

# Development of a Child Health Learning Network to Improve Population Health Outcomes; Presented in Honor of Dr Robert Haggerty

Robert S. Kahn, MD, MPH; Srikant B. Iyer, MD, MPH; Uma R. Kotagal, MBBS, MSc

From the Division of General and Community Pediatrics (Dr Kahn), Division of Emergency Medicine (Dr Iyer), and Anderson Center for Health Systems Excellence (Drs Kahn, Iyer, and Kotagal), Department of Pediatrics, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio. The authors disclose no conflicts of interest.

Address correspondence to Robert S. Kahn, MD, MPH, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave, MLC 7035, Cincinnati, OH 45229 (e-mail: [Robert.Kahn@cchmc.org](mailto:Robert.Kahn@cchmc.org)).

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DR ROBERT HAGGERTY, in a signature article on the future of child health, noted that “our goal, as individuals and as a society, must be to help all children achieve optimal function physically, mentally, and socially.”<sup>1</sup> He outlined significant US disparities in poverty and environmental exposures, along with rising diversity and social isolation, all creating deep challenges to pediatricians’ ability to deliver on that goal. He surmised that solutions would require that pediatricians change their own care strategies and partner with other sectors or risk becoming increasingly irrelevant to the health of children.

This article outlines our growing effort to address optimal health and functioning at a population level for 66,000 children in Cincinnati. We lay out our child health learning network, including the vision, metrics, key strategies, and critical early partners. The learning network is on the basis of learning systems proposed by the Institute for Healthcare Improvement<sup>2</sup> and the Institute of Medicine.<sup>3</sup> We are using it as a way to harness multiple sectors addressing child well-being to work toward shared outcomes using shared improvement strategies. But we first outline the strands of foundational work that helped enable a health care institution to undertake the current population health effort. This emerging work is testament to Dr Haggerty’s insight and prescience about the challenges and necessary solutions.

## FOUNDATIONAL EFFORTS

There is no existing evidenced-based path to move from the current state of child health and health care to the one envisioned by Dr Haggerty. We outline 4 strands of foundational work over the past 10 years that we believe have been critical to setting up our population health work. These include early successes addressing the social determinants of health, analyzing population health outcomes, adapting quality improvement for community health, and developing learning networks around chronic diseases.

