 partners and gave hospitals 6 options to describe their engagement level: (1) Not involved (2) Funding – grantmaking capacity only (3) Networking – exchange ideas and information (4) Cooperation – exchange information and share some resources for similar missions (5) Collaboration – exchange information and share resources to alter activities and enhance the capacity of the other partner, and (6) Alliance – formalized partnership (i.e., binding agreement) among multiple organizations with merged initiatives, common goals and metrics. With a 22% response rate, this dataset contains responses from 1,418 hospitals.[53]

Much of the research on hospital cross-sector partnerships has used the partnership variable as a count measure for the number of partnerships or sectors hospitals partner with, though some have created an index to account for variation in partnership strength. For example, teaching hospitals, large hospitals, multisystem hospitals, hospitals in urban areas, and those in areas with greater market competition were likely to have a greater number of partners.[68,69] One study determined safety-net hospitals established more partnership across more sectors than non-safety-net hospitals, particularly with public health agencies, governments, social services, nonprofits, and health insurance sectors.[70] Two others found a positive association between participating in value-based payment programs, such as an Accountable Care Organization, and the number of partnership sectors.[68,71] Additionally, the number of hospital cross-sector partnerships increased from 2015 to 2017, signaling that hospitals may be investing more resources into population health efforts over time.[68]

However, most of these hospital and community characteristics were also associated with the level of partnership engagement. For example, stronger partnerships were found in hospitals with more resources, such as large, multisystem, teaching hospitals, and those in urban areas.[69,72] Brewster, et.al. (2017) further examined this by comparing hospitals with a high and low quality performance, and found that hospitals in high performing service areas were more likely to develop formal partnerships; seek out various partners for their CHNA, housing, post-discharge case management, among others; and staff believed they could shift their attention upstream because they had a level of financial stability. Whereas hospitals in low performing service areas had more informal partnerships that were more likely within the medical sector and their staff felt as though they couldn't focus on upstream population health because they were too busy treating patients.[73] These findings are further supported by those of Begun and Potthoff who

concluded that multisystem large hospitals were more likely to adopt population health activities into their practices because they are more likely to see a return on their investments more rapidly.[74]

Addressing the Social Needs and Determinants of Health Through Cross-Sector Partnerships

Evidence of hospital cross-sector partnerships is mostly identified through case-studies, often through work captured by community health collaboratives, with just a few research studies capturing larger sample sizes (n>100).[51,54,75] However, hospitals do not often engage in cross-sector or collaborative work. In 2015, 69% of hospitals reported being part of a collaborative[53] but a little more than half (53%) of local health departments reported hospitals as a partner in their CHA[57] Additionally, about 41% of nonprofit hospitals reported no partnering organizations in their CHNA, though about 14% reported 10 or more partners.[57] Despite the limited evidence of hospital cross-sector partnership work, it is clear that hospitals have engaged in cross-sector partnerships to address the social needs of patients, (e.g., creating referral networks to integrate social services into patient care plans)[10,76-78] and upstream factors influencing the social determinants of health (e.g., violence prevention education and community safety programing).[78]

The absence of reliable transportation is a commonly cited barrier to accessing health services, nutritious food, and maintaining employment.[10,79] Hospitals choosing to address this need do so in a variety of ways. For example, some are addressing the need through a systematic "upstream" approach (e.g., supporting policy and infrastructure to improve transportation access and/or mobile clinics) and some address the social needs of patients directly (e.g., case managers scheduling direct transportation services through community partnerships and investing in resources to assess patient transportation needs, like bus passes).[10,80,81] With transportation often

being an issue that impacts health, it is often identified through a screening tool used either by case managers or patient intake forms, which often include other social needs and barriers to achieving health such as food intake, violence, legal needs, utilities, usual source of care, medication adherence, depression, etc.[82-84] However, these tools should only screen for the social needs hospitals can actually address.[85-87]

Many hospitals have used case management services to coordinate care for their high-cost high-need patients,[88,89] because when done right, case managers can help reduce readmission, hospital utilization, and improve health outcomes by connecting patients with services to address their medical and nonmedical needs.[90-92] Establishing cross-sector partnerships is crucial to this process as passive referral to community-based organizations has not been an effective method of addressing social needs because patients may need assistance taking action on referrals and social service agencies may not have the resources to handle an increased case load.[87,89]

Common barriers to the success of partnerships include sustainability in planning, financing, and lack of trust.[35,93] Additionally, the social needs of patients and the community as a whole often outweigh community resources and allocated funding (i.e., Medicaid investments in social supports).[87,94] Several hospitals have begun to partner with their local housing agencies or community development organizations to provide transitional housing and/or affordable permanent housing to their patients.[95-98] Many also partnered with additional organizations to provide wrap around services, including mental health, to patients in transitional housing to improve health, which has contributed to a decrease in unnecessary hospital utilization and readmissions, and have generated an overall cost-savings.[99,100] Though some targeted

interventions have not been successful and these studies often emphasize the importance of clear communication with partners in the early stages of planning an intervention.[89,101]

Thus, multisector collaboratives that organize around a plan and shared vision, such as those in the CHNA and/or CHIP may be more effective in addressing the social needs of patients and the social determinants of health in a community. For example, a Vermont community identified homelessness as a prominent issue in their CHA and the CHNA revealed that 80% of hospitalizations were associated with patients experiencing homelessness.[14] The community formed a Homeless Alliance around the shared goal of reducing homelessness and preventable hospital visits and established a Housing Trust to provide affordable housing for more than 6,000 people. The community has also established a Street Outreach team to help people with unmet mental health, substance abuse, and social needs. Together with support from the governor, banks, and foundations, they purchased 3 motels overtime to provide free and subsidized housing to unhoused people and allocated a small portion of these units to the hospital for unhoused patients. All residents have case managers screen and assist them with accessing the medical and social services they need to improve their wellbeing. This multi-sector intervention has achieved success with a decrease in homelessness and unnecessary hospital visits, as patients have access to critical services that improve their lives. The need to engage various sectors for large collective action is an undertone in most case studies. It is also evident that most partnerships start off small but grow as trust builds over time.

It is also important to note that the Vermont intervention was also dependent upon an annual community-benefit investment of 2.5% of the hospital's net revenue. All nonprofit hospitals are uniquely tasked with providing a "community benefit" and accomplishing certain "community-building activities" if they want to keep their tax-exempt status in addition to the

CHNA and implementation plan.[58] Hospitals regularly commit major financial, human, and intellectual resources into addressing the social needs and social determinants of health. These investments could be seen as strategic and effective preventive care and thus a community benefit. However, the federal law does not connect community benefit spending and CHNA implementation activities, thus most community benefit is attributed to charitable care.[102,103] If the IRS provided more guidance around the expectations of community benefit and community-building activities and the implementation efforts of addressing the CHNA, non-profit hospitals would be further incentivized to invest in the social determinants.[58] This could potentially have an enormous effect on population health as nonprofit hospitals account for two-thirds of all U.S. hospitals.[58] Though, with an understanding that a hospital's future is inextricably linked to the community outside their walls, all hospitals, not just nonprofits, are incentivized to address the social determinants of health in the communities they serve.[23]

A review of publicly announced funding commitments between 2017 and 2019 found 917 hospitals investing at least $2.5 billion into projects targeting the social determinants of health—$1.6 billion towards housing interventions; $1.1 billion towards employment interventions; $476.4 million towards education interventions; $294.2 million towards food security; $253.1 million on social and community context interventions; and $32 million on transportation interventions.[104] These are significant investments, however it's important to note that some appeared to be a reinvestment into the business model of the hospital in some way. For example, hospitals may build, own, and sale the affordable housing complex. This study also noted that in complex projects, like housing, often identified multiple partners but in less complex projects, the hospital either worked alone or with a single partner (i.e., Lyft), signaling

that these community investments may be reinvesting into the business model of the hospital more so than their community and community partners.

Less complex projects may include the provision of community health services. These include services aimed at addressing the social needs and determinants of health that usually do not generate revenue for the hospital but may lead to cost savings. They include housing, food access, transportation, care management, support groups, crisis prevention, etc.[105] They have long been studied in their relation to community benefit spending, hospital characteristics, and community factors.[105-109] Individually, these services have been studied in relation to health care service utilization and spending, where the provision of community health services have been positively associated with government and social spending.[110,111] Some evidence suggests that partnerships for population health inadvertently bring about more resources and therefore more community health services,[112] however, to my knowledge, these services have not been linked to hospital cross-sector partnerships or their level of partnership engagement.

Knowledge Gaps

Cross-sector partnerships exist across a spectrum of engagement, however level of engagement is often discussed vaguely or ignored in most of the recent literature on hospital cross-sector partnerships which assess merely the number of partnership sectors.[69-71] This creates a gap in knowledge as improved outcomes are expected as partners move along the spectrum from informal to formal. Secondly, hospital cross-sector partnerships have mostly been examined through a health collaborative lens, or as a case study or limited analysis of a single intervention. They are often studied to understand structural and organizational drivers of success and development. Thus, there is a lack of evidence that examines cross-sector partnerships from a hospital's perspective and a lack of evidence on the outcomes of cross-sector

partnerships, especially among outcomes that support a business case for hospitals to invest in cross-sector partnerships.

For example, while evidence shows a gradual increase in the number of sectors that hospitals are partnering with, outcomes of these partnerships have mostly been presented in case studies.[67] And while reducing hospital 30-day unplanned readmissions is a priority for nearly every acute care hospital, I have only been able to identify one national based study that examined readmissions and hospital cross-sector partnerships. The study specifically looked for differences in readmission rates between safety net and non-safety net hospitals and the number of sectors hospitals formed partnerships with. The study found no evidence that the interaction between partnerships and safety net hospitals was associated with readmission rates but did find more partnership engagement among safety net hospitals versus non-safety net hospitals.[70]

Central Research Question

Are hospitals' investments in population health strategies improving hospital quality of care, specifically reducing readmission rates? The overall objective of this study is to assess the associations between cross-sector partnership, community health services, and 30-day unplanned readmissions.

Aim 1: Examine predictors of hospital cross-sector partnerships - conduct a taxonomic analysis of hospital cross-sector partnerships and examine variation in hospital and community characteristics. Hypothesis: partnership engagement will be greater in communities without a shortage area designation, with high market competition, low poverty rates, greater median home values, greater proportions of college educated, non-elderly adults, non-Hispanic and predominantly white communities.

Aim 2: Assess variation in hospital services by a hospital cross-sector partnership structure. Hypothesis: the provision of community health services would increase with partnership engagement intensity.

Aim 3: Investigate the association of hospital cross-sector partnerships and 30-day unplanned readmissions. Hypothesis: 30-day readmission rates will be lower among hospitals that partner with a variety of sectors and at more formal levels.

Conclusion

The United States has not historically valued the health and well-being of all people, but instead valued scientific/clinical/pharmaceutical innovation, free-markets, and a strong military. Thus, the historic collective action of major sectors in the U.S. system have resulted in the social and structural determinants of health experienced by people today. The most effective way to address the determinants of health is through a coordinated, collaborative, multisector approach that is culturally appropriate, equitable and socially just.[113,114]

Health reform brought on many systemic changes that altered the way hospitals conduct business. Many have adopted case management services and are partnering across-sectors to integrate social services into care plans. Furthermore, as these changes persist and hospitals adapt, hospitals may see the value in social investments within their communities and lean into their role as an anchor institution.

In choosing to research cross-sector partnerships it's important to remember 5 guiding principles of collaboration: (1) collaboration is an imperative, (2) collaboration is known by many names, (3) collaboration is journey and not a destination, (4) collaboration is as much personal as it is procedural, and (5) collaboration develops in stages.[32]

Chapter 2: Predictors of Hospital Cross-Sector Partnerships for Population Health

Background

Collaborating across-sectors is a longstanding business practice for organizations. Partnerships with other organizations can influence change, innovation, and outcomes. Historically, hospitals have partnered mostly within the healthcare sector (i.e., other hospitals, clinics, providers, insurers), operating only with a limited number of non-medical partners.[30,66,115] Guided by the growing body of evidence linking health outcomes to the social determinants of health, value-based care policies, payment mechanisms, and reimbursement schemas continue to change and adapt. This has influenced hospitals, as they look upstream to partner with non-medical sectors to better accommodate recent changes.[116,117]

Hospitals' partnerships with other community organizations are a key component in effectively addressing the health of the communities they serve. A provision in the Affordable Care Act requiring tax-exempt hospitals to conduct Community Health Needs Assessments (CHNA) every three years attempts to hold hospitals accountable for the health status of the communities they operate within. If effectively done, hospital partnerships with local public health and other community organizations can be established to not only complete CHNA[118,119] but improve population health by integrating social services into care plans to address the social determinants of health such as housing, transportation food,[10,77,120,121] expand health care access,[76,122] and even provide workforce development opportunities to community members.[14,123,124]

It would follow that as partners work together and build trust, they typically will shift from engaging in informal transactional type of activities (i.e., funding a project, participating on committees, sharing data) to more formal transformational interactions (i.e., leveraging resources, improving processes, higher employee/patient satisfaction).[45,46] A history of working together and with other community organizations has a demonstrated a pattern of continued success in future cross-sector partnership efforts.[42,47] This may be because cross-sector partnerships have the strongest association with improved outcomes when both parties are heavily invested in the shared vision.[42]

While there are many motivating factors behind an organization's decision to collaborate, partnerships exists because our world is inherently interconnected, thereby creating a need to work across-sectors to achieve a mutual benefit (e.g., streamline processes, reach a broader/target audience, generate cost savings, share resources, etc.).[41,42] However, assessing nationwide hospital cross-sector partnerships has been difficult because of a lack of readily accessible data. Most evidence of hospital cross-sector partnerships has only been captured through case-studies with few studies capturing larger sample sizes (n>100) that have been able to demonstrate some evidence of hospital cross-sector partnership networks.[51,54,75] The American Hospital Association (AHA), began to collect partnership data as part of their annual survey in 2014, in partnership with the Robert Wood Johnson Foundation. A supplemental population health survey was sent out to hospitals by the AHA in 2015 which included a question about partnership engagement with 36 partners to improve population health. With a response rate of 22% (N=1,418) these data had offered the largest sample of hospital cross-sector partnerships. The AHA started to release data on hospital partnerships in their proprietary dataset beginning in 2017 and has subsequently stopped in 2020.

Hospital cross-sector partnerships in 2015 were associated with teaching hospitals, large hospitals, multisystem hospitals, hospitals in urban areas, and in areas with greater market competition, high patient volume and critical access hospitals.[68,69] Additionally, hospitals in high quality performing areas were found to establish more partnerships and more formal partnerships, whereas hospitals in lower quality performing areas were less likely to established partnerships outside of the medical sector.[73] The importance of hospital cross-sector partnerships is increasingly salient today, but little is still known about national levels of hospital cross-sector partnership engagement.[10,39,125] Moreover, the community characteristics of hospital cross-sector partnerships has yet to be examined.

This study aims to recreate the cross-sector partnership engagement taxonomy among a national sample of hospitals and explore differences in hospital and community characteristics. I further hypothesize that partnership engagement will be greater in communities without a shortage area designation, with high market competition, low poverty rates, greater median home values, greater proportions of college educated, non-elderly adults, non-Hispanic and predominantly white communities. Further improvement on this taxonomy and its predictors can demonstrate the need for targeted population health programing, facilitate strategic partnership development and engagement, and be used in future studies that assess outcomes of hospital behavior.

Methods

Data

The taxonomic analysis was completed using data from the AHA Annual Survey Database™ for fiscal year 2018. This study also linked hospitals to county-level population characteristics from the Area Health Resource Files for 2018 using state and county FIPS codes.

The AHA annual survey was distributed to all open and operating hospitals in, and territories of, the United States. About 71% (4,400) of the 6,218 hospitals surveyed in 2018 responded.

Sample

This analysis focused on non-federal, acute care, general medical/surgical hospitals in the U.S., including the District of Columbia. This represented approximately 70% (4,341) of all hospitals and 79% (3,478) of respondents. Of these, 84% had responses to all partnership variables, 2% were missing at least one partnership variable, and 14% were missing responses for all partnership variables. Missing data were estimated to be missing completely at random but not covariate-dependent, implying that multiple imputation would not be feasible.[126] Hospitals missing all partnership variables were dropped from the study sample, while missing observations in hospitals with at least one partnership response were treated as having no partnership, resulting in a final sample of 3,007 hospitals.

Measures

The AHA annual survey instructed respondents to identify their partnership engagement level for population health initiatives with ten types of partnership sectors. The partnership sectors included: healthcare providers outside of the hospital's system (including other hospitals and health care systems, federally qualified health centers and other community health clinics); health insurance companies; local and/or state public health agencies; local and/or state social services (e.g., food, housing, transportation, energy assistance); other local and/or state government agencies or representatives (including government officials, public safety, and local policy initiatives); non-profit organizations (e.g., national health associations, United Way, YMCA, service leagues, healthy community coalitions); faith-based organizations; schools (e.g.,

childhood, primary, secondary, and colleges/universities); local businesses or chambers of commerce; and national businesses or national chambers of commerce. However, partnerships with national businesses were excluded from this analysis due to missing data.

Partnership engagement level was identified on a 3-point scale ranging from 0-2, respectively representing not involved, collaboration and formal alliance. The AHA defined "not involved" as having no current partnerships with that type of organization; "collaboration" as an exchange of information and shared resources for a similar mission to enhance the capacity of the other partner; and "formal alliance" as a binding agreement among multiple organizations with merged initiatives, common goals, and metrics. Hospitals reported the strongest partnerships among other healthcare providers (μ=1.1, SD=.68) and the weakest with faith-based organizations (μ= .71, SD=.62).

Hospital and community characteristics will be used to examine differences across partnership engagement clusters. With an understanding that partnerships engagement varies by operational standards and the environmental factors within each hospital, variation by cluster is expected in a well-fitting taxonomy. Hospital characteristics include ownership; size; system membership; teaching status; critical access hospital; sole community provider; ACO affiliation; established medical home; total Medicare discharges; total Medicaid discharges. County characteristics include: geographical region; rural; micropolitan; metropolitan;[127] total hospitals in county; shortage area designation for primary care; dental; and mental health (no designation, part-county, or full county); median home value; household income; poverty rate (%); education (persons >24 with >3 years of college; %); elderly population (%); non-Hispanic population (%); and non-white population (%).[128]

Analysis

The hospital partnership engagement taxonomy was formed using a mixture of hierarchical and nonhierarchical clustering methods to partition hospitals in naturally occurring groups based on similar partnership engagement levels across various sectors. First, a principal component analysis was conducted to pair-down the partnership variables into uncorrelated components that explain 70% or more of the total variance. Partnership variables with loadings, in absolute value, greater than .30 in the varimax (orthogonal) rotation were used to define the overarching partnership sector that made up each of the principal components. The principal scores were then standardized to have a mean of zero and a variance of one. Outliers were determined by extreme values in the 2.5^{th} and 97.5^{th} percentiles. Using the Winsor technique, these values were substituted with their corresponding percentile, which resulted in more evenly distributed scores that later facilitate the development of informative clusters.

Hierarchical clusters were then derived using centroid linkages. The optimal number of hierarchical clusters were determined by visual inspection of the dendrogram and interpretation of the Calinski-Harabasz pseudo-F index and the Duda-Hart Je(2)/Je(1) index with corresponding pseudo t-squared statistic. This informed the k-means cluster analysis. The nonhierarchical clusters were specified and tested 50 times to assess the reliability and reproducibility of randomized cluster solutions. A visual inspection of the scree plot and inter-item correlations were calculated to determine internal consistency by the Cronbach's alpha.

The cluster solution was then validated through various tests: First, using a one-way analysis of variance (ANOVA) to check the equality of means of each partnership sector across clusters, and multiple post hoc pairwise comparison tests, adjusted by Duncan's methods for multiple comparisons to determine differences between each cluster. Then a discriminant

analysis was completed to determine how well hospitals fit into the derived clustering groups by the rate of correct classification using the mean values of the variables making up each of the components.

Internal validity was further tested on randomly split halves of the sample, where the unweighted percent of agreement between the categorical clusters in the first and second subsamples were computed and compared using a number of raters, such as Cohen's kappa.[129] Higher levels of agreement between the two clusters indicated a greater reliability of the cluster solution, and any disagreement among raters would have been evaluated to determine the cause. Results of the subsample and full sample analysis were then compared.

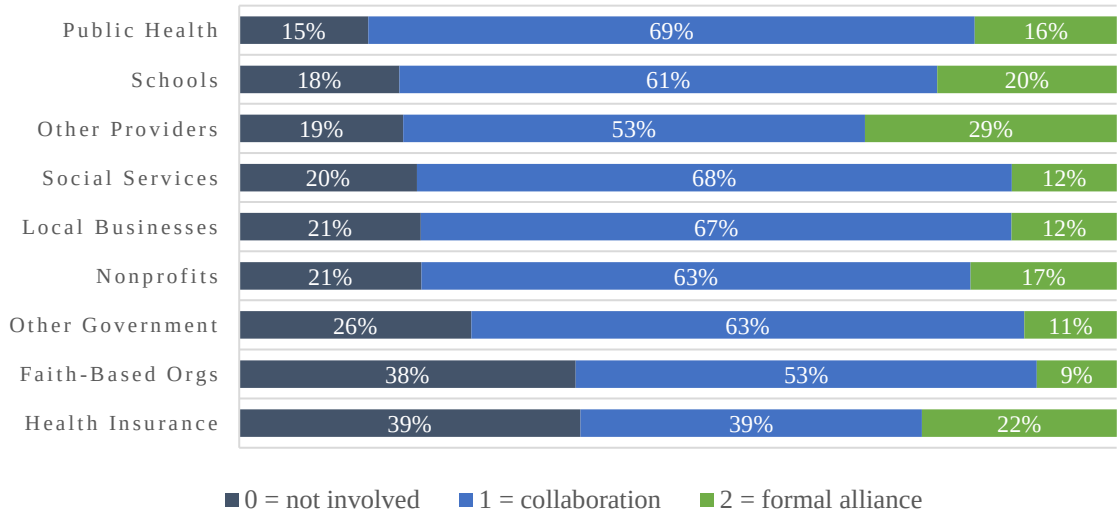
Several other sensitivity analyses were completed. For example, hierarchical clusters were also derived using average and Ward's linkages. The cluster-analysis was completed first, without addressing outliers in the principal component scores, then with the original partnership variables, and then with other partnership groupings (i.e., medical vs. nonmedical). Lastly, the entire analysis was completed on three other sample populations: the entire sample of respondents, a sample restricted to nonprofit hospitals, and a sample restricted to hospitals that were part of multihospital systems. The resulting taxonomy for each sensitivity analysis was similar to the results presented and available upon request.

Lastly, we examined various hospital and community characteristics to assess if these differed across the hospital partnership engagement clusters. Differences among hospital and community characteristics were tested using Pearson chi-square tests for categorical variables and ANOVA for continuous variables. All analyses were completed using Stata®/MP version 16.1.

Results

Most hospitals (93%) reported having at least 1 partnership for population health, of which nearly 45% (n=1,253) reported partnerships within all 9 sectors. Hospitals reported an average of 6.83 partnerships for population health in 2018. The level of partnership engagement varied across-sectors (see Figure 1). Partnerships were most often reported among public health agencies (85%), schools (82%), other healthcare providers (81%), social services (80%), local businesses (79%), and nonprofits (79%), and less often with other government agencies and representatives (74%), faith-based organizations (62%), and health insurance companies (61%). Collaborations were formed most often with public health agencies (69%) social services (68%), and local businesses (67%), while formal alliances were formed most often with other providers (29%), schools (20%) and health insurance (22%).

Figure 1: Range of Hospital Engagement with Partners, 2018 (N=3,007)



Principal Component Analysis

The principal component analysis resulted in the reclassification of the 9 partnership sectors into 4 components representing overarching uncorrelated partnership sectors. The means

of each component reported in Table **1** represent the average level of partnership engagement (range 0-2) instead of the standardized predicted scores to facilitate interpretation. Component 1 represents the government sector as it was defined by state and local government agencies, representatives, and policy initiatives. Component 2 can be thought of as the economic sector because it was defined by partnerships with schools and local businesses. Component 3 represents the healthcare sector which was made up of partnerships with other providers and health insurance plans. Component 4 represents the nonprofit sector, as it was defined by partnerships with faith-based and other nonprofit community organizations. These components represent 77% of the variance in the sample and a standardized mean Cronbach alpha of 0.8537, suggesting that the scale of these components have a high level of internal reliability.

Table 1: Principal Component Analysis of Hospital Partnerships for Population Health

Partnership Sectors	Mean	Std.	Component Loadings	Variance	Cumulative % Variance	alpha
Component 1: Government	**0.92**	**0.49**		**2.65**	**0.29**	**0.7891**
Public Health	1.01	0.56	0.61			
Social Services	0.92	0.56	0.57			
Other Government	0.84	0.59	0.43			
Component 2: Economic	**0.97**	**0.53**		**1.75**	**0.49**	**0.7968**
Schools	1.02	0.62	0.69			
Local Businesses	0.91	0.56	0.70			
Component 3: Healthcare	**0.97**	**0.62**		**1.35**	**0.64**	**0.8243**
Other Providers	1.10	0.68	0.55			
Health Insurance	0.83	0.76	0.81			
Component 4: Nonprofits	**0.83**	**0.55**		**1.21**	**0.77**	**0.8432**
Nonprofits	0.96	0.61	0.33			
Faith-Based	0.71	0.62	0.87			

Notes: Means represent the average partnership engagement scale (range 0-2) instead of the standardized predicted scores to facilitate interpretation. N=3,007

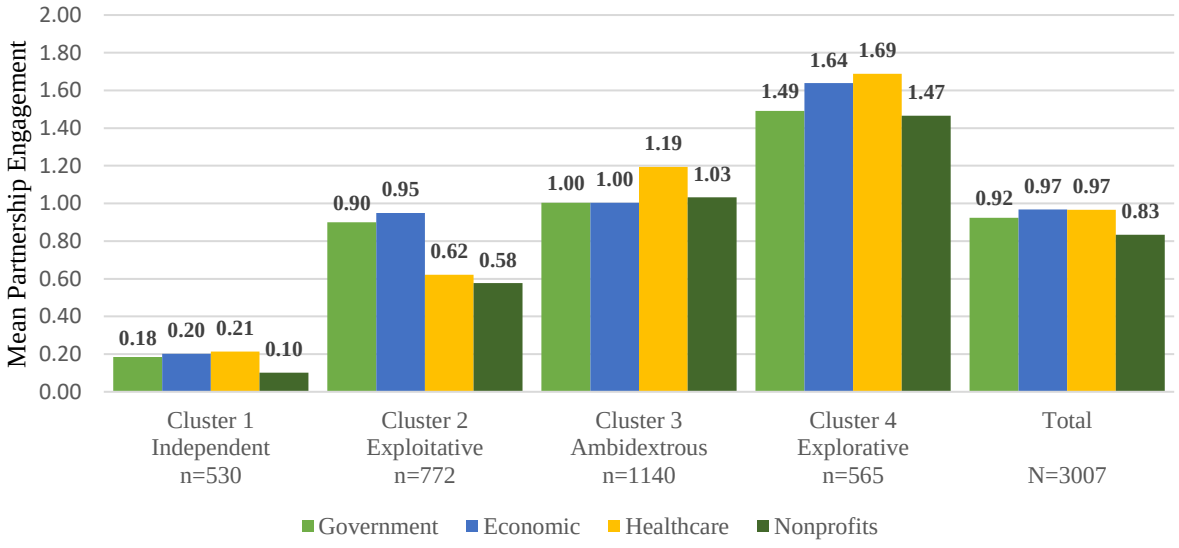
Cluster Analysis

Upon examination of the cluster analyses of partner engagement across the four overarching partnership sectors, a four-cluster solution was determined to be the best fit which produced cluster of sizes 530 (18%), 772 (25%), 1140 (38%), and 565 (19%), respectively. Each component was tested for equality within and across each cluster and in each case an ANOVA test indicated there was significant differences across clusters ($p < .001$). Figure **2** presents the

four-cluster solution where the means of each cluster represent the average values of partnership engagement instead of the standardized means to facilitate interpretation.

The clusters were classified using the concepts of organizational learning, specifically the contradiction between exploitation (the use and development of things already known) and exploration (the pursuit of new knowledge) previously used to describe hospital cross-sector partnerships.[72,130] The first cluster can be described as "independent" because the average partnership engagement of these hospitals was 0.18, meaning partnerships were not often established. When partnerships were established, they were more likely with other healthcare providers and least likely with nonprofits. Meanwhile, hospitals in Cluster 4 were classified as "explorative" because these hospitals were highly engaged in partnerships in every sector with an average partnership engagement of 1.57. They are in pursuit of new knowledge, accepting the risk of the unknown.

Figure 2: Classification of Hospitals Based on Partners and Engagement (N=3,007)



The classification of Clusters 2 and 3 is less obvious largely because the average partnership engagement of both, the government and economic sectors, center around the mean.

Therefore, it was the differences in partnership engagement within the healthcare and nonprofit sectors that distinguishes these two clusters. For Cluster 2, the average partnership engagement was 0.76, with weaker than average partnerships with government (0.90), economic (0.95), healthcare (0.62), and nonprofits (0.58). Further examination of each partnership sector (analysis not shown) revealed wide variations of partnership engagement. Within the healthcare sector, hospital partnership engagement with other healthcare providers averaged at 0.97, which was higher than the government and economic sectors. However, low partnership engagement with health insurance (0.27) decreased the healthcare sector to an average of 0.62. Within the nonprofit sector, partnership engagement with other nonprofits averaged 0.84 while partnership engagement with faith-based organizations averaged 0.32. Within the government sector, partnership engagement tapered from 1.03 among public health agencies, to 0.90 among social service agencies, and 0.77 among other agencies/representatives. Lastly, partnership engagement within the economic sector ranged from 1.00 among schools and 0.90 among businesses. This variation in partnership engagement across-sectors can be interpreted as "exploitative" since partnerships seem to be made strategically within sectors, possibly using information that is already known to safeguard the operations of the hospital.[130]

The mean partnership engagement in Cluster 3 is 1.06, with greater than average partnership engagement across all sectors, though still close to the mean. Partnership engagement within the healthcare sector stands out at 1.19, while government (1.00), economic (1.00), and nonprofit (1.03) sectors hover just above their means. This type of partnership behavior is thought of as "ambidextrous" because they exhibit both exploratory and exploitative behaviors.[131] Exploratory behaviors can be seen through their collaborative engagement across

all sectors and exploitative behaviors can be defined by the higher level of engagement within healthcare sector, which signals a dependence on things already known to be beneficial.[130]

Cluster Validation

The four-cluster solution was validated using two tests, Duncan's multiple range tests, a multiple pairwise comparison of means method, and discriminant analysis. Each component had significant *P*-values (<0.001) across every cluster comparison in the first test, meaning the differences between each cluster were beyond what would be expected by chance. In the second test, the original partnership sector engagement variables were used to develop classification rules for assigning hospitals to one of the four clusters that emerged. Results from the discriminant analysis of the cluster solution generated a 97% rate of correct classification, suggesting that the four-cluster solution was internally valid. These test results support the development of the partnership engagement hospital taxonomy.

Examination of Hospital Characteristics by Engagement Cluster

Table **2** shows the variation in hospital characteristics by cluster. These measures were not included in the cluster analysis. All the variables were significant across the clusters at p-values =< .001. General hospital characteristics associated with partnership engagement, include large-sized, teaching status, multihospital systems, not for profit ownership, and greater discharges associated with Medicaid. Medicare discharges, critical access hospitals, and sole community providers had an inverse relationship with partnership engagement. Independent hospitals had a greater percentage of Medicare discharges and were more often critical access hospitals, while exploitative hospitals had the greatest percentage of sole community providers.

Table 2: Examination of Hospital Characteristics by Partnership Engagement Cluster

Clusters:	Independent n=530	Exploitative n=772	Ambidextrous n=1140	Explorative n=565	p-value	Total N=3007
Hospital Characteristics						
Hospital Size						
Small (<100 beds)	**69.40%**	60.20%	40.10%	24.80%	<.001	47.60%
Medium (100-299 beds)	21.70%	29.00%	35.20%	**37.70%**		31.70%
Large (300+ beds)	8.90%	10.80%	24.70%	**37.50%**		20.80%
Teaching Status						
Non-teaching	**72.80%**	65.70%	50.90%	31.50%	<.001	54.90%
Minor	24.90%	31.10%	42.20%	**51.00%**		37.90%
Major	2.30%	3.20%	6.90%	**17.50%**		7.10%
Ownership						
Not for Profit	45.50%	60.40%	77.50%	**84.10%**	<.001	68.70%
For Profit	**20.60%**	12.00%	8.10%	5.10%		10.70%
Public (Government)	**34.00%**	27.60%	14.50%	10.80%		20.60%
Hospital System						
No	49.10%	39.60%	23.20%	14.70%	<.001	30.40%
Yes	50.90%	60.40%	76.80%	**85.30%**		69.60%
Critical Access Hospital						
No	57.20%	60.20%	78.30%	**90.30%**	<.001	72.20%
Yes	**42.80%**	39.80%	21.70%	9.70%		27.80%
Sole Community Provider						
No	90.80%	89.40%	94.60%	**96.30%**	<.001	92.90%
Yes	9.20%	**10.60%**	5.40%	3.70%		7.10%
Medicare Discharges[a]	**56.21%**	54.61%	52.00%	49.00%	<.001	52.91%
Medicaid Discharges[a]	15.20%	17.27%	18.82%	**20.00%**	<.001	18.00%

NOTES: Differences across clusters were examined using chi-square tests for categorical variables, and ANOVA for continuous variables. [a] = continuous variable, data presented represented the mean and standard deviation (mean(SD)).

Examination of County Characteristics by Engagement Cluster

Table **3** shows the variation in county environment and population characteristics by cluster. In general, partnership engagement increases with urbanicity, part-county shortage designation, hospital competition, median home value, household income, educational attainment, and non-white population. *Independent* hospitals were characterized by higher percentages of hospitals in rural areas, in the South, whole county shortage area designations, the lowest median home values, the lowest household income, highest rate of poverty, and lower educational attainment. *Ambidextrous* hospitals had the highest percentage of hospitals in micropolitan areas, the Midwest, no primary care or dental shortage designation, and greatest elderly population. *Explorative* hospitals had the highest percentages for hospitals in the Northeast and west regions, and non-Hispanic population, while hospitals had the highest percentages of metropolitan areas, all three part-county shortage designation areas, *exploitative* no mental health shortage designation, other hospitals in the area, median home value, household

income, educational attainment, and non-white population. Clusters varied by region. Hospitals in the Northeast were likely to be *ambidextrous*, followed by *explorative*, *exploitative*, then *independent*. Hospitals in the West were similar, but *independent* then *exploitative*. Hospitals in the Midwest were more likely to be *exploitative*, *explorative*, *ambidextrous*, then *independent*. Lastly, hospitals in the South were more likely to be *independent*, *ambidextrous*, *explorative* then *exploitative*.

Table 3: Examination of County Characteristics by Engagement Cluster

Clusters:	Independent n=530	Exploitative n=772	Ambidextrous n=1140	Explorative n=565	p-value	Total N=3007
County Characteristics						
Census Regions						
Northeast	5.50%	10.10%	**17.80%**	16.10%	<.001	13.30%
Midwest	30.40%	**39.80%**	31.30%	33.30%		33.70%
West	16.40%	15.50%	**17.20%**	17.00%		16.60%
South	**47.70%**	34.60%	33.70%	33.60%		**36.40%**
Urbanicity						
Rural	**38.70%**	32.00%	14.80%	5.80%	<.001	21.70%
Micro	18.10%	**20.10%**	16.80%	10.40%		16.70%
Metro	43.20%	47.90%	68.30%	**83.70%**		**61.60%**
Shortage Area - Primary Care						
No Designation	9.40%	**12.00%**	9.00%	7.60%	<.001	9.60%
Part County	78.30%	76.30%	84.40%	**89.70%**		**82.20%**
Whole County	**12.30%**	11.70%	6.60%	2.70%		8.10%
Shortage Area - Dental						
No Designation	16.20%	**17.40%**	13.30%	11.50%	<.001	14.50%
Part County	74.20%	76.20%	82.00%	**87.30%**		**80.10%**
Whole County	**9.60%**	6.50%	4.60%	1.20%		5.40%
Shortage Area - Mental Health[a]						
No Designation	3.60%	6.00%	6.10%	**7.60%**	<.001	5.90%
Part County	38.50%	43.10%	60.90%	**72.00%**		**54.50%**
Whole County	**57.90%**	50.90%	33.10%	20.40%		39.60%
Total Number Hospitals 2018[a]	7.2	6.2	8.7	**13.3**	<.001	8.7
Median Home Value 2014-18[a]	$157,800	$173,973	$210,211	**$232,486**	<.001	$195,855
Household Income 2014-18[a]	$52,917	$55,075	$58,541	**$62,242**	<.001	$57,355
% Below Poverty 2014-18[a]	**15.20%**	14.70%	14.30%	14.10%	<.001	14.50%
% College Educated 2014-18[a]	23.30%	24.40%	28.70%	**31.90%**	<.001	27.20%
% 65+ in 2018[a]	18.17%	**18.43%**	17.33%	16.15%	<.001	17.54%
% non-Hispanic 2018[a]	84.60%	87.05%	**87.18%**	84.53%	<.001	90.00%
% non-white 2018[a]	16.10%	14.30%	19.40%	**22.30%**	<.001	18.00%

NOTES: Differences across clusters were examined using chi-square tests for categorical variables, and ANOVA for continuous variables. [a] = continuous variable, data presented represented the mean and standard deviation (mean(SD)).

Discussion

This analysis resulted in four types of hospital clusters based on their level of engagement with four partnership sectors. Among the 3,007 non-federal, acute care, general medical/surgical hospitals in the study sample, 18% made up the first cluster which were classified as *independent* because they had little to no partnerships in any sector, while 19% in last cluster were classified

as *explorative* because they established partnerships across every sector and did so at more formal levels of engagement. Cluster number two made up 25% of the sample and was classified as e*xploitative* because of their weaker partnerships within the healthcare and nonprofit sector being largely due to partnerships established with one type of partner versus another within a sector group. This indicates that they may establish partnerships based on known facts. Lastly, cluster three was the largest group formed, representing 38% of the sample. It was classified as *ambidextrous* because these hospitals exhibited exploratory and exploitative partnership behavior; they established partnerships across every sector, but most formal partnerships were formed within the healthcare sector.

These findings are in line with previous findings by Noh, et.al., who also found larger hospitals, not for profit hospitals, and teaching hospitals to be more likely classified as *explorative*. This study also linked hospitals with system memberships and hospitals with higher rates of Medicaid discharges to higher partnership engagement, thus the classification of *explorative*.[69] Hospitals with higher rates of Medicare discharges, critical access hospitals and sole provider hospitals had inverse relationships with partnership engagement across clusters. Sole provider hospitals were more likely to be *exploitative*, while the other two were more likely to be independent.

This study adds new knowledge around county characteristics of hospital partnership engagement. In general, partnership engagement increases with urbanicity, part-county shortage area designation, total surrounding hospitals, median home value, household income, educational attainment, and non-white population; hospitals with these characteristics are more likely to be *explorative.* With the exception of part-county shortage area designation, all of these characteristics were to be expected as they are associated with large, teaching hospitals[69,128] and

support the claim that large multisystem hospitals are more likely to be working on upstream population health efforts.[74]

Hospitals in whole county shortage area designations had an inverse relationship with partnership engagement across clusters and were more likely classified as *independent*. Provider shortage areas are associated with higher levels of poverty, unemployment, uninsured, elderly and typically identify underserved populations who experience poorer health outcomes and health disparities. With the knowledge that social needs are greater in the populations, cross-sector partnerships may be crucial in these areas. However, providers in these areas may be more focused on addressing the medical needs of the population. This could be explained by a potential lack of partners to partner with in the area. Hospitals in areas not designated as a shortage area for primary care or dental were more likely to be *exploitative*, whereas hospitals in areas not designated as a mental health shortage area were more likely to be *explorative*. The Whole-county shortage area relationship could potentially be explained by the lack of total surrounding hospitals, and/or the fact that rural areas are more likely to be designated as shortage areas.