### ADDRESSING THE SOCIAL DETERMINANTS OF HEALTH

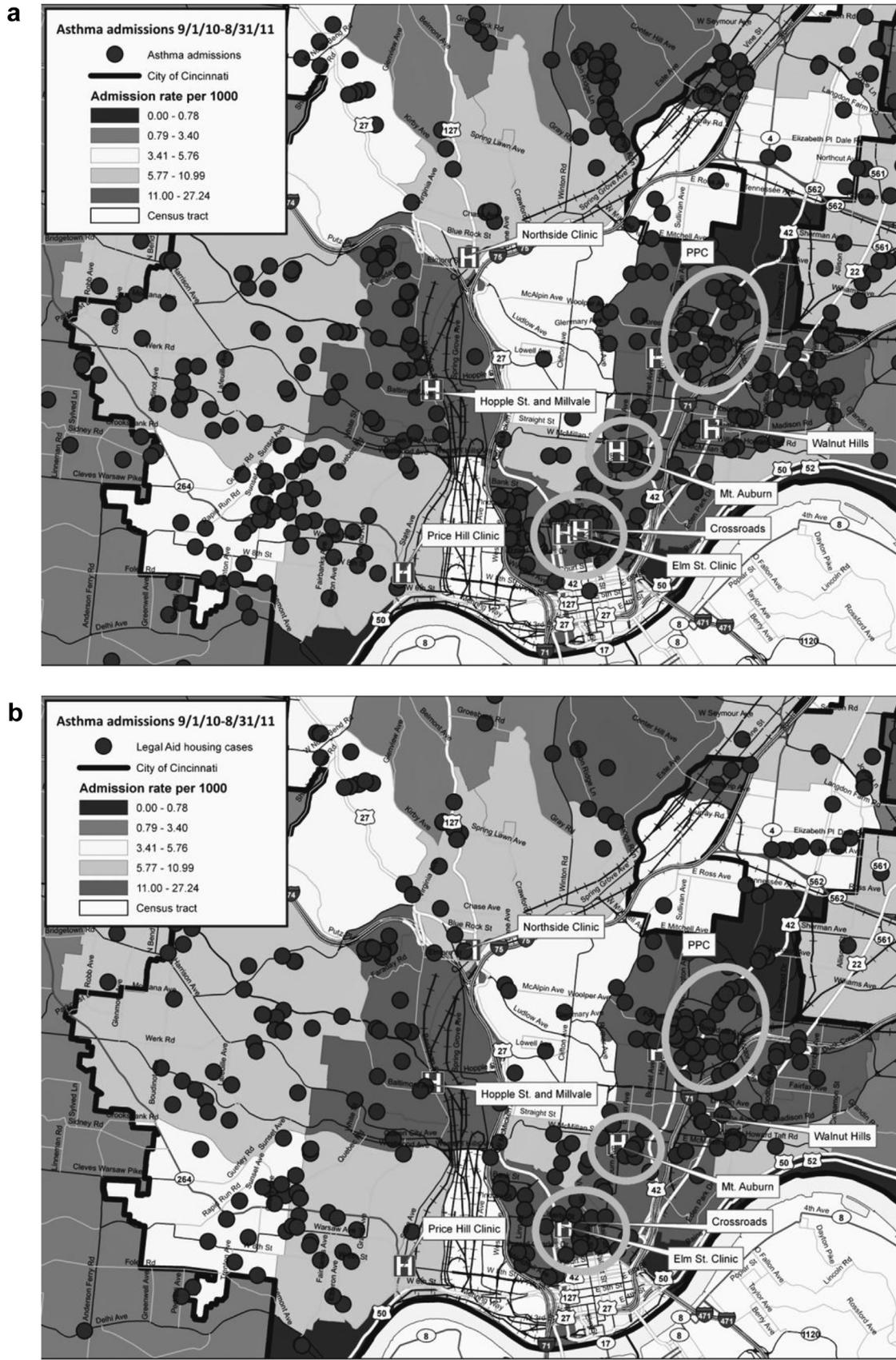
Dr Haggerty pioneered new models of primary care including services to address families’ social needs.<sup>4</sup> In the

intervening years, many studies have documented the effect of social risk factors on child health; far fewer have offered proven interventions that partner health care with other sectors.<sup>5–7</sup> Effective mitigation of social risks in partnership with a strong community agency was important in building will among health care providers and demonstrating the potential of community collaborations.