Hospitals in counties with a greater population of elderly were more likely classified as *exploitative*, a pairwise comparison of means indicated that differences between *independent* and *exploitative* were negligible and thus elderly population had an inverse relationship with partnership engagement. This could also be explained by rural areas, as rural areas have a greater percentage of elderly, which may also explain why higher rates of Medicare discharges resulted in an inverse relationship with partnership engagement. Lastly, hospitals in counties with more Hispanic people were more likely to be *ambidextrous* and *exploitative*, as the difference between the two was also found to be negligible.

Limitations

This study has several limitations. First, the sample is not perfectly representative of hospitals nationwide. Hospitals in the Midwest, medium-sized hospitals, government non-federal hospitals and hospitals with Medicare discharges accounting for 40.2-50.3% of all discharges were slightly overrepresented in this study. Additionally, this study is subject to response and recall bias as the AHA annual survey is dependent on a hospital representative's answers. It is assumed that this representative would be informed about the ongoing practices within the hospital, but it is possible that other partnerships exist unbeknownst to them. Data availability limited this study to an assessment of the unidirectional relationship from the hospital's perspective, where the level of engagement is not validated by the partner. Nor can it assess the strength of the partnership, duration, monetary exchange, or partnership satisfaction based on the available data.

This dissertation will further examine this taxonomy to test if partnership engagement is associated with the availability of population health services and assess if partnership engagement is associated with better health outcomes. Other studies should test how well this taxonomy holds up with other organizational taxonomies of health networks and hospital governance. For example, Stephen M. Shortell pointed out that his taxonomy of hospital systems could provide insightful information about the organizational behaviors of hospitals.[132] He predicted that hospitals which are highly centralized and highly differentiated should have high partnership engagement with non-healthcare-related partners. As the value-based services continues to gain traction this taxonomy can be useful in describing the role of cross-sector partnerships. For example, the Centers for Medicare and Medicaid Services innovation center funded 29 organizations to participate in a 5-year program aimed at fostering partnerships with

community-based organizations and hospitals to address the social determinants of health. This taxonomy can be used to assess how partnership engagement varied across hospitals and partners and used to measure outcomes against.

Conclusion

The purpose of this study was to classify hospitals based upon their level of engagement in partnerships for population health and assess associations between partnership engagement and characteristics of the hospitals and the community they serve. Since it is established that poor health outcomes are often exacerbated by the social determinants of health, including education, transportation, housing, and access to food,[133-135] more hospitals are looking to partner with community organizations to address the social needs of patients aimed at improving patient outcomes and ultimately hospital quality.[72,74,136-138] This study defined a four cluster taxonomy of hospitals based on their partnership engagement across four partnership sectors. Most hospitals are engaging collaboratively across partner sectors, but still rely heavily on partnerships with other healthcare providers to improve population health. This taxonomy can be used in future research to study the implications of partnership engagement on participation in value-based care programs and health outcomes. Hospital stakeholders may find these results useful in their evaluation of partnerships and in their evidence-based decision-making processes.

Chapter 3: The Association Between Hospital Cross-Sector Partnerships Engagement and the Provision of Community Health Services

Background

The United States has the most expensive health care system in the world, and yet, despite achieving average population health outcomes, which is why most health reform efforts have centered around cost containment strategies with an emphasis on quality to achieve the *triple aim*.[21,139] While provisions of the Affordable Care Act shift payments from volume-based (i.e., fee-for-service) to value-based (i.e., accountable care organizations), there are calls for greater integration of social services in health care and cross-sector collaboration as reform efforts continue to promote population health.[58,140] This is largely because it is well known that social determinants of health, defined by the World Health Organization as the structural determinants and "conditions in which people are born, grow, live, work and age," have a significant impact on health; influence health care access, utilization and outcomes; and thus are major contributors to the persistent and pervasive health disparities present in the U.S.[3]

Nonprofit hospitals account for two-thirds of hospitals in the U.S. and are uniquely tasked with providing a "community benefit" and accomplishing certain "community-building activities" if they want to maintain their tax-exempt status.[58] While research demonstrates much of this community benefit is tabulated as charitable care,[102,103] the intent is to encourage nonprofit hospitals to move from merely providing charitable care, conducting assessments, and establishing action plans to taking action, investing in the communities they serve, and improving the social determinants of health. Since hospitals regularly commit major financial, human, and intellectual resources into addressing health challenges, addressing social inequities is a form of preventive care. With an understanding that a hospital's future is inextricably linked

to the community outside their walls,[23] if hospitals adequately invest in the communities they serve, they should receive higher quality ratings, incur fewer payment penalties, and retain a high-quality workforce. Therefore, all hospitals are incentivized to promote population health initiatives.

Many hospitals do this by providing services the community values, aimed at addressing the social needs of patients and the social determinants of health of the communities they serve. These services usually do not generate revenue for the hospital but may lead to cost-savings overtime. These services have been referred to as social services,[141] community health services,[142] community benefit activities,[105,106] community health promotion services,[107,143] community-oriented outreach services,[132] among others, and include housing, food access, transportation, care management, support groups, crisis prevention, etc. They have long been studied in their relation to community benefit spending, hospital characteristics, and community factors.[105-109] Individually, these services have been studied in relation to health care service utilization and spending, where the provision of community health services have been positively associated with government and social spending.[110,111] Some evidence suggests that partnerships for population health inadvertently bring about more resources and therefore more community health services.[112]

To improve access to these services, many hospitals have begun to systemically screen their patients for unmet health-related social needs.[10,84,144,145] These include income, educational attainment, difficulty paying for medication, food insecurity, housing instability, utility needs, transportation needs, and interpersonal safety. Screening is highly associated with hospitals under alternative payment models, such as accountable care communities, though hospitals should only screen for the measures they can address.[85-87] For example, many hospitals offer case

management services to their high-cost high-need patients,[88,89] because when done right, case managers can help reduce readmission, hospital utilization, and improve health outcomes[90-92] as passive referral to community-based organizations has not been an effective method of addressing social needs.[87,89]

Cross-sector partnerships have long been at the center of solving large population health concerns,[8,36,146-148] and the importance of these partnerships remains salient today as evident by the global response to COVID-19. For example, cross-sector partnerships and collaboration were essential in addressing misinformation, vaccine mistrust, promoting and facilitating access to COVID-19 testing sites; providing alternative housing for healthcare providers; and solving supply chain issues for personal protective equipment, vaccines, computers, and even toilet paper.[149-152] However, they were also pertinent in addressing the non-medical social needs of patients. For example, when California announced shelter-in-place orders to prevent the spread of COVID 19, Contra Costa Health Services (a local county-based safety-net health system) was able to identify 7,096 Medicaid beneficiaries in the county at the highest risk for respiratory infection and assess what social determinants were preventing them from adhering to the shelter-in place mandate. These social needs were addressed through their partnerships with local food banks, transit authority, pharmacies and other medical care providers, which allowed Contra Costa County to maintain positive infections and hospitalizations of approximately around 3% of the tested and untested population.[151]

While there is no doubt that hospitals are investing more in collaborative population health initiatives, little is known about the relationship between hospital cross-sector partnerships and the provision of community health services. Thus, this study seeks to assess if hospital partnership engagement (HPE) is associated with the hospitals' provision of community health

services. We hypothesize that the provision of community health services would increase with HPE intensity.

Methods

Data

The 2018 American Hospital Association's (AHA) Annual Survey was used to identify hospital services, partnerships, and characteristics. The survey was distributed to all 6,218 open and operating hospitals in the U.S. and received a 71% response rate. A qualified staff member from each hospital reported and confirmed all data on behalf of their institution. These data were linked to the Minority Health Social Vulnerability Index (SVI) dataset using state and county FIPS codes. Although, the Minority Health SVI was released in 2021, it added county-level measures of healthcare access and health status to the 2018 SVI created by the Centers for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR). The final sample size included 3,006 non-federal, acute care, general medical/surgical hospitals in the U.S. and the District of Columbia with at least one response to the partnership questions and SVI data.

Measures

This study focused on the total number of community health services each hospital provided in their local community. Community health services were defined in previous research and include community health education, health fairs, community outreach, hospital sponsored support groups, fitness center access, enabling services, transportation to health services, crisis prevention, community psychiatric education, child wellness programing, employment assistance, teen outreach, community violence prevention programs, meal delivery, and

supportive housing.[105,132] Reference Appendix 2: Definitions of Each Community Health Service for definitions of each. Hospitals were asked in the AHA annual survey whether the service was provided in their local community by the hospital, their health system, or another provider through a formal arrangement (e.g., contract or joint venture). The AHA survey emphasized "provided in their local community" and since partnerships are the focus of this study, the total number of services were calculated using one response per service if it was provided by either of those mechanisms (range: 0-15).

The main independent variable was hospital partnership engagement (HPE). In Chapter 2 a taxonomy of hospitals partnership behavior was developed which classified hospitals by the sectors they partnered with and their level of engagement (not involved, informal, or formal). Hospitals were classified as either as independent, exploitative, ambidextrous, or explorative. *Independent* refers to hospitals with little to no partnerships, while *explorative* refers to hospitals that partner across all sectors and often at a formal level. *Exploitative* refers to hospitals that form partnerships strategically within each sector, especially among evidence-based partners (i.e., other providers, public health, and schools), and *ambidextrous* hospitals are those that exhibit exploratory and exploitative partnership behavior, where they collaborate across all sectors but have stronger partnerships within the healthcare sector.

Hospitals participating in alternative payment models may be incentivized to work collaboratively across-sectors to improve health outcomes, thus we controlled for accountable care organization (ACO) affiliation. Hospitals were considered to have an ACO-affiliation if they reported currently leading or participating in an ACO, otherwise they were considered unaffiliated. Other variables include hospital characteristics, such as nonprofit, for-profit, or public ownership; hospital system membership (yes/no); hospital size based on number of beds

(e.g., 1-99, 100-299, 300+); teaching status based on AHA methodology (e.g., non-teaching, minor, major); and geographic region based on the U.S. Office of Management and Budget designation (e.g., rural, micropolitan, metropolitan).

County-level community characteristics were pulled from the Minority Health Social Vulnerability Index database.[153] This included six indices, scaled from 0 to 1 (low to high vulnerability) that measured socioeconomic status (below poverty, unemployed, income, no high school diploma); household composition and disability (aged 65 or older, aged 17 or younger, older than age 5 with a disability, single-parent households); minority status and language (non-Hispanic White population, speak English "less than very well"); housing type and transportation (multi-unit structures, mobile homes, crowding, no vehicle, group quarters); health care infrastructure and access [reverse coded] (hospitals, urgent care clinics, pharmacies, primary care physicians, uninsured); medical vulnerability (cardiovascular disease, chronic respiratory disease, obesity, diabetes, no internet access). These measures indicate the relative vulnerability of every county, except for Rio Arriba County, New Mexico, which accounted for the loss of 1 hospital, due to data collection errors reported by the U.S. Census Bureau.

Analysis

The relationship between HPE and community health services was assessed in three ways. The first used Chi-squared tests of independence and two sample t-tests to examine differences in the provision of community health services across HPE intensity. The second employed Poisson regression analyses with and without state-fixed effects to account for various state policies (e.g., state efforts to lead or participate in accountable care models or additional quality reporting or improvement programs) that may influence the provision of these services. The third employed multiple binary logistic regression models to assess the adoption of each

service by HPE and ACO-affiliation controlling for the same hospital and community characteristics. Standard errors were adjusted for clustering by states using robust standard errors. Incident rate ratios (IRRs) are reported for Poisson regressions and odds ratios are reported for logistic regressions. Model fit was assessed using generalized linear models. Controlling for states allowed the generalized linear models to mimic the fixed effects in Poisson models, producing identical results.

Other sensitivity analyses included using the linear regression models and negative binomial models. Additionally, the total sum of community health services was adjusted to include only measures with at least 10% and 20% difference in service provision. Lastly, other county-level characteristics were used, first the summarized index for all six SVI indices and secondly, data from the Area Resource File. Results from these sensitivity tests were similar to the findings presented in this study and are available upon request, though results using the overall SVI found no statistical difference in the provision of services by overall SVI. However, the strength of using the SVI data compared to other community indices, is the availability of separate categorical indices that accounted for the overall index. This allowed us to assess for specific county characteristics that attributed to the provision of community health services. All analyses were conducted in Stata version 16.0. The University of Maryland's institutional review board determined this research did not meet the federal definition of human subjects research.

Results

The sample included 3,006 hospitals (see Table 4). In order of HPE intensity, 18% of hospitals exhibited independent HPE, 26% exploitative, 38% ambidextrous, and 19% explorative. A little more than half (53%) of the sample reported an affiliation with an ACO. Most hospitals were more often owned by a non-profit, with for-profits and publicly owned

hospitals representing 11% and 21% of the sample, respectively. Most were part of a health care system, had more than one hundred beds, were a nonteaching hospital, and located in a metropolitan area. The mean ranking for socioeconomic status, household composition, health care access, and medical vulnerability were under the 50th percentile, indicating that most counties had relatively lower levels of poverty, unemployment, older populations, disabled populations, poor healthcare access, etc. The mean ranking for minority status and language and housing type and transportation were above the 50th percentile, indicating that most counties had higher levels of non-white populations, persons that speak English "less than very well", multi-unit structures, crowding, and persons with no vehicle.

Table 5 provides details on the distribution of each of the twelve community health services across HPE intensity. More than half of hospitals in the sample provided community health education (95%), health fairs (92%), community outreach (87%), support groups (79%), and access to a fitness center (54%). This is followed by transportation to health services (48%), crisis prevention (47%), enabling services (46%), community psychiatric education (44%), children wellness programing (42%), employment services (34%), teen outreach (31%), and community violence prevention (28%). Meal delivery (23%) and supportive housing (22%) were provided in about 1 in 5 hospitals.

The average number of community health services hospitals provided increased with each category of HPE, from 3.5 (*SD*=2.4) in independent, 4.5 (*SD*=2.6) in exploitative, 6.1 in ambidextrous (*SD*=2.9), and 7.7 (*SD*=2.9) in explorative, and differences between groups were statistically significant ($p<.001$). Within each category of HPE, the proportion of hospitals providing each community service grew as HPE intensity increased from independent, exploitative, ambidextrous, and explorative. Additionally, differences in the provision of each

service between HPE groups were statistically significant ($p<.05$) except in two instances, where differences in fitness center access between independent and exploitative hospitals and differences in meal delivery between exploitative and ambidextrous hospitals were not statistically significant.

The odds of providing each service increased with HPE intensity, even when accounting for the other covariates, and controlling for state-fixed effects (Table 6). The provision of community health education, health fairs, community outreach, hospital sponsored support groups, community psychiatric education, and children's wellness programming was statistically significant ($p<.05$) at every level of HPE compared to independent HPE. The likelihood of providing transportation to health services, enabling services, crisis prevention, employment services, teen outreach, and community violence prevention was statistically significant ($p<.05$) in ambidextrous HPE and explorative HPE relative to independent HPE. The odds of providing access to a fitness center, providing meal delivery services, or supportive housing services was only statistically significant in hospitals with exploratory HPE relative to independent HPE ($p<.05$). Lastly, ACO-affiliation was statistically significant ($p<.05$) in providing community health education, hospital sponsored support groups, access to a fitness center, employment services, teen outreach, community violence prevention, and meal delivery.

Overall, the results from the Poisson regression models indicate that the provision of community health services increases with HPE intensity (Table 7: Poisson Regression Models Assessing Variation in Hospital Community Health Services, with and without State-fixed Effects (N=3,006)). Holding all other variables constant and using independent HPE as the reference group, exploitative HPE was associated with 16% (SE=0.030, $p<.001$) more services or 13% (SE=0.032, $p<.001$) with fixed effects; ambidextrous HPE was associated with 29%

(*SE*=0.032, *p*<.001) more services or 24% (*SE*=0.039, *p*<.001) with fixed effects; and explorative HPE was associated with 39% (*SE*=0.047, *p*<.001) more services or 32% (*SE*=0.047, *p*<.001) with fixed effects. ACO-affiliated hospitals provided 12% (*SE*=0.016, *p*<.001) more services compared to unaffiliated hospitals holding other variables constant or 11% (*SE*=0.033, *p*<.001) with fixed effects.

The provision of community health services was positively associated with nonprofit hospitals, health care system membership, larger (more beds) hospitals, teaching hospitals, and urban geography; and negatively associated in counties with higher rates of medical vulnerability. Without accounting for state-fixed effects, household composition was negatively associated with the provision of community health services (*p*<.05), meaning less services were provided in counties with lower working aged adults (aged 18-65 years), more individuals who report a disability, and single-parent households, though that difference was not statistically significant when comparing differences with and across states. Additionally, the provision of community health services was positively associated with greater non-white and non-English speaking populations (*p*<.10) and poor health care access (*p*<.05), though the differences across counties were only statistically significant under state-fixed effects.

Discussion

This study found HPE to be a significant predictor of the total sum of community health services provided by hospitals, as well as each community health service. As hypothesized, the number of services and the likelihood of providing each service increased with HPE intensity and this held true when state-level effects were controlled for. While this study included services that were provided in their local communities by the hospital, within their health care system, and through joint ventures, the results were similar when examining only services provided

directly through the hospital. These results support other findings that demonstrate the need for cross-sector collaboration to address the social needs and social determinants of health.[10,149,154,155]

As expected, ACO-affiliation was a significant predictor of community health services. On average, ACO-unaffiliated hospitals provided 1 less service than ACO-affiliated hospitals. This study did not find a significant moderation effect of ACO-affiliation on the relationship between HPE and community health services, but HPE and ACO-affiliation are positively correlated (results available upon request).[71] This was expected because a main feature of ACOs is working with partners to improve health outcomes. These finding also support Dr. Stephen M. Shortell's prediction that highly centralized hospitals offering a variety of services would have greater partnership engagement with non-healthcare-related partners.[132]

Findings support hypothesis, where the provision of community health services was found to be positively associated with nonprofit hospitals, multihospital systems, large hospitals (more beds), teaching hospitals, and urban geography as these types of hospitals are more likely to have more available resources, access to cross-sector partners,[69] participate in an alternative payment model,[137] and tend to be financially stable, so they can take on the risk of addressing upstream factors.[151,156] Of the six social vulnerability indices included in the model, three were statistically significant. More services were provided in counties with higher rates of minorities and non-English speakers and in counties with poor health care access, but less in counties with higher rates of medical vulnerability, older populations, and individuals with disabilities. Future studies may wish to assess and evaluate the provision of community health services on a neighborhood level to assess utilization, community satisfaction, and any associated community benefit of providing these services. Additionally, it is likely that less services were provided in

counties with higher rates of medical vulnerability because of associated strains on the healthcare system serving high-need populations. However, research indicates that HPE intensity and community health services can help improve primary care access, emergency department utilization, and inpatient stays for medically vulnerable populations.[17]

With the growing interest in addressing the social determinants of health to target population health and the continual shift to value-based payment models, it is likely that the provision of community health services will continue to rise. Though, little is still known about the provision of, access to, and long lasting benefits of providing community health services.[138] For example, hospitals may be able to provide access to in-house services like supportive housing,[157] medical-legal partnerships that address unsafe living conditions,[158] food, and other social services[159] but they are unable to directly address the underlying structural determinates that exacerbate health.[160] However, over time, continuing to address the social determinates of health through a multisector approach is necessary to succeed in achieving population health improvements.[161] Effective cross-sector partnerships are necessary to help hospitals facilitate access to community social services, deduplicate services, fund projects, and advocate for community services and programs.[89,159,162] Over time, these efforts may bring about social justice.