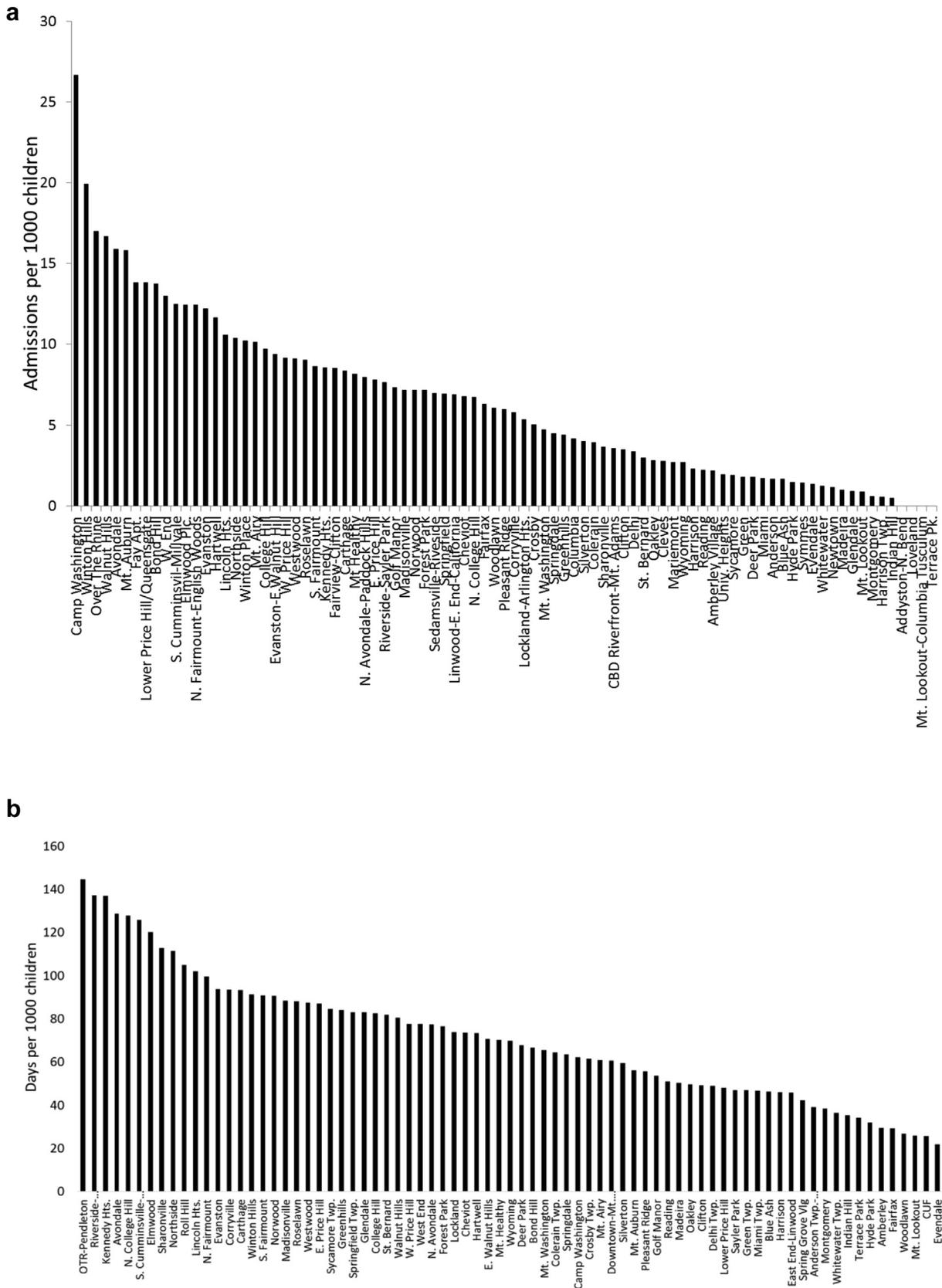
A medical-legal partnership was developed with the Legal Aid Society of Greater Cincinnati.<sup>8</sup> Together with the attorneys and social workers, clinical leaders developed screening items and referral tools. These were woven into the electronic health record templates for the 3 primary care clinics serving more than 30,000 children.<sup>9</sup> The electronic health record, which contains health conditions as well as patient addresses, offered an opportunity to identify possible clustering or hotspots for such conditions as asthma (Fig. 1a). Legal Aid then provided data on their cases in which housing was affected by such problems as threatened evictions or mold (Fig. 1b). As the 3 circles indicate in Figure 1, high rates of asthma admissions and high rates of poor housing conditions nearly directly overlay each other. This data mapping made a clear case that the 2 organizations shared a population of families with significant, and related, needs.

Screening and shared understanding have led to substantial results. In 1 case, a pattern of referrals for poor quality housing led to a deeper examination by Legal Aid. They identified 19 buildings with a single property owner, all of which were in violation of city code.<sup>10</sup> Legal Aid worked with tenants and the mortgage company to successfully push for substantial repairs. Subsequently, a \$30 million Housing and Urban Development grant was obtained to fully rehabilitate many of the buildings.

The medical legal partnership, in concert with other collaborations,<sup>11</sup> was an important demonstration that health care can successfully address social determinants in partnership with strong community agencies. Although this programmatic success was important, it was critical to develop a clearer understanding of the challenges at a population level and move toward a more broadly aligned and more upstream approach.



**Figure 1.** (a) Cincinnati neighborhood hotspots for asthma admissions. (b) Legal Aid Society housing cases mapped against neighborhood asthma hot spots.



**Figure 2.** (a) Annual asthma admission rate per 1000 children, aged 0 to 17 years according to neighborhood, Hamilton County, 2010 to 2012. (b) Annual hospital bed day rate per 1000 children, aged 0 to 17 years according to neighborhood, Hamilton County, 2012 to 2014.

### ANALYZING POPULATION HEALTH OUTCOMES

We expanded the mapping of asthma discharges to all asthma admissions in the county. Most children in the county needing hospitalization are cared for at Cincinnati Children's Hospital. We built a small team with the analytic capacity to examine electronic health record data and use geospatial mapping software. We coded all admissions over 3 years to the home address of the patient (Fig. 2a). Two facets are immediately apparent. First, there is tremendous health inequity with vastly different admission rates across the neighborhoods. Second, several neighborhoods had 0 admissions. This suggests that, although genetics are important, it is possible to eliminate admissions with existing medications if children have the right social and physical environment. One analysis indicated that a reduction of the countywide admission rate to that of the best quintile of neighborhoods would eliminate 95% of all admissions.<sup>12</sup>

We then confirmed such variation across neighborhoods for other causes of admission, such as preterm birth, injuries, and mental health admissions. There was significant correlation of the high morbidity neighborhoods across conditions. These analyses helped make the case that there are common root causes to the morbidity that are best addressed in collaboration with the community and community partners. Moreover, smaller programmatic approaches would be insufficient to address these large-scale inequities.

In our most recent analyses we examined total hospital bed days according to neighborhood, irrespective of condition (Fig. 2b). We have broadened the work from admissions to bed days to inform analyses of potential savings in health care costs. With demonstrated effectiveness of community partnerships to address social determinants and data on the population scale of child health inequity, the third important strand of work was developing effective strategies to improve health for children outside of our own clinics.

### ADAPTING QUALITY IMPROVEMENT FOR COMMUNITY HEALTH

The hospital has a strong quality improvement program and supported an initial foray into the community health work as part of its strategic plan. Our goal was to build on the community partnership and population health outcomes' efforts to develop the strategies and interventions needed to improve child health over time. Community health teams were developed around 4 conditions: infant mortality, unintentional injury, asthma, and obesity. We highlight the work of the injury team.

Our hospital's trauma and injury prevention specialists sought to reduce community injury rates. They partnered with the nascent population health team to map hospital emergency room visits and admissions for unintentional injuries among children aged 1 to 5 years. They focused on starting small to learn and develop effective prototypes. One neighborhood was identified with a high rate of injuries among an estimated 1150 children that age. The intervention was an evidenced-based installation of home safety equipment. Quality improvement techniques were used to enhance recruitment of homes and volunteers to install the equipment. The population health data were

converted into a monthly chart that could help give more rapid feedback on the intervention's effect on injury rates, compared with nonintervention neighborhoods. Process charts depicting monthly rates of homes receiving the intervention were also developed. Injury rates were significantly reduced, with a 59% reduction in intervention homes and a 9% overall reduction for the community.<sup>13</sup>