Limitations

This study has several limitations. First, the study is subject to response and recall bias as the AHA annual survey is dependent on a hospital representative's answers. It is assumed that this representative would be informed about the ongoing services provided by the hospital, but it is possible that other services exist unbeknownst to them. Second, data on the provision of services, ACO-affiliation, and partnerships are limited and therefore cannot assess the intensity

or degree to which these services are provided, length of ACO participation, or partnership goals. Third, while county-level characteristics are controlled for using the Minority Health Social Vulnerability Index data, counties and hospital service areas are not necessarily synonymous. Fourth, Poisson models are subject to overdispersion, though goodness of fit was assessed using generalized linear models and using robust standard errors. Fifth, while all logistic models used the same equation, the explanatory power of the equation widely varied in each service and maybe measuring the same thing.[163] Lastly, results are subject to unobserved heterogeneity because the model cannot account fully for similarities among hospitals.

Future research should seek to assess if differences in service provision is associated with service utilization, health outcomes, and patient satisfaction. Previous research found positive association between enabling services and primary care and patient satisfaction.[80] Furthermore, a more in-depth analysis should be done to assess within state differences, differences by rural/urban geography, and by patient diagnosis, as some of these services may only be provided to specific subpopulation of patients.

Conclusion

We found a positive association between HPE the provision of community health services. HPE was a significant predictor of each service. Controlling for state-level effects improved the model fit and suggests that state-level factors account for the differences in service provision. The provision of community health services is expected to rise with interest and pressure to integrate social services and medical care. Future research should consider HPE when assessing the availability of community health services.

Table 4: Sample Characteristics, 2018

	Total N=3006	
Hospital Partnership Engagement	*n*	*(percent)*
Independent	530	(17.6%)
Exploitative	772	(25.7%)
Ambidextrous	1,139	(37.9%)
Explorative	565	(18.8%)
Accountable Care Organization		
Unaffiliated	1,420	(47.2%)
Affiliated	1,586	(52.8%)
Ownership		
Non-Profit	2,064	(68.7%)
For-Profit	323	(10.7%)
Public	619	(20.6%)
Hospital System		
No	913	(30.4%)
Yes	2,093	(69.6%)
Bed-Size		
Small (<100)	1,429	(47.5%)
Medium (100-299)	953	(31.7%)
Large (300+)	624	(20.8%)
Teaching Status		
Non-teaching	1,650	(54.9%)
Minor	1,141	(38.0%)
Major	215	(7.2%)
Geographic Location		
Rural	654	(21.8%)
Micropolitan	501	(16.7%)
Metropolitan	1,851	(61.6%)
Social Vulnerability Indices (0-1)[a]	*mean*	*(SD)*
Socioeconomic Status	0.44	(0.26)
Household Composition & Disability	0.41	(0.29)
Minority Status & Language	0.70	(0.28)
Housing Type & Transportation	0.58	(0.27)
Health Care Access	0.41	(0.23)
Medical Vulnerability	0.38	(0.28)

Data Source: 2018 American Hospital Association annual survey and 2018 Minority Health Social Vulnerability Index.
[a] = Index scaled percentile from 0 (low vulnerability) to 1 (high vulnerability)

Table 5: The Provision of Community Health Services by Hospital Partnership Engagement

		Hospital Partnership Engagement					Overall
		Independent n=530	Exploitative n=772	Ambidextrous n=1140	Explorative n=565	p-value	Total N=3007
Community Health Services		*%*	*%*	*%*	*%*		*%*
Community Health Education	No	17	6	3	1		6
	Yes	83	94	97	99	<.001	94
Health Fair	No	19	9	5	3		8
	Yes	82	91	95	97	<.001	92
Community Outreach	No	30	17	7	3		13
	Yes	70	83	93	98	<.001	87
Support Groups	No	46	26	13	5		21
	Yes	54	74	87	95	<.001	79
Fitness Center	No	60	57	41	29		46
	Yes	40^	44^	59	72	<.001	54
Transportation	No	69	62	48	32		53
	Yes	31	38	52	68	<.001	48
Crisis Prevention	No	78	67	43	29		53
	Yes	22	33	57	71	<.001	47
Enabling Services	No	80	71	44	25		54
	Yes	20	30	56	75	<.001	46
Community Psychiatric Education	No	82	67	50	31		57
	Yes	18	33	50	69	<.001	44
Children's Wellness Program	No	81	68	52	63		58
	Yes	19	32	48	64	<.001	42
Employment Services	No	83	74	62	49		66
	Yes	17	26	38	51	<.001	34
Teen Outreach	No	91	81	63	44		69
	Yes	9	19	37	57	<.001	31
Community Violence Prevention	No	91	82	66	52		72
	Yes	9	18	34	48	<.001	28
Meal Delivery	No	83	78	78	67		77
	Yes	17	22^	22^	33	<.001	23
Supportive Housing	No	86	82	78	69		79
	Yes	14	18.40	22	32	<.001	22
Total		*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*		*Mean (SD)*
Community Health Services		3.5 (2.4)	4.6 (2.6)	6.2 (2.9)	7.7 (2.9)		5.6 (3.1)

Data Source: Author's analysis of 2018 American Hospital Association (AHA) annual survey

Notes: Services are listed in order provision from most often to least often provided. Chi-square test of independence p-values are displayed. Results indicate that the provision of every community health service is associated with Hospital Partnership Engagement. Two sample t-tests were used to assess differences between each category of Hospital Partnership Engagement. Results indicate that differences were all at least statistically significant at the 95% level unless otherwise denoted (^ = not statistically different between indicated groups).

Table 6: State-Fixed-Effects Logistic Regression Estimates for Community Health Services

	Community Health Education ***(N=2,683)***		**Health Fairs** ***(N=2,713)***		**Community Outreach** ***(N=2,911)***		**Support Groups** ***(N=2,933)***		**Fitness Center** ***(N=2,991)***	
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE
Hospital Partnership Engagement										
Independent	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Exploitative	2.83	(0.57)***	1.90	(0.35)***	1.56	(0.24)**	1.73	(0.25)***	0.91	(0.11)
Ambidextrous	3.43	(0.81)***	2.36	(0.48)***	2.39	(0.42)***	2.32	(0.36)***	1.17	(0.15)
Explorative	4.53	(2.02)***	2.85	(0.90)***	4.71	(1.47)***	3.74	(0.90)***	1.54	(0.24)**
Accountable Care Organization										
Affiliated vs. Unaffiliated	1.69	(0.37)*	1.12	(0.19)	1.29	(0.19)	1.67	(0.21)***	1.74	(0.16)***

	Transportation ***(N=3,006)***		**Enabling Services (N=*2,996)***		**Crisis Prevention** ***(N=3,002)***		**Community Psychiatric Education** ***(N=3,002)***		**Children's Wellness** ***(N=3,002)***	
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE
Hospital Partnership Engagement										
Independent	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Exploitative	1.04	(0.14)	1.2	(0.18)	1.16	(0.17)	1.70	(0.26)***	1.39	(0.21)*
Ambidextrous	1.29	(0.17)*	2.21	(0.32)***	1.86	(0.27)***	2.11	(0.32)***	1.74	(0.25)***
Explorative	1.97	(0.30)***	3.60	(0.63)***	2.28	(0.39)***	3.01	(0.53)***	2.27	(0.38)***
Accountable Care Organization										
Affiliated vs. Unaffiliated	1.15	(0.10)	1.65	(0.17)	1.73	(0.17)	1.23	(0.12)	1.42	(0.14)

	Employment Services ***(N=2,991)***		**Teen Outreach** ***(N=2,985)***		**Community Violence Prevention** ***(N=2,985)***		**Meal Delivery** ***(N=2,985)***		**Supportive Housing** ***(N=2,931)***	
	OR	SE	OR	SE	OR	SE	OR	SE	OR	SE
Hospital Partnership Engagement										
Independent	*Ref.*		*Ref.*		*Ref.*		*Ref.*		*Ref.*	
Exploitative	1.23	(0.19)	1.43	(0.28)	1.38	(0.27)	1.11	(0.17)	1.11	(0.19)
Ambidextrous	1.46	(0.22)**	2.25	(0.41)***	2.15	(0.39)***	0.98	(0.15)	1.23	(0.20)
Explorative	1.80	(0.30)***	3.61	(0.73)***	2.47	(0.49)***	1.56	(0.27)*	1.70	(0.31)**
Accountable Care Organization										
Affiliated vs. Unaffiliated	1.26	(0.12)*	1.47	(0.16)***	1.30	(0.14)*	1.29	(0.14)*	0.98	(0.11)

Data Source: 2018 American Hospital Association (AHA) annual survey and the 2018 Minority Health Social Vulnerability Index.
Note: Logistic regressions controlling for state fixed effects. Other covariates include hospital ownership, system membership, bed size, teaching statis, geographical location, county-level socioeconomic status, county-level household composition & disability, county-level minority status & language, county-level housing type & transportation, county-level health care access, and county-level medical vulnerability. Sample size varies because some states had no variation.
Abbreviations: ***p<0.001; **p<0.01; *p<0.05; OR= Odds Ratio; SE= Standard Error; N= Sample Size

Table 7: Poisson Regression Models Assessing Variation in Hospital Community Health Services, with and without State-fixed Effects (N=3,006)

	Without State-fixed Effects			With State-fixed Effects		
	IRR	**SE**	**(95% CI)**	**IRR**	**SE**	**(95% CI)**
Hospital Characteristics						
Hospital Partnership Engagement (HPE)						
Independent	Ref.			Ref.		
Exploitative	**1.16**	0.030	(1.11,1.22)***	**1.13**	0.032	(1.07,1.20)***
Ambidextrous	**1.29**	0.032	(1.23,1.35)***	**1.24**	0.039	(1.17,1.32)***
Explorative	**1.39**	0.037	(1.32,1.46)***	**1.32**	0.047	(1.23,1.42)***
Accountable Care Organization (ACO)						
Unaffiliated	Ref.			Ref.		
Affiliated	**1.12**	0.016	(1.08,1.15)***	**1.10**	0.033	(1.04,1.17)**
Ownership						
Non-Profit	Ref.			Ref.		
For-Profit	**0.66**	0.020	(0.62,0.70)***	**0.70**	0.027	(0.65,0.76)***
Public	**0.96**	0.019	(0.92,0.99)*	1.01	0.029	(0.96,1.07)
Hospital System						
No	Ref.			Ref.		
Yes	**1.13**	0.019	(1.09,1.17)***	**1.13**	0.026	(1.08,1.18)***
Bed-Size						
Small (<100)	Ref.			Ref.		
Medium (100-299)	**1.19**	0.025	(1.15,1.24)***	**1.18**	0.033	(1.12,1.25)***
Large (300+)	**1.24**	0.031	(1.18,1.30)***	**1.24**	0.051	(1.15,1.35)***
Teaching Status						
Non-teaching	Ref.			Ref.		
Minor	**1.09**	0.019	(1.06,1.13)***	**1.07**	0.022	(1.03,1.11)**
Major	**1.24**	0.030	(1.18,1.30)***	**1.16**	0.029	(1.11,1.22)***
County Characteristics						
Geographic Location						
Rural	Ref.			Ref.		
Micropolitan	**1.07**	0.031	(1.01,1.13)*	1.06	0.033	(0.99,1.13)
Metropolitan	**1.12**	0.035	(1.05,1.19)***	**1.09**	0.028	(1.03,1.14)**
Socioeconomic Status	0.95	0.047	(0.86,1.05)	1.00.	0.060	(0.89,1.13)
Household Composition	**0.92**	0.038	(0.85,1.00)*	0.98	0.045	(0.90,1.08)
Minority Status & Language	1.02	0.050	(0.92,1.12)	**1.18**	0.065	(1.06,1.32)**
Housing Type & Transportation	0.95	0.033	(0.88,1.01)	0.98	0.041	(0.90,1.06)
Health Care Access	0.99	0.031	(0.93,1.05)	**1.07**	0.035	(1.01,1.14)*
Medical Vulnerability	**0.91**	0.039	(0.83,0.99)*	**0.84**	0.056	(0.74,0.96)**
Akaike Information Criterion (AIC)			14,558.21			13,838.40
Bayesian Information Criterion (BIC)			14,678.38			13,952.56

Data Source: 2018 American Hospital Association annual survey and the 2018 Minority Health Social Vulnerability Index.
Abbreviations: N= Sample Size: IRR = incident rate ratio; SE = standard error; CI = Confidence Intervals; ***p<0.001; **p<0.01; *p<0.05;

Chapter 4: Hospital Cross-Sector Partnership Engagement and 30-Day Unplanned Readmissions

Background

The United States continues to spend more on health care than any other high-income country, despite achieving average population health outcomes.[1,2] it's largely thought to be due to the influence of the social determinants of health, such as the conditions in which people are born, live, work, and age.[133,164,165] To incentivize lower healthcare spending, improved health outcomes and improved patient satisfaction,[21] the Centers for Medicare & Medicaid Services' (CMS) links hospital payments to hospital quality metrics such as the Hospital Readmissions Reduction Program (HRRP), and publicly reports hospital quality measures.

With nearly a decade of penalties, policy revisions, and the continual refinement of quality metrics, the HRRP has been credited with improving hospital readmissions from 16.7% in 2010 to 15.7 in 2017[166]–though, the amount of credit to be given is highly debated.[167,168] Readmission reductions are associated with effective care transitions[169], thus many hospitals have hired care coordinators,[170] targeted high-utilizers,[101,171] and/or partner with more outpatient services/providers.[172] Hospitals participating in value-based payment model(s) have also seen reductions in readmission rates.[92,173,174] While readmission rates for targeted conditions of the HRRP declined more drastically than nontargeted conditions, overall national readmission reductions have plateaued since 2015.[175,176] Thus, readmissions remain a prevalent issue.[166]

One of the widely promoted strategies to improve readmission rates and hospital quality is to address the social determinants of health with an aim to eliminate unjust and avoidable health disparities.[5] This work requires a thorough examination of why the conditions in which

people live and work are impacting their health and devising interventions that go beyond health care and public health, to stimulate environmental, political, physical, economic, systemic, and social change.[6] This is why hospitals must go beyond screening patients for social risk factors, passively referring them to social services, and population health management and invest in cross-sector partnerships to address the social aspects that affect health.[37,87,89]

For example, hospitals that are part of multisector collaboratives have reduced community violence, provided legal services, and conducted workforce readiness and life skills training.[177] Cross-sector partnerships have been linked to preventable deaths, lower unnecessary utilization, and lower costs.[73,155,178,179] Case studies have even found readmission reductions when hospitals partner with meal delivery,[178] housing,[78,180] and transportation services.[81] Cross-sector partnerships are a vital part of addressing the social determinants, but effective partnerships built upon the collective impact model take time and other resources.[12,47,73,78] Cross-sector partnerships can exist across a spectrum of engagement from a funding arrangement, to information and resource sharing, to a formal [written] alliance.[72] Though, formal partnerships are associated with better health outcomes as it establishes a framework for the collaboration, identifies shared goals, and builds upon a level of trust.[12,47,73,78]

The examination of partnership engagement is often overlooked in research studies. For example, a study found that participation in valued-based payment plans was associated with more cross-sector partnerships but it's unclear if these partnerships were informal or formal.[71] Additionally, most research on cross-sector partnerships that involve hospitals are case studies with a limited scope (i.e., one partner, initiative, service), focus on local public health departments or community collaboratives, and/or examine partnership development, sustainability, and satisfaction rather than hospital outcomes. While this research is necessary

and fundamental to building the knowledge base, there is a lack of large-scale quantitative research assessing hospital cross-sector partnership engagement, utilization, and outcomes from the hospitals' perspective. This type of evidence is needed to support hospital decision-makers as they invest in population health strategies to achieve the *Triple Aim*: improved patient experiences, improved health, and lower costs.[21]

The overall objective of this study is to assess the relationship between hospital cross-sector partnership engagement and hospital quality. This study focuses on the outcome of 30-day hospital-wide all-cause unplanned readmissions because it is a validated proxy measure of hospital quality.[181,182] The central hypothesis of this study posits that 30-day readmission rates will be lower among hospitals that partner with a variety of sectors and at more formal levels. Partnering at a formal level would suggest that patient referrals to social services may be coordinated, intentional and treated with high priority, as research demonstrates patients rarely follow through with referrals to social service agencies on their own, even when they identify a need for the service (i.e., food access, housing, transportation, etc.), and therefore may need further assistance in taking action.[87,89] In theory, these partnerships can be leveraged to address the social needs that exacerbate patient health outcomes.[183]

Methods

Data

The 2018 American Hospital Association's (AHA) Annual Survey was used to identify non-federal acute care general medical/surgical hospitals respondents that answered at least 1 of the partnership for population health questions (N=3,007).[184] Using the Medicare Provider Number, this file was merged with CMS' 2018 hospital inpatient prospective payment system impact file[185] to obtain hospital payment and geographic identifiers, and CMS' Unplanned

Hospital Visits – Hospital file from quarter 2 of the 2020 Annual Hospital files, which contained 2018 thirty-day hospital-wide all-cause unplanned readmission rate (reference Appendix 3: Data Source Information).[186] Lastly, 2018 population characteristics were pulled from the Minority Health Social Vulnerability Index (SVI) and the Area Health Resource File using state and county FIPS codes.[153] The Census Bureau reported data collection errors for 1 county, which resulted in the loss of 1 hospital from the sample. Another 117 hospitals were dropped from the sample because of missing readmission rates: 27 were not in the CMS dataset, 19 had no data for the reporting period, 58 had less than 25 readmissions, and 12 were not participating in the inpatient and outpatient quality reporting programs. The final sample consisted of 2,890 hospitals.

Measures

Dependent Variables. This study used the thirty-day hospital-wide all-cause unplanned readmission measure as a proxy to measure hospital quality.[181,182] This all-cause readmission measure assesses the rate at which patients require urgent (unplanned) rehospitalization within thirty days of being discharged from the hospital. A readmission is only counted if it is an unplanned inpatient admission to a short-term acute care hospital, and only one admission is counted per patient within thirty days after their initial discharge. A lower rate is associated with higher/better quality. The hospital-wide all-cause measure is assessed annually. The publicly available data consists of the risk-standardized rates for fee-for-service Medicare enrollees, 65 years or older, admitted into nonfederal acute care hospitals, and adjusts for a person and population characteristics. Person-level adjustments are made based on the age and comorbidities of patients at their initial hospitalization and population-level adjustments are made at the hospital-level based on discharge diagnosis codes of initial hospitalizations.

This study first examines readmission rates as a continuous variable with rates ranging from 12.9 (low) to 21 (high), a mean of 15.23, and standard deviation of 0.73. The natural log of readmission rates was used to reduce right-skewness. Knowing that readmission rates are risk standardized, we expect to see small marginal effects. Therefore, we also examined the tails of readmissions rates as categorical variables – to assess the probability of being amongst the top performing hospitals and the probability of being amongst the poorest performing hospitals. Dividing readmission rates into quartiles, the first was labeled as "top performing" hospitals and hospitals in quartiles 2-4 were labeled as "other hospitals". Top performing hospitals had readmission rates of 14.8 or lower and included 28% of the sample. Then hospitals in quartile 4 were labeled the "poorest performing" hospitals, with quartiles 1-3 labeled as "other hospitals". Poor performing hospitals had readmission rates of 15.7 or higher and included 23% of the sample.

Independent Variables. Hospital partnership engagement (HPE) is the main independent variable of interest. HPE categories were defined in our previous study using a taxonomy of hospitals' partnership behavior which clustered hospitals by the sectors they partnered with and level of engagement (not involved, informal, or formal) using a widely used methodology.[72,132,142,187] Hospitals were classified as either as independent, exploitative, ambidextrous, or explorative. *Independent* refers to hospitals with little to no partnerships, while *explorative* refers to hospitals that partner across all sectors and often at a formal level. *Exploitative* refers to hospitals that form partnerships strategically within each sector, most often with other providers, public health departments, and schools. A*mbidextrous* hospitals are those that exhibit exploratory and exploitative partnership behavior, where they collaborate across all sectors but have stronger partnerships within the healthcare sector.