### DEVELOPING LEARNING NETWORKS AROUND CHRONIC DISEASES

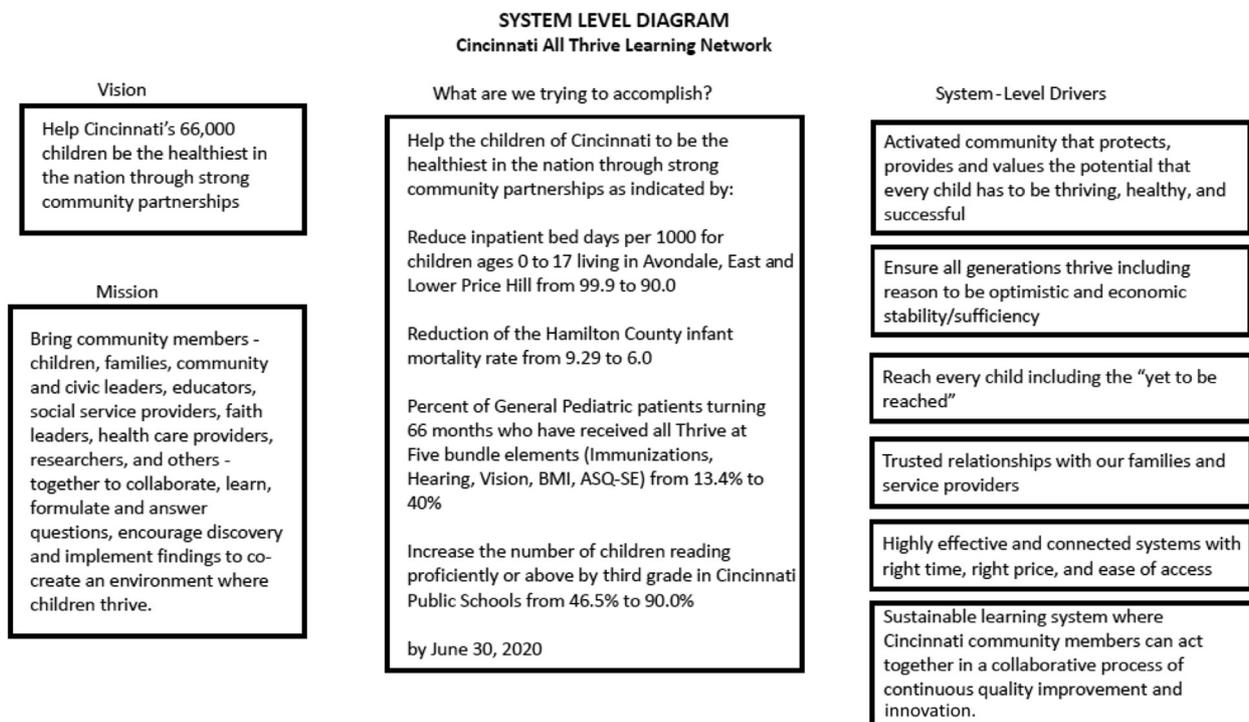
A final foundational element that set up our population health effort is the development of collaborative learning networks to improve chronic disease outcomes.<sup>14</sup> Beyond a typical improvement collaborative, Margolis and others are testing how to harness the collective talents and motivation of patients, clinicians, and researchers to improve chronic disease outcomes. The goal is to have them all working effectively together to dramatically accelerate results for such conditions as inflammatory bowel disease and diabetes. This idea of harnessing many motivated people for faster results has produced such products as Wikipedia and Trip Advisor, where many people contribute time and energy to a shared outcome. It is also useful for large complex problems where the capacity to drive results is beyond the reach of any 1 set of stakeholders.<sup>14</sup> A particularly innovative aspect of their work is that parents and patients become deeply involved, helping to shape clinical and research priorities, cocreate new approaches, and test their ideas as part of improvement teams.

These 4 areas of early success—collaborating successfully to address the social determinants, analyzing population health outcomes, adapting quality improvement for use in the community, and developing a model of learning networks—all helped build a foundation. With these successes, we felt more confident putting forth a bolder, more integrative vision for child health commensurate with Dr Haggerty's challenge 20 years earlier.

### ALL CHILDREN THRIVE LEARNING NETWORK TO IMPROVE POPULATION HEALTH OUTCOMES

#### VISION

The vision is to help ensure Cincinnati's 66,000 children are the healthiest in the nation through strong community partnerships. Several key decisions were made that informed the vision statement. The first was a decision to declare a geographic boundary to the effort. We felt a population-based denominator was critical to ensure that partners in the network (eg, health care providers and agencies), sought to reach every child. Outside of public health, efforts to improve outcomes and accountability for those outcomes typically focus on those directly served (ie, families who walk through the doors of the clinics and agencies). Measurement focuses on patients who actively seek services or participants who enroll. Our population goal seeks to create shared accountability for all children on the basis of a geographic boundary. It will require new ways to reach those who rarely reach out for care or services.



**Figure 3.** System-level diagram of the main drivers for community health. ASQ-SE indicates Ages and Stages Questionnaire: Social-Emotional; BMI, body mass index.

The choice of geographic boundary was not straightforward. Neighborhood, city, county, and regional boundaries were considered. The goal is a scalable model useful not just for the region, but the state and beyond. However, some of the difficult learning required at a family by family level suggested the need to start at the neighborhood or even block level, such as in the Harlem Children's Zone.<sup>15</sup> We chose to articulate the 5-year goal at the city level, including 66,000 children ages 0 to 17 years, so that the full scale would always be in the forefront of the work. Specific neighborhoods have been identified for in-depth work on the social determinants of health.

The shared accountability for a population of children has a significant corollary effect. Shared accountability for children fosters an increased willingness to address outcomes that no single pediatric practice or school could deliver on its own. When working within one's pediatric practice, it is difficult to take responsibility for such goals as increased maternal birth spacing or improved school outcomes for the child. However, when pediatricians, obstetricians, and educators all commit to share a vision around population outcomes, taking responsibility for goals outside the control of any one sector becomes a possibility.

Another key element is the acknowledgment that our institution's role has limits and will require partners. Our strategic plan statement explicitly seeks to "help... through strong community partnerships." Although we are committed to the goal, success will only come by working through effective collaborations in the community.

## OUTCOMES

The vision is for all children to be healthy. But what are the correct metrics to assess progress? We sought to

emphasize prevention and health promotion and focus on child development through age 9 years. We wanted to go beyond the 'absence of illness' and include metrics that assess whether a child is thriving. We sought to include measures that were actively being used by key partners and acknowledged the need to develop some new ones. We ultimately chose 4 measures, 2 related to morbidity and mortality and 2 related to thriving. Our 4 current measures are:

1. Infant mortality rate
2. Disparity in hospital bed days between worst off and best off neighborhoods
3. Composite measure of healthy "mind and body" at age 5 years
4. Reading at grade 3 at the level of proficiency or above

The infant mortality rate is the standard metric, and we offer a brief explanation of the other 3. As noted previously, we found tremendous inequities in the annual rate of hospital bed days per 1000 children across the >80 neighborhoods in our county, among specific conditions such as asthma and overall. We proposed to reduce that gap by 10% in 2 of the neighborhoods with the greatest excess of bed days. We are currently developing a composite measure of child health at age 5 years. Pediatricians have many specific measures, such as body mass index, social emotional well-being, and visual acuity, but falling short in any one or more of these can mean significant challenges at the start of kindergarten. We are proposing the measure is only a 'pass' if all elements are a 'pass.' Finally, we use the Cincinnati Public Schools metric for reading proficiency in support of their efforts to improve this outcome. These 4 outcomes are the 'big dots' to improve; multiple other measures, such as preterm birth rate, support achievement of these main outcomes.

## LEARNING NETWORK APPROACH

In addition to a shared vision and 4 metrics, we need methods to jointly solve the complex underlying problems. There is no readily available portfolio of programs to be implemented. We have laid the groundwork for a “learning network” modeled after the chronic disease networks described previously. The goal is to harness the ideas, talents, and inherent motivation of the many community stakeholders and sectors so that we can break down silos and accelerate the pace of improvement.<sup>14</sup> We seek to create a platform for parents and professionals to learn and to innovate together. This includes organizing workgroups and providing core supports, such as quality improvement capacity-building, data analytics, and family-centered design. After input and careful consideration, it was named the All Children Thrive Learning Network.

A shared understanding across the varied stakeholders about the central causes of poor child outcomes is critical. In the absence of that understanding, much of the work could fail to address central underlying processes or could be too distant from the outcomes. To develop that shared understanding and to structure the work, the Learning Network, as a whole, and the workgroups have each developed “driver diagrams” or logic models (Fig. 3). These diagrams include the global aim about thriving children. They also include a more specific aim that is measurable and is time-bound; for example, “we will decrease preterm birth (gestation age <37 weeks) in 1 neighborhood by 10% by June 30, 2018.” They also lay out 5 to 8 factors or drivers that are critical to improvement. Finally, a set of possible interventions related to each driver is outlined. The daily work of the Learning Network is to develop and test those interventions. At frequent intervals, the group’s learning is reviewed, the theory of change is re-examined, and the driver diagram is revised accordingly.

## ORGANIZING PARTNERS AND PARENTS

Partners whose work directly addresses the 4 outcomes have been organized into improvement teams. Each improvement team is co-led by a respected community leader. Working partners include stakeholders in education (eg, Head Start providers, librarians, public school teachers), prenatal care (eg, obstetricians, community health workers), and child health (pediatricians, public health commissioner, behavioral health specialists). A fourth improvement team is focused on the social determinants of health. This group addresses risks common to all 4 outcomes, such as housing instability, lack of employment, and public benefit denials. For all teams, we seek out partners who are committed to the outcomes, biased toward action, open to data and learning, truly collaborative, and optimistic.