Research suggest that higher readmission rates are seen in system affiliated hospitals, teaching hospitals, for profit hospitals, large hospitals, rural hospitals, and hospitals across regions.[180,188] The AHA survey was used to identify these hospital structural characteristics: hospital system affiliation (no/yes); teaching hospitals (no/yes; identified by Council of Teaching Hospitals membership); hospital ownership (nonprofit, for profit, public), hospital size (measured using hospital beds: small<100), medium=100-299, large=>300). Geographic identifiers were pulled from the CMS Impact file, such as rurality (large urban, small urban, and rural), and region defined by the four main Census divisions (Northeast, Midwest, South, and West). Additionally, this study controlled for critical access hospital designation identified in the AHA survey (no/yes) because they may not have the same incentive to improve hospital quality as their Medicare payments are not tied to readmission rates.

Major predictors of higher readmission rates are social risk factors,[189] less post-discharge facilities in the area such as skilled nursing facilities,[180,190] the previous year's readmission rate,[175,191] and safety net hospitals.[70] The Minority Health Social Vulnerability Index (range 0-1, where 0=low vulnerability and 1=high vulnerability) represented the social risk factors and the number of skilled nursing facilities in the area was pulled from the Area Health Resource File. Both are measured at the county-level for year 2018. With no federal definition of a safety-net hospital, this study used a common method where safety-nets were defined as hospitals serving a larger proportion of Medicare and Medicaid patients, using the fourth quantile of Medicare Disproportionate Share Hospital (DSH) patient percentage pulled from CMS's Impact file.[70] The 2017 Medicare readmission penalty was also pulled from the Impact file and ranged from 0-3%.

Analysis

Two sample t-tests were used to examine differences in sample characteristics by readmission performance, where low and average performing hospitals were compared to the top performing hospitals – the hospitals with the lowest rates. Simple and multiple regressions were then used to assess the relationships between HPE and overall readmission rates using ordinary least squares (OLS) regressions. Readmission rates were log transformed to account for skewness in the model, thus, the natural log was easily translated as the marginal effect. The odds of performing amongst the top 25% of hospitals was assessed using logistic regressions. Robust standard errors were used to adjust for heteroskedasticity. Analyses were conducted in Stata version 16.0. The University of Maryland's institutional review board determined this research did not meet the federal definition of human subject's research.

Results

Sample Characteristics

The average thirty-day all-cause readmission rate for this sample was 15.23(*SD*=0.73). Lower readmission rates are desired. Average/poorer performing hospitals (n=2,084) had an average readmission rate of 15.53 (*SD*=.581) and ranged from 14.9 to 21, whereas top performing hospitals (n=806) had an average readmission rate of 14.41 (*SD*=.364) and ranged 12.9-14.8. Table 8 presents a comparison of sample characteristics by performance level, where the lower and average performing hospitals were compared to the higher performing hospitals. Two-sample t-tests were used to assess differences. There appears to be no significant ($p<.05$) differences in the proportions of HPE levels between high and lower performers. However, significant differences were seen between these two groups among all other covariates.

As expected, higher performing hospitals were in counties with lower social vulnerability, received a smaller readmission penalty in 2017, and were less likely to be a safety-net hospital. However, lower performing hospitals had a greater number of skilled nursing facilities in their county. Lower performing hospitals had greater proportions of critical access hospitals, teaching hospitals, for-profit and government owned hospitals, smaller hospitals, rural hospitals, and hospitals in the South. Higher performing hospitals were more likely to be part of a hospital system, be a nonprofit, be medium sized, be in a micropolitan area, and located in the West.

Comparison of readmission rates by HPE

Table 9 displays the differences in readmission rates by performance and across the four levels of HPE. The proportion of top performing hospitals increases with HPE intensity, from 25% in independent HPE, 27% in exploitative HPE, 29% in ambidextrous, and 30% in explorative. However, the proportion of poor performing hospitals remained steady at about 23% across all levels of HPE.

Average readmission rates decreased with HPE intensity, from 15.25 (*SD*=.647) in independent HPE to 15.18 (*SD*=.74) in explorative HPE. Top performing hospitals had greater variation in readmission rates. Among the top performers, independent HPE (14.5, *SD*=.318) and exploitative HPE (14.48, *SD*=.339) had significantly higher rates of readmission rates in comparison to ambidextrous HPE (14.39, *SD*=.392, $p<.01$) and explorative HPE (14.36, *SD*=.353, $p<.01$). Among the poorest performing hospitals, differences in readmission rates were insignificant. Independent HPE had the lowest readmission rates (16.15, *SD*=0.5) followed by explorative HPE (16.19, *SD*=.453), and exploitative and ambidextrous HPE had an average of 14.96 and 14.91, respectively.

Effect of HPE on Readmission Rates

The simple and multiple linear regression results can be found in Table 10. When looking at the univariate relationship between HPE and readmission rates, readmission rates were slightly smaller across HPE intensity when compared to independent HPE, resulting in little predictive power (R^2=0.15). Nevertheless, hospitals with explorative HPE had rates 0.05 (*SE*=0.003; *p*=0.071) percentage points smaller than independent HPE. After accounting for hospital structural characteristics, the relationship between HPE and readmissions grew (R^2=12). Readmission rates among hospitals with explorative HPE were 0.80 (*SE*= 0.003, *p*=0.006) percentage points smaller than hospitals with independent HPE holding all else constant. However, most of the change in average marginal effect was explained away when other major predictors of readmission rates were added to the model (R^2=24). Hospitals with explorative HPE had readmission rates 0.56 (*SE*=0.003; *p*=0.038) percentage points smaller than independent HPE, holding all else constant.

Among hospital predictors, higher readmission rates were associated with critical access hospitals, teaching hospitals, for profit and government hospitals, hospitals with 100 beds or more, hospitals that are not part of multihospital systems, hospitals in large urban areas, and hospitals in the Northeast region. This remained true even after accounting for other predictors, though their magnitude of effect changed. Holding all else constant, the number of skilled nursing facilities in the county, social vulnerability, the percent of Medicare readmission penalty received in the previous year, and safety-net hospitals were all associated with higher readmission rates.

The Odds of Being a Top Performing Hospital

The results of the univariate logistic regression indicate a greater probability of being a top performing hospital with each level of HPE when compared to independent HPE (see Table 11). The odds of being amongst the top performing hospitals were 25 times greater (*SE*=0.155; *p*=0.070) for hospitals with ambidextrous HPE and 31 times greater (*SE*=0.182; *p*=0.057) for hospitals with explorative HPE. However, HPE could only explain approximately 0.14% of the variation in performance and this significant association was explained away once hospital-level predictors were added to the model (PR^2=6.15). HPE remained an insignificant predictor of top performing hospitals once other major predictors of readmissions were added to the model (PR^2=10.17).

In model two, the probability of being a top performing hospital was greater in hospitals that were part of multihospital systems than those that aren't; small urban and rural areas than large urban areas; and in every region when compared to the Northeast. Lower probabilities were seen in critical access hospitals, teaching hospitals, for profit hospitals, and public hospitals. Hospital size was an insignificant predictor. However, after controlling for other predictors of readmissions, hospital size became a positive predictor of being a top performing hospital. The marginal effect changed for other hospital predictors, but the association remained the same. Furthermore, the number of skilled nursing facilities in the county, social vulnerability, the percent of Medicare readmission penalty received in the previous year, and safety-net hospitals were all negatively associated with the odds of being a top performing hospital, holding all else constant.

The Odds of Being a Poor Performing Hospital

The results of the univariate logistic regression indicate no significant relationship between HPE and readmission rates (see Table 12). When controlling for hospital predictors, the odds of being amongst the poorest performing hospitals was 23 times less (*SE*=0.116; *p*=0.078) for hospitals with ambidextrous HPE and 38 times less (*SE*=0.109; *p*=0.006) for hospitals with explorative HPE when compared to independent HPE (PR^2=10.56). After adding major predictors of readmission rates to the model, the marginal effect of HPE decreased. The difference in odds between ambidextrous and independent HPE was no longer significant, and the odds of being a poor performing hospital was now 34 (*SE*=0.121; *p*=0.024) times less for hospitals with exploratory HPE than independent HPE (PR^2=17.31).

The odds of being a poor performing hospital were greater in teaching vs non-teaching hospitals; for profit vs nonprofit hospitals; and among medium and large hospitals vs. small hospitals. While the odds of being a poor performing hospital were lower for critical access hospitals, hospitals that are part of multihospital systems, hospitals in small urban vs large urban areas, and hospitals in every region vs. the Northeast. These effects remained strong after controlling for major predictors of hospital readmissions in all variables but for critical access hospitals, which now had 63 times greater odds of being a poor performing hospital. Furthermore, all major predictors of readmission rates had greater odds of being amongst the poorest performing hospitals.

Discussion

This study examined the average marginal effect of HPE on 30-day hospital-wide all-cause unplanned readmission rates and the odds of being a top performing hospital. Overall, readmission rates were smaller across levels of HPE intensity. Hospitals with explorative HPE

had significantly ($p<0.01$) lower readmission rates than hospitals with independent HPE, even after controlling for other predictors of readmission rates. In the full model, rates differed by half a percent (0.56), which is meaningful as readmission rates ranged from 12.9 to 21, had a mean of 15.23 and standard deviation of 0.73. Despite HPE being a significant ($p<0.1$) predictor of top performing hospitals in the univariate logistic regression, HPE became an insignificant predictor after including other predictors of hospital readmissions. HPE may not be a strong predictor of top performing hospitals, but HPE was a significant predictor of performing better than the poorest performing hospitals.

These findings support the growing body of case studies that are assessing hospital-level outcomes of cross-sector partnerships. As anchor institutions in the communities they serve, if hospitals invest in collaborative cross-sector efforts to address the social determinants of health, they may experience a positive return on that investment, as improved hospital quality.[23] While literature indicates that most hospital cross-sector partnerships are developed as part of the CHNA process, required by the Internal Revenue Services for non-profit hospitals, partnerships that address the social determinants of health are often established intentionally to improve hospital quality.[67] For-profit hospitals are also uniquely able to serve as a community anchor because they are often in counties with higher unemployment and uninsured rates, low self-perceived health, and in states that expanded Medicaid.[192]

Findings also promote the classification of partnerships across the spectrum of collaboration/engagement. A previous study examined the effect of hospital cross-sector partnerships and safety-net hospital status on readmission rates, where partnerships were indexed to create a continuous variable.[70] The authors found safety-net hospitals had more partnerships than non-safety-net hospitals, but they found no relationship between the interaction of

partnerships and safety-net hospitals on readmission rates. The authors agree that establishing a partnership is not enough to see an improvement in hospital outcomes. For example, a case study examined the referral program established through an informal partnership between a hospital and social service, and found that patients rarely followed through on the social service referral.[89] This was thought to be due to low levels of patient health literacy and motivation, the lack of follow-up from the referrer, and unclear expectations set in the partnership. Clear partnership goals, expectations, and communication channels are fundamental to partnership development.

However, it is important to note that passive screening and referrals are an ineffective approach to population health as they address the social needs of patients and not the community.[193] Additionally, many social service agencies do not have the capacity to address an influx of cases.[194] Therefore, hospitals should work collaboratively with social service agencies from idea conception through implementation and onwards. As partnerships continually become a focus of population health strategies, the AHA should consider increasing the scale of partnership engagement from the 3 point-scale currently used to the 5-point scale used in their supplemental 2015 Population Health Survey to capture a more precise level of partnership engagement.

While HPE was a weak predictor of top performing hospitals, this was somewhat expected as studies have had difficulties in identifying strategies that continuously reduce readmission rates. Previous research has instead found top performing hospitals were distinguished by aspects of organizational culture. For example, they intentionally worked to improve intra-hospital collaboration, worked to share data with post-acute care providers, addressed the process of reducing readmissions with a growth mindset, and addressed

readmissions from a patient-centered perspective instead of a hospital- and penalty-centered perspective.[195]

Furthermore, this study found higher rates of readmission and thus lower probability of being a top performer when hospitals were in more socially vulnerable counties, even after controlling for rurality, critical access hospitals, and safety-net hospitals. These findings support the call for CMS to further evaluate how readmission rates and/or penalties are calculated as current risk adjustment methodologies do not fully account for patient risk factors.[70,196] Additionally, the number of skilled nursing facilities was a significant but weak predictor. Perhaps future studies should adjust for a full measure of post discharge care supply, such as palliative care, home health, nursing homes, skilled nursing facilities, primary care physicians and nurse practitioners.[172] While CMS is considering using the hospital-wide all-cause readmission rate as the measure used to assess hospital penalties, future studies should assess the association between HPE and readmission penalties.[166] Researchers should also assess differences in HPE and readmission rates over time.

Limitations

This study was designed as a cross-sectional study and therefore causality between HPE and readmission rates cannot be established. The analysis was limited to 3 levels of partnership engagement. This study cannot evaluate the level of partnership engagement. Additionally, AHA data was subject to response and recall bias. It is assumed that an informed representative responded to the survey, but it is possible that other partnerships exist unbeknownst to them. Next, data was limited to hospitals with readmission rates. It is possible that high performing hospitals with fewer than 25 cases were not captured in the study because readmission rates for hospitals with fewer than 25 Medicare readmissions were set to missing. The National Quality

Forum reindorsed the all-cause readmission measure in 2017 but noted that changes in hospital readmission rates have begun to plateau, though the same number of hospitals receive a penalty each year. With concerns that the methodology is not capturing a change in readmission rates, they expressed a desire to see changes in the methodology when they reevaluate the measure in 2023.

Conclusion

Hospital-wide all-cause readmission rates are a good measure of overall hospital quality. This study found modest reductions in readmission rates in hospitals with explorative HPE, after accounting for hospital and other major predictors of readmission rates. Improving population health requires hospitals to work with and across multiple sectors. These results show a preliminary benefit to establishing a variety of cross-sector partnerships and strategically establishing formal partnership with those that are dedicated to accomplishing a shared goal. AHA should continue to collect these data as more research is needed on hospital cross-sector partnerships.

Table 8: Sample Characteristics by Readmission Performance, 2018

	30-Day Hospital Wide All-Cause Readmission Performance							
	Lower Performers n=2,084 (72%)		Top Performers n=806 (28%)			Sample Total N=2,890	
30-Day Hospital Wide							
All-Cause Readmission Rate	μ=15.53	(SD=.581)	μ=14.41	(SD=.364)		μ=15.23	(SD=.73)
Hospital Partnership Engagement							
Independent	374	(18%)	122	(15%)	+	496	(17%)
Exploitative	536	(26%)	198	(25%)		734	(25%)
Ambidextrous	784	(38%)	320	(40%)		1,104	(38%)
Explorative	390	(19%)	166	(21%)		556	(19%)
Hospital Predictors							
Critical Access Hospital							
No	1473	(71%)	652	(81%)	***	2,125	(74%)
Yes	611	(29%)	154	(19%)	***	765	(26%)
Hospital System							
No	650	(31%)	199	(25%)	***	849	(29%)
Yes	1434	(69%)	607	(75%)	***	2,041	(71%)
Teaching Hospital							
No	1904	(91%)	772	(96%)	***	2,676	(93%)
Yes	180	(9%)	34	(4%)	***	214	(7%)
Ownership							
Nonprofit	1378	(66%)	624	(77%)	***	2,002	(69%)
For Profit	243	(12%)	63	(8%)	**	306	(11%)
Public	463	(22%)	119	(15%)	***	582	(20%)
Hospital Size							
Small (<100 beds)	988	(47%)	337	(42%)	**	1,325	(46%)
Medium (100-299 beds)	643	(31%)	298	(37%)	**	941	(33%)
Large (≥300beds)	453	(22%)	171	(21%)		624	(22%)
Rurality							
Large Urban	1285	(62%)	521	(65%)		1,051	(36%)
Small Urban	328	(16%)	159	(20%)	***	890	(31%)
Rural	471	(23%)	126	(16%)	***	949	(33%)
Census Regions							
Northeast	325	(16%)	72	(9%)	***	397	(14%)
Midwest	706	(34%)	275	(34%)		981	(34%)
South	785	(38%)	251	(31%)	***	1,036	(36%)
West	268	(13%)	208	(26%)	***	476	(16%)
Major Predictors							
Skilled Nursing Facilities #	μ=24	(SD=54.8)	μ=17	(SD=30.3)	***	μ=22	(SD=49.3)
Social Vulnerability Index (%)	μ=.60	(SD=.285)	μ=.57	(SD=.27)	*	μ=59%	(SD=.281)
2017 Readmission Penalty (%)	μ=.46	(SD=.652)	μ=.31	(SD=.525)	***	μ=42%	(SD=.623)
Safety-Net Hospital							
No	1659	(80%)	703	(87%)	***	2,150	(74%)
Yes	425	(20%)	103	(13%)	***	740	(26%)

Date Source: Thirty-Day Hospital Wide All-Cause Readmission Rates were pulled from the 2020 Unplanned Hospital Visits file (quarter 2) of the Centers for Medicare & Medicaid Services' Annual Hospital database. Readmission rates above the sample mean are associated with lower performance. Covariates were pulled from the 2018 American Hospital Association's Annual Survey and Minority Health Social Vulnerability Index (SVI). Using quartiles of readmission rates, Top Performers were identified as the first quartile of hospitals (hospitals with the lowest rates) and quartiles 2-4 were labeled Lower Performers

N= population size; n=sample size; μ=mean; SD= standard deviation; p-values: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 9: Differences in Proportions and Readmission Rates Across Hospital Partnership Engagement

	Hospital Partnership Engagement											
	Independent			Exploitative			Ambidextrous			Explorative			Total	
	N=496		p-value	N=734		p-value	N=1104		p-value	N=556		p-value	N=2890	
Sample Population	*n*	*%*		*n*	*%*		*n*	*%*		*n*	*%*		*n*	*%*
Other Hospitals vs	374	(75%)		536	(73%)		784	(71%)		390	(70%)		2,084	(72%)
Top Performing	122	(25%)		198	(27%)		320	(29%)		166	(30%)		806	(28%)
Other Hospitals vs	388	(78%)		567	(77%)		851	(77%)		427	(77%)		2,233	(77%)
Poorest Performing	108	(22%)		167	(23%)		253	(23%)		129	(23%)		657	(23%)
Readmission Rates	*Mean*	*SD*		*Mean*	*SD*		*Mean*	*SD*		*Mean*	*SD*		*Mean*	*SD*
Average Readmission Rates	15.25	(0.647)		15.25	(0.721)		15.22	(0.763)		15.18	(0.740)		15.23	(0.730)
Other Hospitals vs	15.50	(0.524)		15.54	(0.604)		15.56	(0.600)		15.53	(0.562)		15.54	(0.581)
Top Performing	14.50	(0.318)	*	14.48	(0.339)	^	14.39	(0.392)	* ^	14.36	(0.353)	* ^	14.42	(0.364)
Other Hospitals vs	15.00	(0.425)	*	14.96	(0.439)	^	14.91	(0.502)	*	14.88	(0.500)	* ^	14.93	(0.475)
Poorest Performing	16.15	(0.500)		16.26	(0.570)		16.26	(0.552)		16.19	(0.453)		16.23	(0.531)

Date Sources: Thirty-Day Hospital-Wide All-Cause Readmission Rates were pulled from the 2020 Unplanned Hospital Visits file (quarter 2) of the Centers for Medicare & Medicaid Services' Annual Hospital database. Lower readmission rates indicate higher/greater performance. P-value column represents the results of two sample t-tests done to compare rates across levels of Hospital Partnership Engagement: * results (p<.05) compared to Independent HPE and ^ results (p<.05) compared to Exploitative HPE