We have specifically focused on bringing families, all of whom live in the neighborhoods with poor child outcomes, into the Learning Network. Parents were engaged early on to understand their aspirations for their children and the barriers they face. We hired a design firm that used ethnographic methods to solicit their narratives. Several parents were hired as peer interviewers. Parents shared their

insights with each other and with their improvement teams in the workgroups. Their perspective has been critical to help drive integration across sectors, such as education and health. We have adapted an activation scale that assesses movement from awareness to participation to contribution to ownership, and we have set goals for the number of parents involved at each level. We help identify parents’ personal interests and motivations and then integrate them meaningfully onto each team.

## LEARNING NETWORK PRINCIPLES

Because of the complexity of the problems and the very diverse partners, we established principles that guide the Learning Network. These principles, along with the vision and metrics, center the work. More than 100 partners and parents participated in developing and refining these principles. They are presented frequently at meetings and events. The 5 principles of the All Children Thrive Learning Network are:

1. Equity is foundational to improving children’s health;
2. Children are the center of our work;
3. Relationships and trust are essential for sustainable solutions;
4. We all teach and we all learn; and
5. Daily work is action oriented and results focused.

## LEARNING NETWORK SUPPORTS

We hypothesize that certain core supports are needed across all improvement teams and that, for quality and reliability purposes, support should be centralized rather than embedded in each team. Four cores have been developed: family-centered design, community activation, data and evaluation, and quality improvement. The family-centered design and community activation both ensure that children and families are at the center of our work, trusted relationships form, and families are helping to cocreate solutions with our many partners. The data and quality improvement cores help community partners who have fewer such resources while ensuring a focus on testing, measuring results, and sharing what works and what does not. Quality improvement training, adapted for community partners, has been particularly well received and put to use. Leaders from United Way, the public school system, the public health department, and community agencies have all taken a quality improvement course and are guiding improvement projects.

## EARLY LESSONS AND CHALLENGES

We have learned several lessons in our emergent effort. First, shared outcome measures should include an explicit focus on health equity. This helps drive attention to root causes and ensures downstream health care solutions do not dominate the effort. Second, parents and other family members are central to designing and coleading multisector work. They offer a powerful voice for integrated, seamless services that address the needs of the whole child. They also help move service providers through issues of competition and trust. Third, the basic methods of quality

improvement are applicable in almost every service sector. We are even beginning to teach parents these techniques as well.

A fourth issue remains a serious challenge: pathways to sustainable financing are not clear. Savings accrued through reduced health care or education costs typically do not accrue to this upstream work. The movement toward value-based health care payment reform and other novel mechanisms, such as social impact bonds, should help address this challenge. Finally, scale remains a great challenge. Successes seen at the neighborhood level need to be scaled citywide, and successes in any one city ideally could be adapted and spread to other cities quickly. A nascent national All Children Thrive seeks to build such a platform for scale-up (<https://www.allchildrenthrive.org>). The Institute for Healthcare Improvement is also developing 100 Million Healthier Lives, a network to accelerate collaboration and systems change (<http://www.100mlives.org>).

### CONCLUSIONS

Persistent child health disparities necessitate new approaches. Dr Haggerty noted that social factors challenged pediatricians' ability to promote optimal child health and that new methods and new partners were required. In partnership with many others, we had some early successes addressing social determinants, building shared will to address population health outcomes, and applying quality improvement in the community to complex problems. None of these strategies are highly unusual or unordinary; but together we predict they can produce extra-ordinary results. We are currently building the All Children Thrive Learning Network with a vision, outcomes, improvement strategies, and operating principles that are supported by the many stakeholders that serve children and families. Parents themselves are actively engaged in developing the Learning Network and driving the improvements needed for children to thrive. If successful, Dr Haggerty's vision to help all children achieve optimal function physically, mentally, and socially through multisector partnerships will have been achieved.

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