Table 10: Simple and Multiple Regressions Examining Readmission Rates

	Model 1		Model 2		Model 3	
	AME	Robust SE	AME	Robust SE	AME	Robust SE
Hospital Partnership Engagement						
Independent	Ref.		Ref.		Ref.	
Exploitative	-0.02%	0.003	0.06%	0.002	0.10%	0.002
Ambidextrous	-0.26%	0.002	-0.30%	0.002	-0.15%	0.002
Explorative	-0.51% +	0.003	-0.80% **	0.003	-0.56% *	0.003
Hospital Predictors						
Critical Access Hospital			0.72% ***	0.002	2.52% ***	0.002
Hospital System			-0.54% *	0.002	-0.60% **	0.002
Teaching Hospital			1.97% ***	0.004	1.71% ***	0.004
Ownership						
Nonprofit			Ref.		Ref.	
For Profit			1.84% ***	0.003	1.28% ***	0.003
Public			0.47% *	0.002	0.22%	0.002
Hospital Size						
Small (<100 beds)			Ref.		Ref.	
Medium (100-299 beds)			1.02% ***	0.002	0.40% +	0.002
Large (≥300beds)			1.39% ***	0.003	0.36%	0.003
Rurality						
Large Urban			Ref.		Ref.	
Small Urban			-1.35% ***	0.002	-0.92% ***	0.002
Rural			-0.58% **	0.002	-0.31%	0.002
Census Regions						
Northeast			Ref.		Ref.	
Midwest			-2.44% ***	0.003	-2.05% ***	0.003
South			-1.76% ***	0.003	-1.89% ***	0.003
West			-4.01% ***	0.003	-4.08% ***	0.003
Major Predictors						
Skilled Nursing Facilities (#)					0.01% ***	0.000
Social Vulnerability Index (%)					2.01% ***	0.004
2017 Readmission Penalty (%)					2.22% ***	0.002
Safety-Net Hospital					1.88% ***	0.002

AME: Average Marginal Effects; SE: Standard Error; Ref: Reference Group for categorical variable.
p-values: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 11: Logistic Regression Examining the Odds of Being a Top Performing Hospital

	Model 1		Model 2		Model 3	
	OR	Robust SE	OR	Robust SE	OR	Robust SE
Hospital Partnership Engagement						
Independent	Ref.		Ref.		Ref.	
Exploitative	1.13	0.151	1.05	0.144	1.03	0.144
Ambidextrous	1.25 +	0.155	1.00	0.134	0.93	0.129
Explorative	1.31 +	0.182	1.03	0.161	0.96	0.154
Hospital Predictors						
Critical Access Hospital			0.46 ***	0.061	0.27 ***	0.039
Hospital System			1.20 +	0.134	1.26 *	0.140
Teaching Hospital			0.43 ***	0.093	0.48 ***	0.103
Ownership						
Nonprofit			Ref.		Ref.	
For Profit			0.47 ***	0.075	0.54 ***	0.090
Public			0.68 **	0.088	0.71 *	0.095
Hospital Size						
Small (<100 beds)			Ref.		Ref.	
Medium (100-299 beds)			1.00	0.119	1.21	0.150
Large (≥300beds)			0.99	0.146	1.42 *	0.220
Rurality						
Large Urban			Ref.		Ref.	
Small Urban			1.60 ***	0.170	1.35 **	0.153
Rural			1.45 **	0.180	1.24 +	0.160
Census Regions						
Northeast			Ref.		Ref.	
Midwest			2.07 ***	0.323	1.97 ***	0.318
South			1.63 **	0.253	1.83 ***	0.309
West			4.16 ***	0.685	5.04 ***	0.908
Major Predictors						
Skilled Nursing Facilities (#)					1.00 ***	0.001
Social Vulnerability Index (%)					0.50 **	0.107
2017 Readmission Penalty (%)					0.52 ***	0.054
Safety-Net Hospital					0.52 ***	0.069

OR: Odds Ratios; SE: Standard Error; Ref: Reference Group for categorical variable.
p-values: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 12: Logistic Regression Examining the Odds of Being a Poor Performing Hospital

	Model 1		Model 2		Model 3	
	OR	Robust SE	OR	Robust SE	OR	Robust SE
Hospital Partnership Engagement						
Independent	Ref.		Ref.		Ref.	
Exploitative	1.06	0.148	1.02	0.156	1.02	0.161
Ambidextrous	1.07	0.139	0.77 +	0.116	0.79	0.124
Explorative	1.09	0.161	0.62 **	0.109	0.66 *	0.121
Hospital Predictors						
Critical Access Hospital			0.67 *	0.110	1.63 **	0.302
Hospital System			0.75 *	0.088	0.71 **	0.089
Teaching Hospital			1.71 **	0.300	1.65 **	0.310
Ownership						
Nonprofit			Ref.		Ref.	
For Profit			2.16 ***	0.328	1.80 ***	0.288
Public			1.10	0.159	0.97	0.143
Hospital Size						
Small (<100 beds)			Ref.		Ref.	
Medium (100-299 beds)			2.35 ***	0.332	1.91 ***	0.284
Large (≥300beds)			3.41 ***	0.568	2.42 ***	0.433
Rurality						
Metropolitan			Ref.		Ref.	
Micropolitan			0.63 ***	0.071	0.72 **	0.091
Rural			0.83	0.111	0.87	0.130
Census Regions						
Northeast			Ref.		Ref.	
Midwest			0.46 ***	0.066	0.50 ***	0.076
South			0.53 ***	0.074	0.46 ***	0.071
West			0.23 ***	0.042	0.19 ***	0.039
Major Predictors						
Skilled Nursing Facilities (#)					1.00 *	0.001
Social Vulnerability Index (%)					2.81 ***	0.701
2017 Readmission Penalty (%)					2.39 ***	0.191
Safety-Net Hospital					2.03 ***	0.262

OR: Odds Ratio; SE: Standard Error; Ref: Reference Group for categorical variable.
p-values: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Chapter 5: Conclusion

Summary of Evidence

The central research question of this dissertation asked if hospital investments in population health strategies improved hospital quality and established three research aims to study this. In this section, the findings of each aim will be summarized.

Predictors of Hospital Cross-Sector Partnerships for Population Health

In the first study, we sought to conduct a taxonomic analysis of hospital cross-sector partnerships and then examine the variation in hospital and community characteristics.

The taxonomic analysis resulted in four-clusters of hospitals based on their level of engagement with four overarching partnership sectors, therefore known as the hospital partnership engagement (HPE) taxonomy. These sectors were government, economy, healthcare, and nonprofits. The first cluster of hospitals was classified as *independent* because they had little to no partnerships in any sector. The second cluster was classified as e*xploitative* because most partnerships were informal and the seemingly strategic partnerships they established within each sector, particularly within the healthcare and nonprofit sector. This indicated that they may establish partnerships based on known facts, previous relationships, or projects. The third cluster of hospitals was classified as *ambidextrous*, because they established informal partnerships across all sectors and formal partnerships within the healthcare sector. The fourth cluster was classified as *explorative* as they partnered across all sectors at more formal levels, especially within the healthcare sector.

We found many hospital and county characteristics increased or decreased across the spectrum of collaboration, or HPE intensity. For example, partnership engagement increased with hospital size, teaching status, nonprofit ownership, being part of multihospital systems, and

greater proportions of Medicaid discharges. Whereas, the proportion of Medicare discharges, critical access hospitals, and sole community providers had an inverse relationship with partnership engagement – though, more sole community providers made up the exploitative HPE cluster than the independent HPE cluster (10.6% vs. 9.20%).

Additionally, partnership engagement increased with urbanicity, hospital competition, median home value, household income, educational attainment, and non-white population; and partnership engagement declined with shortage area designation, poverty, and elderly populations – though hospitals with exploitative HPE were more likely to have higher elderly populations than hospitals with independent HPE.

County-level percentages of Hispanic population and region do not correlate with HPE intensity. For example, hospitals in counties with higher percentages of Hispanic populations were more likely to have ambidextrous or exploitative HPE. Additionally, clusters varied by region. While the South was associated with independent HPE, and the Midwest was associated with exploitative, ambidextrous and explorative HPE was associated with the Northeast and West.

The Association Between Hospital Cross-Sector Partnerships Engagement and the Provision of Community Health Services

The second study asked if hospital partnership engagement (HPE) was associated with hospitals providing access to community health services that address the social needs and social determinants of health. As hypothesized, we found HPE to be a significant predictor of the total sum of community health services provided by hospitals, as well as each of those services. This association even held true after accounting for state-level effects, which are associated with hospital quality. These findings promote the use of cross-sector collaboration to address the

social determinants of health, however, they also indicate that hospitals with more resources (i.e., large, nonprofit, teaching hospitals in metropolitan areas) are able to work on the social determinants of health. This was especially concerning as hospitals serving more medically vulnerable populations were less likely to offer community health services.

Hospital Cross-Sector Partnership Engagement And 30-Day Unplanned Readmissions

The third study examined the association between HPE and 30-day hospital-wide all-cause unplanned readmission rates and sought to examine the likelihood of being at the top or bottom group of performers. We saw lower readmission rates across levels of HPE intensity and our analysis indicated that hospitals with explorative HPE had significantly ($p<0.01$) lower readmission rates than hospitals with independent HPE, even after controlling for other predictors of readmission rates. Readmission rates differed by half a percent (0.56) between explorative and independent HPE, which is meaningful as readmission rates are risk standardize and are heavily centered around the mean. We also determined that HPE was not associated with being a top performing hospital, but it was a significant predictor of performing better than the poorest performing hospitals, further indicating that HPE is associated with hospital quality.

Research Limitations

The cross-sectional study design of this research limits the interpretation of our findings to measures of association as we cannot determine causality as the data on cross-sector partnerships were limited to 3 options (e.g., no partnership, informal partnership, or formal partnership); data on services provision do not include utilization; and data on readmissions were only available for Medicare patients, 65 years of age and older, in fee-for-service Medicare plans. This study was also dependent upon survey data from the AHA and is subject to missing data and recall bias. Additionally, the hospital respondent may not know of all the ways their

hospital partners across-sectors. For example, there may be a population health department that works with community organizations but operates separately from the care coordinators who may have established their own partnerships.

Study Implications

Despite these limitations, these findings demonstrate an association between HPE and hospital quality. We found positive correlations between HPE and community characteristics, community health services and readmission rates, all of which contribute to new knowledge to this field of study. Findings support the role hospitals can play in addressing the social determinants of health through the provision of community health services that are tailored for the community they serve[23] and expanding access to social services that address the social needs of the patients they serve. Which supports the call to promote cross-sector partnerships as a means to achieving population health, as indicated in AHA's Path Forward,[197] the Robert Wood Johnson's Culture of Health Action Framework,[40] the Center for Medicare & Medicaid Innovation's Accountable Care Communities,[198] and the U.S. Department of Health & Human Services' 10 Essential Public Health Services[199] and National Stakeholder Strategy for Achieving Health Equity.[4]

By using the HPE taxonomy, we were able to go beyond measuring the number of cross-sector partnerships but assess partnership behavior, by the level of engagement across-sectors. Future studies should consider using this approach when assessing cross-sector partnerships. One step that would help in this effort is if AHA expands the 3-option scale of partnership engagement to the 6-option scale used in the 2015 population health study. Although the AHA removed the level of engagement scale in 2020 and replaced it with a non-mutually exclusive selection to assess the activities in which the partnership was used. For example, which sectors

were partnerships established to address the social needs of patients, the social determinants of health of the community, and which participated in the CHNA process. This will help assess how hospitals are partnering across-sectors to achieve population health however the level of engagement has been minimized.

Much of this type of research is funded through philanthropic organizations such as The Commonwealth Fund and the Robert Wood Johnson Foundation (RWJF). However, RWJF has gone beyond funding research, as they've helped to develop tools to assess partnerships[200,201], established research networks dedicated to cross-sector partnerships (i.e., Aligning Systems for Health), and publicly report progress on hospital cross-sector partnerships. Additionally, the de Beaumont Foundation maintains a "Practical Playbook" of evidence and tools that support building partnerships between public health and healthcare.

However, there is still a lot of work in this area that needs to be done, as only 20% of hospitals established a formal partnership with a state or local government organization and 30% with a community organization.[202] While more research into cross-sector partnerships, especially related to hospital outcomes, is needed to further the business case for hospitals to invest in their communities, one of the biggest barriers to sustaining cross-sector partnerships and working towards a shared goal is funding community initiatives to improve population health and building trust.[203,204] The future of this research is rooted in understanding the relationship between partnerships and funding, how community initiatives sustain funding to achieve population health, and the role CHNAs play in the decision to fund various partners and initiatives.

The Bookings Institution, Trust for America's Health, and the Urban Institute have been promoting the concept of "braiding and blending" funding streams to achieve shared goals, such

as CMS' policy to allow Medicare to cover supportive housing.[205-207] The de Beaumont Foundation worked with The National Academy for State Health Policy to create tools to help governors address policies to improve health, such as cross-sector partnerships and the braiding and blending of funds.[208] Some states have already worked to promote the "braiding and blending" of funds to fund innovative projects that span across agencies.[209] Future research should examine how HPE influences hospital community benefit spending, especially in states with and without the ability to braid and blend funds.

Conclusion

In conclusion, cross-sector partnerships are a vital piece of population health puzzle. Hospitals have been slow to adopt this mindset and take action to address local issues, however changes in payment and tax policies have encouraged hospitals to work across-sectors to improve population health and hospital quality. This study adds new knowledge linking cross-sector partnerships to community characteristics, community health services and ultimately readmission rates using national data centered around hospitals. With an impending recession, cross-sector partnerships will be invaluable in ensuring food access, housing, and transportation of vulnerable populations.

Appendix 1: Partnerships for Population Health

Scale of partnership:

1. Health care providers outside your system (Include other hospitals health care systems, FQHCs, community clinics)
2. Health insurance companies
3. Local or state public health organizations (Include public health departments, institutes, etc.)
4. Local or state human/social service organizations (Include food, housing/rental assistance, energy assistance, transportation assistance)
5. Other local or state government (Include municipal, city or county government, including public safety and policy/legislative initiatives at a local level)
6. Non-profit organizations (Include National health associations, United Way, YMCA, Service leagues, healthy community coalitions)
7. Faith-based organizations
8. Schools (Include childhood, primary and secondary schools, and colleges/universities)
9. Local businesses or chambers of commerce
10. National businesses or chambers of commerce

Scale of partnership:

1. Not involved. No current partnerships with this type of organization
2. Collaboration. Exchange information and share resources for a similar mission to enhance the capacity of the other partner

3. Formal Alliance. Formalized partnership (binding agreement) among multiple organizations with merged initiatives, common goals and metrics

SOURCE: American Hospital Association. 2018 AHA Annual Survey.

Appendix 2: Definitions of Each Community Health Service

1. **Children's wellness program.** A program that encourages improved health status and a healthful lifestyle of children through health education, exercise, nutrition, and health promotion.
2. **Community health education:** Education that provides health information to individuals and populations as well as support for personal, family and community health decisions with the objective of improving health status.
3. **Community outreach**: A program that systematically interacts with the community to identify those in need of services, alerting persons and their families to the availability of services, locating needed services, and enabling persons to enter the service delivery system.
4. **Crisis prevention**: Services provided in order to promote physical and mental well-being and the early identification of disease and ill health prior to the onset and recognition of symptoms so as to permit early treatment.
5. **Employment services**: Services designed to support individuals with significant disabilities to seek and maintain employment.
6. **Enabling services**: A program that is designed to help the patient access health care services by offering any of the following linguistic services, transportation services, and/or referrals to local social services agencies.
7. **Fitness center.** Provides exercise, testing, or evaluation programs and fitness activities to the community and hospital employees.
8. **Health fairs**: Community health education events that focus on the prevention of disease and promotion of health through such activities as audiovisual exhibits and free diagnostic services.

9. **Meal delivery services.** A hospital sponsored program which delivers meals to people, usually the elderly, who are unable to prepare their own meals. Low cost, nutritional meals are delivered to individuals' homes on a regular basis.
10. **Psychiatric education services:** Provides psychiatric educational services to community agencies and workers such as schools, police, courts, public health nurses, welfare agencies, clergy, and so forth. The purpose is to expand the mental health knowledge and competence of personnel not working in the mental health field and to promote good mental health through improved understanding, attitudes, and behavioral patterns.
11. **Support groups.** A hospital sponsored program that allows a group of individuals with common experiences or issues who meet periodically to share experiences, problems, and solutions in order to support each other.
12. **Supportive housing services.** A hospital program that provides decent, safe, affordable, community-based housing with flexible support services designed to help the individual or family stay housed and live a more productive life in the community.
13. **Teen outreach services**: A program focusing on the teenager which encourages an improved health status and a healthful lifestyle including physical, emotional, mental, social, spiritual and economic health through education, exercise, nutrition and health promotion.
14. **Transportation to health services**: A long-term care support service designed to assist the mobility of the elderly. Some programs offer improved financial access by offering reduced rates and barrier-free buses or vans with ramps and lifts to assist the elderly or handicapped; others offer subsidies for public transport systems or operate mini-bus services exclusively for use by senior citizens.

15. **Violence prevention programs (Community**): An organized program that attempts to make a positive impact on the type(s) of violence a community is experiencing. For example, it can assist victims of violent crimes, e.g., rape, or incidents, e.g., bullying, to hospital or to community services to prevent further victimization or retaliation. A program that targets the underlying circumstances that contribute to violence such as poor housing, insufficient job training, and/or substance abuse through means such as direct involvement and support, education, mentoring, anger management, crisis intervention and training programs would also qualify.

Response Options:

1. **Owned/provided by the hospital or its subsidiary**. All patient revenues, expenses and utilization related to the provision of the service are reflected in the hospital's statistics reported elsewhere in this survey.
2. **Provided by my health system (in my local community)**. Another health care provider in the same system as your hospital provides the service and patient revenue, expenses, and utilization related to the provision of the service are recorded at the point where the service was provided and would not be reflected in your hospital's statistics reported elsewhere in this survey. (A system is a corporate body that owns, leases, religiously sponsors and/or manages health providers)
3. **Provided through a partnership or joint venture with another provider that is not in my system.** All patient revenues and utilization related to the provision of the service are recorded at the site where the service was provided and would not be reflected in your hospital statistics reported elsewhere in this survey. (A joint venture is a contractual arrangement between two

or more parties forming an unincorporated business. The participants in the arrangement remain independent and separate outside of the venture's purpose.)

SOURCE: American Hospital Association. 2018 AHA Annual Survey.

Appendix 3: Data Source Information

With the knowledge that budget cycles vary for all hospitals, an analysis of hospital reporting periods (beginning and ending dates) in the 2018 American Hospital Association Annual Survey was conducted. All hospitals reported in 2018, however, 34% of hospitals in the sample reported on a typical local government budget cycle (July 2017 – June 2018); about 17% reported on the federal budget cycle (October 2017 – September 2018); about 44% reported on a calendar year cycle (January 2018 – December 2018); and roughly 5% reported on other cycles throughout the year.

Additionally, an analysis of the Unplanned Hospital Visit files from the Care Compare database, previously known as Hospital Compare, was also conducted because reporting timeframes for measures vary. In general, there is a two-year lag in reporting, reporting is done quarterly basis, and these files are organized by calendar year. The "30-day Hospital-Wide All-Cause Unplanned Readmission Rate" represents 1 year of data from July-June (quarter 2). This means that files from quarters 3 and 4 of the 2019 files and quarters 1 and 2 of the 2020 files make up the 2017-2018 readmission measures. Differences in reporting across quarters were assessed. It was concluded that the rates reported the 2020 quarter 2 file were consistent with previous files with the only change occurring when a missing rate, identified by a negative number referring to low case rates in a previous quarter changed to an actual rate. Since this is a retrospective study, it was decided that the more complete 2020 quarter 2 file should be used as opposed to the 2019 quarter 3 file.

While the 2018 readmission rate time-period may not match up perfectly with the reporting period of each hospital, they align for at least 6 months of hospital behavior for the

63% of hospitals that reported an end date past June 2018 in the AHA data. Upon reflection, this difference should not significantly affect the results of this study because the main outcome of interest is hospital cross-sector partnership engagement (HPE), and theory suggests that effective partnership engagement builds slowly over time with mutual trust and respect. Therefore, any differences that may have been seen during the July-December 2018 timeframe due to a difference in HPE during that timeframe would be small. Lastly, this a cross-sectional study testing for associations between HPE and readmission rates, not causation since there are many unknowns about how hospitals leveraged their partners to improve upon readmission rates. In theory, hospitals with greater HPE intensity can leverage the abilities of their partners to address many of the social determinants of health that impact poor health outcomes, preventing the need for patients to return to the hospital for at least 30-days after an admission.

Bibliography

1. Schroeder SA. We Can Do Better — Improving the Health of the American People. *New England Journal of Medicine.* 2007;357:1221-1228.
2. Dieleman JL, Squires E, Bui AL, et al. Factors Associated With Increases in US Health Care Spending, 1996-2013. *JAMA.* 2017;318(17):1668-1678.
3. Braveman P, Gottlieb L. The social determinants of health: it's time to consider the causes of the causes. *Public Health Rep.* 2014;129 Suppl 2:19-31.
4. National Partnership for Action to End Health Disparities. National Stakeholder Strategy for Achieving Health Equity. 2011;Rockville, MD(Department of Health and Human Services (US)):252.
5. Whitehead M, Dahlgren G. *Concepts and principles for tackling social inequities in health: Levelling up Part 1*. Copenhagen Ø, Denmark: World Health Organization Regional Office for Europe;2006.
6. Brown AF, Ma GX, Miranda J, et al. Structural Interventions to Reduce and Eliminate Health Disparities. *Am J Public Health.* 2019;109(S1):S72-S78.
7. Dentoni D, Bitzer V, Schouten G. Harnessing Wicked Problems in Multi-stakeholder Partnerships. *Journal of Business Ethics.* 2018;150(2):333-356.
8. Roussos ST, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. *Annu Rev Public Health.* 2000;21(1):369-402.
9. Bachrach DB, Wallis KW, Pfister HP, Lipson ML. *Addressing Patients' Social Needs: An Emerging Business Case for Provider Investment.* New York, NY United States: Commonwealth Fund; 2014/05/29/ 2014.
10. Fraze T, Lewis VA, Rodriguez HP, Fisher ES. Housing, Transportation, And Food: How ACOs Seek To Improve Population Health By Addressing Nonmedical Needs Of Patients. *Health Aff (Millwood).* 2016;35(11):2109-2115.
11. Social Security Administration. Definitions. https://www.ssa.gov/OP_Home/ssact/title19/1905.htm, 2019.
12. Henderson SS, Smith-King EJ. Sectoral decision making: structures, processes and trust. *Management Decision.* 2015;53(7):1545-1559.
13. Hearld LR, Alexander JA. Sustaining participation in multisector health care alliances: The role of personal and stakeholder group influence. *Health Care Manage Rev.* 2020;45(3):196-206.
14. Health Research and Educational Trust. *Hospital-Community Partnerships to Build a Culture of Health: A Compendium of Case Studies.* Chicago, IL: Health Research and Educational Trust; 2017/08// 2017.
15. Sekhri N, Feachem R, Ni A. Public-private integrated partnerships demonstrate the potential to improve health care access, quality, and efficiency. *Health Aff (Millwood).* 2011;30(8):1498-1507.
16. Varda DM, Retrum JH, Chapman C. Exploring the Process, Models, and Outcomes of Hospital-Public Health Partnerships. *Front Public Health Serv Syst Res.* 2014;3(5).
17. Hardin L, Trumbo S, Wiest D. Cross-sector collaboration for vulnerable populations reduces utilization and strengthens community partnerships. *Journal of Interprofessional Education & Practice.* 2020;18:100291.

18. French MT, Homer J, Gumus G, Hickling L. Key Provisions of the Patient Protection and Affordable Care Act (ACA): A Systematic Review and Presentation of Early Research Findings. *Health Serv Res.* 2016;51(5):1735-1771.
19. Institute of Medicine. *Population Health Implications of the Affordable Care Act: Workshop Summary.* Washington, DC: The National Academies Press; 2014.
20. Burwell SM. Setting value-based payment goals--HHS efforts to improve U.S. health care. *N Engl J Med.* 2015;372(10):897-899.
21. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Aff (Millwood).* 2008;27(3):759-769.
22. Kindig DA. What Are We Talking About When We Talk About Population Health? In. *Health Affairs Blog.* Vol 2016: Health Affairs; 2019.
23. Koh HK, Bantham A, Geller AC, et al. Anchor Institutions: Best Practices to Address Social Needs and Social Determinants of Health. *American Journal of Public Health.* 2020;110(3):309-316.
24. Woulfe J, Oliver TR, Zahner SJ, Siemering KQ. Multisector partnerships in population health improvement. *Prev Chronic Dis.* 2010;7(6):A119.
25. Gottlieb L, Tobey R, Cantor J, Hessler D, Adler NE. Integrating Social And Medical Data To Improve Population Health: Opportunities And Barriers. *Health Aff (Millwood).* 2016;35(11):2116-2123.
26. Ring PS, van de Ven AH. Developmental Processes of Cooperative Interorganizational Relationships. *The Academy of Management Review.* 1994;19(1):90-118.
27. Thomson AM, Perry JL, Miller TK. Conceptualizing and Measuring Collaboration. *Journal of Public Administration Research and Theory.* 2007;19(1):23-56.
28. Gazley B. The Current State of Interorganizational Collaboration: Lessons for Human Service Research and Management. *Human Service Organizations: Management, Leadership & Governance.* 2016;41(1):1-5.
29. Wood DJ, Gray B. Toward a Comprehensive Theory of Collaboration. *The Journal of Applied Behavioral Science.* 2016;27(2):139-162.
30. Halverson PK, Mays GP, Kaluzny AD. Working together? Organizational and market determinants of collaboration between public health and medical care providers. *Am J Public Health.* 2000;90(12):1913-1916.
31. Bryson JM, Crosby BC, Stone MM. The Design and Implementation of Cross-Sector Collaborations: Propositions from the Literature. *Public Administration Review.* 2006;66(s1):44-55.
32. Gajda R. Utilizing Collaboration Theory to Evaluate Strategic Alliances. *American Journal of Evaluation.* 2004:13.
33. Hearld LR, Alexander JA, Wolf LJ, Shi Y. The perceived importance of intersectoral collaboration by health care alliances. *J Community Psychol.* 2019;47(4):856-868.
34. Rice Jr JB, Ronchi DS. Strategic Partnership: Collaboration, Alliances & the Coordination Spectrum. *Logistics Solutions.* 2002(1):22-27.
35. McCullough JM, Eisen-Cohen E, Lott B. Barriers and facilitators to intraorganizational collaboration in public health: Relational coordination across public health services targeting individuals and populations. *Health Care Manage Rev.* 2020;45(1):60-72.
36. Selsky JW, Parker B. Cross-Sector Partnerships to Address Social Issues: Challenges to Theory and Practice. *Journal of Management.* 2016;31(6):849-873.

37. Health Research and Educational Trust. *A Playbook for Fostering Hospital-Community Partnerships to Build a Culture of Health.* Chicago, IL: Health Research and Educational Trust; July 2017.
38. Zahner SJ, Oliver TR, Siemering KQ. The mobilizing action toward community health partnership study: multisector partnerships in US counties with improving health metrics. *Prev Chronic Dis.* 2014;10:E05.
39. Hogg RA, Varda D. Insights Into Collaborative Networks Of Nonprofit, Private, And Public Organizations That Address Complex Health Issues. *Health Aff (Millwood).* 2016;35(11):2014-2019.
40. Towe VL, Leviton L, Chandra A, Sloan JC, Tait M, Orleans T. Cross-Sector Collaborations And Partnerships: Essential Ingredients To Help Shape Health And Well-Being. *Health Aff (Millwood).* 2016;35(11):1964-1969.
41. Bryson JM, Crosby BC, Stone MM. Designing and Implementing Cross-Sector Collaborations: NeededandChallenging. *Public Administration Review.* 2015;75(5):647-663.
42. Gazley B. Linking Collaborative Capacity to Performance Measurement in Government—Nonprofit Partnerships. *Nonprofit and Voluntary Sector Quarterly.* 2010;39(4):653-673.
43. Ansell C, Gash A. Collaborative Governance in Theory and Practice. *Journal of Public Administration Research and Theory.* 2007;18(4):543-571.
44. Tamarack Institute. Tool: Collaboration Spectrum. In:2017.
45. de Montigny JG, Desjardins S, Bouchard L. The fundamentals of cross-sector collaboration for social change to promote population health. *Global Health Promotion.* 2019;26(2):41-50.
46. Sadoff CW, Grey D. Cooperation on International Rivers. *Water International.* 2005;30(4):420-427.
47. Alexander JA, Hearld LR, Mittler J. Measuring leadership in multisector health care alliances. *Nonprofit Management and Leadership.* 2011;21(4):341-361.
48. Mellewigt T, Madhok A, Weibel A. Trust and formal contracts in interorganizational relationships — substitutesand complements. *Managerial and Decision Economics.* 2007;28(8):833-847.
49. Alonazi WB. Exploring shared risks through public-private partnerships in public health programs: a mixed method. *BMC Public Health.* 2017;17(1):571.
50. Gazley B, Brudney JL. The Purpose (and Perils) of Government-Nonprofit Partnership. *Nonprofit and Voluntary Sector Quarterly.* 2016;36(3):389-415.
51. Erickson J, Milstein B, Schafer L, et al. *Progress Along the Pathway for Transforming Regional Health: A Pulse Check on Multi-Sector Partnerships.* Robert Wood Johnson Foundation and the Rippel Foundation; 2017/03// 2017.
52. Central Oregon Health Council. Working Collaboratively to Make Health Care Better in our Community. 2019; https://cohealthcouncil.org/about-cohc/. Accessed November 16, 2019.
53. Health Research and Educational Trust. *Approaches to Population Health in 2015: A National Survey of Hospitals.* Chicago, IL: Health Research and Educational Trust; 2015/08// 2015.
54. Bevc CA, Retrum JH, Varda DM. Patterns in PARTNERing across Public Health Collaboratives. *Int J Environ Res Public Health.* 2015;12(10):12412-12425.

55. Retrum JH, Chapman CL, Varda DM. Implications of network structure on public health collaboratives. *Health Educ Behav.* 2013;40(1 Suppl):13S-23S.
56. Varda DM, Chandra A, Stern SA, Lurie N. Core dimensions of connectivity in public health collaboratives. *J Public Health Manag Pract.* 2008;14(5):E1-7.
57. Laymon B, Shah G, Leep CJ, Elligers JJ, Kumar V. The proof's in the partnerships: Are Affordable Care Act and Local Health Department accreditation practices influencing collaborative partnerships in community health assessment and improvement planning? *J Public Health Manag Pract.* 2015;21(1):12-17.
58. Rosenbaum S. Hospitals as Community Hubs: Integrating Community Benefit Spending, Community Health Needs Assessment, and Community Health Improvement. *Economic Studies at Brookings.* 2016;5.
59. Sandler T. Collective action: fifty years later. *Public Choice.* 2015;164(3-4):195-216.
60. McPherson M, Smith-Lovin L, Cook JM. Birds of a Feather: Homophily in Social Networks. *Annual Review of Sociology.* 2001;27(1):415-444.
61. Varda DM, Retrum JH. Collaborative Performance as a Function of Network Members' Perceptions of Success. *Public Performance & Management Review.* 2015;38(4):632-653.
62. Chapman CL, Varda DM. Nonprofit Resource Contribution and Mission Alignment in Interorganizational, Cross-Sector Public Health Networks. *Nonprofit and Voluntary Sector Quarterly.* 2017;46(5):1052-1072.
63. Bevc CA, Retrum JH, Varda DM. New perspectives on the "silo effect": initial comparisons of network structures across public health collaboratives. *Am J Public Health.* 2015;105 Suppl 2(S2):S230-235.
64. Hearld LR, Alexander JA. Governance processes and change within organizational participants of multi-sectoral community health care alliances: the mediating role of vision, mission, strategy agreement and perceived alliance value. *Am J Community Psychol.* 2014;53(1-2):185-197.
65. Siegal G, Siegal N, Bonnie RJ. An account of collective actions in public health. *Am J Public Health.* 2009;99(9):1583-1587.
66. Mays GP, Scutchfield FD. Improving public health system performance through multiorganizational partnerships. *Prev Chronic Dis.* 2010;7(6):A116.
67. Hilts KE, Yeager VA, Gibson PJ, Halverson PK, Blackburn J, Menachemi N. Hospital Partnerships for Population Health: A Systematic Review of the Literature. *Journal of healthcare management / American College of Healthcare Executives.* 2021;66(3):170-198.
68. Hilts KE. *An Examination of How National Policies Are Driving Population Health Outcomes and Organizational Change in Private and Public Sectors* [Ph.D.]. Ann Arbor, Indiana University - Purdue University Indianapolis; 2020.
69. Park S, Hamadi H, Apatu E, Spaulding AC. Hospital Partnerships in Population Health Initiatives. *Population Health Management.* 2019;23(3):226-233.
70. Cheon O, Baek J, Kash BA, Jones SL. An exploration of community partnerships, safety-net hospitals, and readmission rates. *Health Services Research.* 2020;55(4):531-540.
71. Hearld LR, Karabukayeva A. Participation in Value-Based Payment Programs and U.S. Acute Care Hospital Population Health Partnerships. *Journal of healthcare management.* 2022;67(2):103-119.

72. Noh E, Potthoff S, Begun JW. A taxonomy of hospitals based on partnerships for population health management. *Health Care Manage Rev.* 2020;45(4):321-331.
73. Brewster AL, Brault MA, Tan AX, Curry LA, Bradley EH. Patterns of Collaboration among Health Care and Social Services Providers in Communities with Lower Health Care Utilization and Costs. *Health Serv Res.* 2018;53 Suppl 1:2892-2909.
74. Begun JW, Potthoff S. Moving Upstream in U.S. Hospital Care Toward Investments in Population Health. *J Healthc Manag.* 2017;62(5):343-353.
75. Prybil L, Scutchfeld FD, Rex K, et al. *Improving Community Health through Hospital-Public Health Collaboration: Insights and Lessons Learned from Successful Partnerships.* Lexington, KY: Commonwealth Center for Governance Studies, Inc; 2014.
76. Phillips FB. *Sustaining Community-Hospital Partnerships to Improve Population Health.* Maryland Community Health Resources Commission; 2015 2015.
77. Alvarez R, Ginsburg J, Grabowski J, Post S, Rosenberg W. The Social Work Role in Reducing 30-Day Readmissions: The Effectiveness of the Bridge Model of Transitional Care. *J Gerontol Soc Work.* 2016;59(3):222-227.
78. Lynch J, Cunningham M, Morita J. Case Study: The Alliance for Health Equity: Hospitals, Health Departments, and Community Partners Working Together for Health Equity in Chicago and Suburban Cook County. In: Michener JL, Castrucci BC, Bradley DW, et al., eds. *The Practical Playbook II: Building Multisector Partnerships That Work.* New York: Oxford University Press; 2019:271-282.
79. Kheirkhah P, Feng Q, Travis LM, Tavakoli-Tabasi S, Sharafkhaneh A. Prevalence, predictors and economic consequences of no-shows. *BMC Health Serv Res.* 2016;16(1):13.
80. Yue D, Pourat N, Chen X, et al. Enabling Services Improve Access To Care, Preventive Services, And Satisfaction Among Health Center Patients. *Health Aff (Millwood).* 2019;38(9):1468-1474.
81. Health Research and Educational Trust. *Transportation and the Role of Hospitals.* Chicago, IL: Health Research & Educational Trust;2017.
82. Schaeffer AM, Jolles D. Not Missing the Opportunity: Improving Depression Screening and Follow-Up in a Multicultural Community. *JCJQ.* 2019;45(1):31-39.
83. Hatef E, Predmore Z, Lasser EC, et al. Integrating social and behavioral determinants of health into patient care and population health at Veterans Health Administration: a conceptual framework and an assessment of available individual and population level data sources and evidence-based measurements. *AIMS Public Health.* 2019;6(3):209-224.
84. Fraze TK, Brewster AL, Lewis VA, Beidler LB, Murray GF, Colla CH. Prevalence of Screening for Food Insecurity, Housing Instability, Utility Needs, Transportation Needs, and Interpersonal Violence by US Physician Practices and Hospitals. *JAMA Netw Open.* 2019;2(9):e1911514.
85. Billioux AC, Verlander K, Anthony SE, Alley DE. Standardized Screening for Health-Related Social Needs in Clinical Settings: The Accountable Health Communities Screening Tool. Paper presented at: NAM Perspectives2017; Discussion Paper, National Academy of Medicine, Washington, DC.
86. Buitron de la Vega P, Losi S, Sprague Martinez L, et al. Implementing an EHR-based Screening and Referral System to Address Social Determinants of Health in Primary Care. *Med Care.* 2019;57 Suppl 6 Suppl 2:S133-S139.

87. Kreuter M, Garg R, Thompson T, et al. Assessing The Capacity Of Local Social Services Agencies To Respond To Referrals From Health Care Providers. *Health Aff (Millwood).* 2020;39(4):679-688.
88. Sherry M, Wolff JL, Ballreich J, DuGoff E, Davis K, Anderson G. Bridging the Silos of Service Delivery for High-Need, High-Cost Individuals. *Popul Health Manag.* 2016;19(6):421-428.
89. Kulie P, Steinmetz E, Johnson S, McCarthy ML. A health-related social needs referral program for Medicaid beneficiaries treated in an emergency department. *Am J Emerg Med.* 2021;47:119-124.
90. Joo JY, Liu MF. Case management effectiveness in reducing hospital use: a systematic review. *Int Nurs Rev.* 2017;64(2):296-308.
91. Bazzoli GJ, Carcaise-Edinboro P, Sabik LM, Chandan P, Harpe S. Integrated Case Management: Does It Reduce Health Service Disparities Across African American and White Medicaid Beneficiaries? *Med Care Res Rev.* 2017;74(4):486-501.
92. Ouayogode MH, Mainor AJ, Meara E, Bynum JPW, Colla CH. Association Between Care Management and Outcomes Among Patients With Complex Needs in Medicare Accountable Care Organizations. *JAMA Netw Open.* 2019;2(7):e196939.
93. Butler SM, Higashi T, Cabello M. *Budgeting to promote social objectives—a primer on braiding and blending.* Washington, DC: The Brookings Institution; April 2020.
94. Sandhu S, Sharma A, Cholera R, Bettger JP. Integrated Health and Social Care in the United States: A Decade of Policy Progress. *International journal of integrated care.* 2021;21(4):9-9.
95. Beck AF, Klein MD, Schaffzin JK, Tallent V, Gillam M, Kahn RS. Identifying and treating a substandard housing cluster using a medical-legal partnership. *Pediatrics.* 2012;130(5):831-838.
96. Butler SM, Cabello M. *Housing as a Hub for Health, Community Services, and Upward Mobility.* Washington, DC: The Brookings Institution; March 15 2018.
97. Hawryluk M. *Why Hospitals Are Getting Into The Housing Business.* Kaiser Health News; Oct 4 2019.
98. Health Research and Educational Trust. *Housing and the Role of Hospitals.* Chicago, IL: Health Research and Educational Trust;2017.
99. Evashwick CJ, Turner JS. *Case Studies in Population and Community Health Management.* Chicago, IL: Health Administration Press; 2019.
100. Basu A, Kee R, Buchanan D, Sadowski LS. Comparative cost analysis of housing and case management program for chronically ill homeless adults compared to usual care. *Health Serv Res.* 2012;47(1 Pt 2):523-543.
101. Finkelstein A, Zhou A, Taubman S, Doyle J. Health Care Hotspotting - A Randomized, Controlled Trial. *N Engl J Med.* 2020;382(2):152-162.
102. Herring B, Gaskin D, Zare H, Anderson G. Comparing the Value of Nonprofit Hospitals' Tax Exemption to Their Community Benefits. *Inquiry.* 2018;55:46958017751970.
103. Zare H, Eisenberg MD, Anderson G. Comparing the value of community benefit and Tax-Exemption in non-profit hospitals. *Health Serv Res.* 2021;n/a(n/a).
104. Horwitz LI, Chang C, Arcilla HN, Knickman JR. Quantifying Health Systems' Investment In Social Determinants Of Health, By Sector, 2017-19. *Health Aff (Millwood).* 2020;39(2):192-198.

105. Song PH, Lee SY, Alexander JA, Seiber EE. Hospital ownership and community benefit: looking beyond uncompensated care. *J Healthc Manag.* 2013;58(2):126-141; discussion 141-122.
106. Basu S, Landon BE, Song Z, Bitton A, Phillips RS. Implications of workforce and financing changes for primary care practice utilization, revenue, and cost: a generalizable mathematical model for practice management. *Med Care.* 2015;53(2):125-132.
107. Proenca EJ, Rosko MD, Zinn JS. Correlates of hospital provision of prevention and health promotion services. *Med Care Res Rev.* 2003;60(1):58-78; discussion 79-84.
108. Ferdinand AO, Epane JP, Menachemi N. Community benefits provided by religious, other nonprofit, and for-profit hospitals: a longitudinal analysis 2000-2009. *Health Care Manage Rev.* 2014;39(2):145-153.
109. Tsega M, Lewis C, McCarthy D, Shah T, Coutts K. *Review of Evidence on the Health Care Impacts of Interventions to Address the Social Determinants of Health.* New York: The Commonwealth Fund; July 1, 2019 2019.
110. Koh KA, Racine M, Gaeta JM, et al. Health Care Spending And Use Among People Experiencing Unstable Housing In The Era Of Accountable Care Organizations. *Health Aff (Millwood).* 2020;39(2):214-223.
111. Singh SR, Bakken E, Kindig DA, Young GJ. Hospital Community Benefit in the Context of the Larger Public Health System: A State-Level Analysis of Hospital and Governmental Public Health Spending Across the United States. *J Public Health Manag Pract.* 2016;22(2):164-174.
112. McCullough JM, Singh SR, Leider JP. The Importance of Governmental and Nongovernmental Investments in Public Health and Social Services for Improving Community Health Outcomes. *J Public Health Manag Pract.* 2019;25(4):348-356.
113. Braveman PA, Kumanyika S, Fielding J, et al. Health disparities and health equity: the issue is justice. *Am J Public Health.* 2011;101 Suppl 1:S149-155.
114. Pulliam RM. Practical Application of Critical Race Theory: A Social Justice Course Design. *Journal of Social Work Education.* 2017;53(3):414-423.
115. Prybil LD, Scutchfield FD, Dixon RE. The Evolution of Public Health-Hospital Collaboration in the United States. *Public Health Rep.* 2016;131(4):522-525.
116. Gittell JH, Weiss L. Coordination Networks Within and Across Organizations: A Multi-level Framework*. *Journal of Management Studies.* 2004;41(1):127-153.
117. Casalino LP, Erb N, Joshi MS, Shortell SM. Accountable Care Organizations and Population Health Organizations. *J Health Polit Policy Law.* 2015;40(4):821-837.
118. Wilson KD, Mohr LB, Beatty KE, Ciecior A. Describing the continuum of collaboration among local health departments with hospitals around the community health assessments. *J Public Health Manag Pract.* 2014;20(6):617-625.
119. Beatty KE, Wilson KD, Ciecior A, Stringer L. Collaboration among Missouri nonprofit hospitals and local health departments: content analysis of community health needs assessments. *Am J Public Health.* 2015;105 Suppl 2(S2):S337-344.
120. Fraze TK, Beidler LB, Briggs ADM, Colla CH. 'Eyes In The Home': ACOs Use Home Visits To Improve Care Management, Identify Needs, And Reduce Hospital Use. *Health Aff (Millwood).* 2019;38(6):1021-1027.
121. Wilke T, Leight S. Partnering with Transportation Sector Actors and Advocates to Improve Health Outcomes. In: Michener JL, Castrucci BC, Bradley DW, et al., eds. *Practical Playbook II.* 2 ed. New York, NY: Oxford University Press; 2019.

122. Dobbins JM, Peiper N, Jones E, Clayton R, Peterson LE, Phillips Jr RL. Patient-centered medical home recognition and diabetes control among health centers: exploring the role of enabling services. *Population health management.* 2018;21(1):6-12.
123. *The Practical Playbook II: Building Multisector Partnerships That Work.* Oxford University Press; 2019.
124. Zuckerman D, Parker K. *Inclusive, local hiring: Building the pipeline to a healthy community.* The Democracy Collaborative2017.
125. Fisher ES, Shortell SM, Savitz LA. Implementation Science: A Potential Catalyst for Delivery System Reform. *JAMA.* 2016;315(4):339-340.
126. Li C. Little's test of missing completely at random. *The Stata Journal.* 2013;13(4):795-809.
127. Ratcliffe M, Charlynn B, Holder K, Fields A. Defining Rural at the U.S. Census Bureau. 2016.
128. Parker K, Horowitz J, Brown A, Fry R, Cohn DV, Igielnik R. Demographic and economic trends in urban, suburban and rural communities. In: *What Unites and Divides Urban, Suburban and Rural Communities.* Pew Research Center; 2018.
129. Cohen J. *Statistical power analysis for the behavioral sciences.* Hillsdale, N.J.: L. Erlbaum Associates; 1988.
130. Levinthal DA, March JG. The myopia of learning. *Strategic Management Journal.* 1993;14(S2):95-112.
131. Tushman ML, O'Reilly III CA. Ambidextrous organizations: Managing evolutionary and revolutionary change. *California management review.* 1996;38(4):8-29.
132. Shortell SM, Gottlieb DJ, Martinez Camblor P, O'Malley AJ. Hospital-based health systems 20 years later: A taxonomy for policy research and analysis. *Health Serv Res.* 2021;n/a(n/a).
133. Wilkinson RG, Marmot M, World Health Organization, University College L, International Centre for Health and Society. Social determinants of health: the solid facts. 2003.
134. Braveman P, Egerter S, Williams DR. The social determinants of health: coming of age. *Annu Rev Public Health.* 2011;32:381-398.
135. Herrin J, St Andre J, Kenward K, Joshi MS, Audet AM, Hines SC. Community factors and hospital readmission rates. *Health Serv Res.* 2015;50(1):20-39.
136. Kumar GS, Klein R. Effectiveness of case management strategies in reducing emergency department visits in frequent user patient populations: a systematic review. *J Emerg Med.* 2013;44(3):717-729.
137. Anderson AC, Chen J. ACO Affiliated Hospitals Increase Implementation of Care Coordination Strategies. *Med Care.* 2019;57(4):300-304.
138. Amarasingham R, Xie B, Karam A, Nguyen N, Kapoor B. *Using Community Partnerships to Integrate Health and Social Services for High-Need, High-Cost Patients.* The Commonwealth Fund; 2018 2018.
139. Obama B. United States Health Care Reform: Progress to Date and Next Steps. *JAMA.* 2016;316(5):525-532.
140. Seshamani M, Sen AP. *Moving Toward High-Value Health Care: Integrating Delivery System Reform into 2020 Policy Proposals.* The Commonwealth Fund; November 2018.

141. McCullough JM. Government Health and Social Services Spending Show Evidence of Single-Sector Rather Than Multi-Sector Pursuit of Population Health. *Inquiry.* 2019;56:46958019856977.
142. Bazzoli GJ, Shortell SM, Dubbs N, Chan C, Kralovec P. A taxonomy of health networks and systems: bringing order out of chaos. *Health Serv Res.* 1999;33(6):1683-1717.
143. Ginn GO, Moseley CB. The Impact of State Community Benefit Laws on the Community Health Orientation and Health Promotion Services of Hospitals. *Journal of Health Politics, Policy and Law.* 2006;31(2):321-344.
144. Lee J, Korda C. *Social determinants of health: How are hospitals and health systems investing in and addressing social needs?* : Deloitte Center for Health Solutions;2017.
145. Fichtenberg C, Delva J, Minyard K, Gottlieb LM. Health And Human Services Integration: Generating Sustained Health And Equity Improvements. *Health Aff (Millwood).* 2020;39(4):567-573.
146. Mattessich PW, Rausch EJ. Cross-sector collaboration to improve community health: a view of the current landscape. *Health Aff (Millwood).* 2014;33(11):1968-1974.
147. Buffett HW, Eimicke WB. *Social Value Investing: A Management Framework for Effective Partnerships.* New York: Columbia University Press; 2018.
148. Philip C, Novick CG, Novick LF. Local Transmission of Zika Virus in Miami-Dade County: The Florida Department of Health Rises to the Challenge. *J Public Health Manag Pract.* 2019;25(3):277-287.
149. Balser J, Ryu J, Hood M, Kaplan G, Perlin J, Siegel B. Care Systems COVID-19 Impact Assessment: Lessons Learned and Compelling Needs. *NAM Perspect.* 2021;2021.
150. Wong EY, Schachter A, Collins HN, et al. Cross-Sector Monitoring and Evaluation Framework: Social, Economic, and Health Conditions Impacted During the COVID-19 Pandemic. *Am J Public Health.* 2021;111(S3):S215-s223.
151. Brewster AL, Fleming M, Knox M, Roth A. Community Resilience For COVID-19 And Beyond: Leveraging A System For Health Care And Social Services Integration. In. *Health Affairs Blog*: Health Affairs; 2020.
152. Chen C, Pittman P, Westergaard S, Salsberg E, Erikson C. Emerging Health Workforce Strategies To Address COVID-19. In. *Health Affairs Blog*: Health Affairs; 2020.
153. Minority Health Social Vulnerability Index Overview. U.S. Department of Health and Human Services (HHS) Office of Minority Health; 2021. https://www.minorityhealth.hhs.gov/minority-health-SVI/assets/downloads/MH%20SVI%20Overview_11.19.2021.pdf. Accessed November, 2021.
154. Lewis VA, Tierney KI, Fraze T, Murray GF. Care Transformation Strategies and Approaches of Accountable Care Organizations. *Med Care Res Rev.* 2019;76(3):291-314.
155. Brewster AL, Wilson TL, Frehn J, Berish D, Kunkel SR. Linking Health And Social Services Through Area Agencies On Aging Is Associated With Lower Health Care Use And Spending. *Health Aff (Millwood).* 2020;39(4):587-594.
156. Petchel S, Gelmon S, Goldberg B. The Organizational Risks Of Cross-Sector Partnerships: A Comparison Of Health And Human Services Perspectives. *Health Aff (Millwood).* 2020;39(4):574-581.
157. Drabo EF, Eckel G, Ross SL, et al. A Social-Return-On-Investment Analysis Of Bon Secours Hospital's 'Housing For Health' Affordable Housing Program. *Health Affairs.* 2021;40(3):513-520.

158. Beck AF, Henize AW, Qiu T, et al. Reductions In Hospitalizations Among Children Referred To A Primary Care–Based Medical-Legal Partnership. *Health Affairs.* 2022;41(3):341-349.
159. Akiya K, Fisher E, Wells A, Li Y, Peck C, Pagán JA. Aligning Health Care and Social Services to Reduce Hospitalizations and Emergency Department Visits: An Evaluation of the Community Care Connections Program. *Med Care.* 2021;59(8):671-678.
160. National Academies of Sciences E, and Medicine ,,. Investing in Interventions That Address Non-Medical, Health-Related Social Needs: Proceedings of a Workshop. In: Alper J, Martinez RM, eds. *Investing in Interventions That Address Non-Medical, Health-Related Social Needs: Proceedings of a Workshop.* Washington (DC)2019.
161. Auerbach J. Social Determinants of Health Can Only Be Addressed by a Multisector Spectrum of Activities. *J Public Health Manag Pract.* 2019;25(6):525-528.
162. Brewster AL, Kunkel S, Straker J, Curry LA. Cross-Sectoral Partnerships By Area Agencies On Aging: Associations With Health Care Use And Spending. *Health Aff (Millwood).* 2018;37(1):15-21.
163. Teixeira-Pinto A, Siddique J, Gibbons R, Normand SL. Statistical Approaches to Modeling Multiple Outcomes In Psychiatric Studies. *Psychiatr Ann.* 2009;39(7):729-735.
164. Marmot M, Allen JJ. Social determinants of health equity. *Am J Public Health.* 2014;104 Suppl 4(S4):S517-519.
165. Williams DR, Collins C. US Socioeconomic and Racial Differences in Health: Patterns and Explanations. *Annual Review of Sociology.* 1995;21(1):349-386.
166. Medicare Payment Advisory Commission. Update: MedPAC's evaluation of Medicare's Hospital Readmission Reduction Program. 2019.
167. Shen C, Wadhera RK, Yeh RW. Misclassification of Hospital Performance Under the Hospital Readmissions Reduction Program: Implications for Value-Based Programs. *JAMA Cardiology.* 2021;6(3):332-335.
168. Thompson RG, Jr., Alonzo D, Hu MC, Hasin DS. Substance Use Disorders and Poverty as Prospective Predictors of Adult First-Time Suicide Ideation or Attempt in the United States. *Community Ment Health J.* 2017;53(3):324-333.
169. Henke RM, Karaca Z, Jackson P, Marder WD, Wong HS. Discharge Planning and Hospital Readmissions. *Medical Care Research and Review.* 2016;74(3):345-368.
170. Ellsworth JL. Case managers: a key to reducing readmissions. *Prof Case Manag.* 2015;20(3):147-149.
171. Hoyer EH, Brotman DJ, Apfel A, et al. Improving Outcomes After Hospitalization: A Prospective Observational Multicenter Evaluation of Care Coordination Strategies for Reducing 30-Day Readmissions to Maryland Hospitals. *Journal of general internal medicine.* 2018;33(5):621-627.
172. Griffith KN, Schwartzman DA, Pizer SD, et al. Local Supply Of Postdischarge Care Options Tied To Hospital Readmission Rates. *Health Affairs.* 2022;41(7):1036-1044.
173. Ryan AM, Krinsky S, Adler-Milstein J, Damberg CL, Maurer KA, Hollingsworth JM. Association Between Hospitals' Engagement in Value-Based Reforms and Readmission Reduction in the Hospital Readmission Reduction Program. *JAMA Intern Med.* 2017;177(6):862-868.
174. Kim Y, Thirukumaran CP, Li Y. Greater Reductions in Readmission Rates Achieved by Urban Hospitals Participating in the Medicare Shared Savings Program. *Med Care.* 2018;56(8):686-692.

175. Desai NR, Ross JS, Kwon JY, et al. Association Between Hospital Penalty Status Under the Hospital Readmission Reduction Program and Readmission Rates for Target and Nontarget Conditions. *JAMA.* 2016;316(24):2647-2656.
176. Yale New Haven Health Services Corporation – Center for Outcomes Research and Evaluation (YNHHSC/CORE). *Trend in hospital-wide 30-day readmission rates.* online: CMS Hospital Chartbook;2017.
177. National Academies of Sciences E, and Medicine ,,. *Multisector Community Health Partnerships: Potential Opportunities and Challenges: Proceedings of a Workshop—in Brief.* Washington, DC: National Academies Press; 2017.
178. Hummel SL, Karmally W, Gillespie BW, et al. Home-Delivered Meals Postdischarge From Heart Failure Hospitalization. *Circ Heart Fail.* 2018;11(8):e004886.
179. Pruitt Z, Emechebe N, Quast T, Taylor P, Bryant K. Expenditure Reductions Associated with a Social Service Referral Program. *Popul Health Manag.* 2018;21(6):469-476.
180. Gupta S, Zengul FD, Davlyatov GK, Weech-Maldonado R. Reduction in Hospitals' Readmission Rates: Role of Hospital-Based Skilled Nursing Facilities. *Inquiry.* 2019;56:46958018817994.
181. Khouri RK, Jr., Hou H, Dhir A, et al. What is the impact of a clinically related readmission measure on the assessment of hospital performance? *BMC Health Serv Res.* 2017;17(1):781.
182. Khera R, Horwitz LI, Lin Z, Krumholz HM. Publicly Reported Readmission Measures and the Hospital Readmissions Reduction Program: A False Equivalence? *Ann Intern Med.* 2018;168(9):670-671.
183. Georgia Health Policy Center. *Aligning Systems for Health: Two Years of Learning.* Atlanta, GA: Andrew Young School of Policy Studies, Georgia State University; 2021.
184. American Hospital Association. 2018 AHA Annual Survey. In:2018.
185. National Bureau of Economic Research. Centers for Medicare and Medicaid Services (CMS) Impact File Hospital IPPS. In. (Online) Cambridge (MA): NBER; 2017.
186. Centers for Medicare and Medicaid Services. Unplanned Hospital Visits - Hospital. In. *Hospital Datasets.* Vol 2020. CMS.gov: Centers for Medicare & Medicaid Services,; 2020.
187. Bazzoli GJ, Harless DW, Chukmaitov AS. A taxonomy of hospitals participating in Medicare accountable care organizations. *Health Care Manage Rev.* 2019;44(2):93-103.
188. Horwitz LI, Bernheim SM, Ross JS, et al. Hospital Characteristics Associated With Risk-standardized Readmission Rates. *Medical Care.* 2017;55(5).
189. Joynt Maddox KE, Reidhead M, Hu J, et al. Adjusting for social risk factors impacts performance and penalties in the hospital readmissions reduction program. *Health Serv Res.* 2019;54(2):327-336.
190. McHugh JP, Foster A, Mor V, et al. Reducing Hospital Readmissions Through Preferred Networks Of Skilled Nursing Facilities. *Health Aff (Millwood).* 2017;36(9):1591-1598.
191. Thompson MP, Waters TM, Kaplan CM, Cao Y, Bazzoli GJ. Most Hospitals Received Annual Penalties For Excess Readmissions, But Some Fared Better Than Others. *Health Affairs.* 2017;36(5):893-901.
192. Cronin CE, Franz B, Choyke K, Rodriguez V, Gran BK. For-profit hospitals have a unique opportunity to serve as anchor institutions in the U.S. *Prev Med Rep.* 2021;22:101372.

193. Castrucci BC, Auerbach AJ. Meeting Individual Social Needs Falls Short Of Addressing Social Determinants Of Health. In. *Health Affairs Blog*. January 16 ed2019.
194. Burgess JF, Hockenberry JM. Can all cause readmission policy improve quality or lower expenditures? A historical perspective on current initiatives. *Health Econ Policy Law.* 2014;9(2):193-213.
195. Brewster AL, Cherlin EJ, Ndumele CD, et al. What Works in Readmissions Reduction: How Hospitals Improve Performance. *Med Care.* 2016;54(6):600-607.
196. National Quality Forum. *Hospital-Wide All-Cause Unplanned Readmission Measure (HWR).* 2020.
197. American Hospital Association. *Advancing Health in America the Path Forward.* 2018.
198. Alley DE, Asomugha CN, Conway PH, Sanghavi DM. Accountable Health Communities--Addressing Social Needs through Medicare and Medicaid. *N Engl J Med.* 2016;374(1):8-11.
199. Lau J, Knudsen J. Reducing Disparities In Telemedicine: An Equity-Focused, Public Health Approach. *Health Affairs.* 2022;41(5):647-650.
200. Center for Health Care Strategies. Partnership Assessment Tool for Health (PATH). 2017.
201. Varda D. PARTNER Tool. *Program to Analyze, Record, and Track Networks to Enhance Relationships* 2015; http://www.partnertool.net/. Accessed July 2018, 2018.
202. Robert Wood Johnson Foundation. The Number and Quality of Partnerships. *Building a Culture of Health* https://www.rwjf.org/en/cultureofhealth/taking-action/fostering-cross-sector-collaboration/quality-of-partnerships.html. Accessed November 5, 2021, 2021.
203. Nichols LM, Taylor LA. Social Determinants As Public Goods: A New Approach To Financing Key Investments In Healthy Communities. *Health Aff (Millwood).* 2018;37(8):1223-1230.
204. Butler SM. New Budgeting Tools Will Help Foster Social Determinants of Health. *JAMA.* 2020;323(3):207-208.
205. Brookings Institution. Brookings Institution's Braiding And Blending Working Group. 2022; https://www.brookings.edu/braiding-and-blending-working-group/. Accessed April 20, 2022.
206. Ilakkuvan V, de Biasi A. Braiding and Blending Funds to Support Community Health Improvement: A Compendium of Resources and Examples. *Trust for America's Health.* 2018.
207. Cabello M, Ballard K. Braiding and blending: managing multiple funds to improve health. *PFS Perspectives.* 2018. https://pfs.urban.org/pay-success/pfs-perspectives/braiding-and-blending-managing-multiple-funds-improve-health.
208. National Academy for State Health Policy, de Beaumont Foundation. Toolkit: Upstream Health Priorities for Governors. 2020.
209. Child Care Technical Assistance Network. Financing Strategically: Layering or Blending and Braiding Multiple Funding Streams. *Early Childhood Systems Building Resource Guide.* 2021. https://childcareta.acf.hhs.gov/systemsbuilding/systems-guides/financing-strategically/maximizing-impact-public-funding/blending. Accessed April 20, 2021.