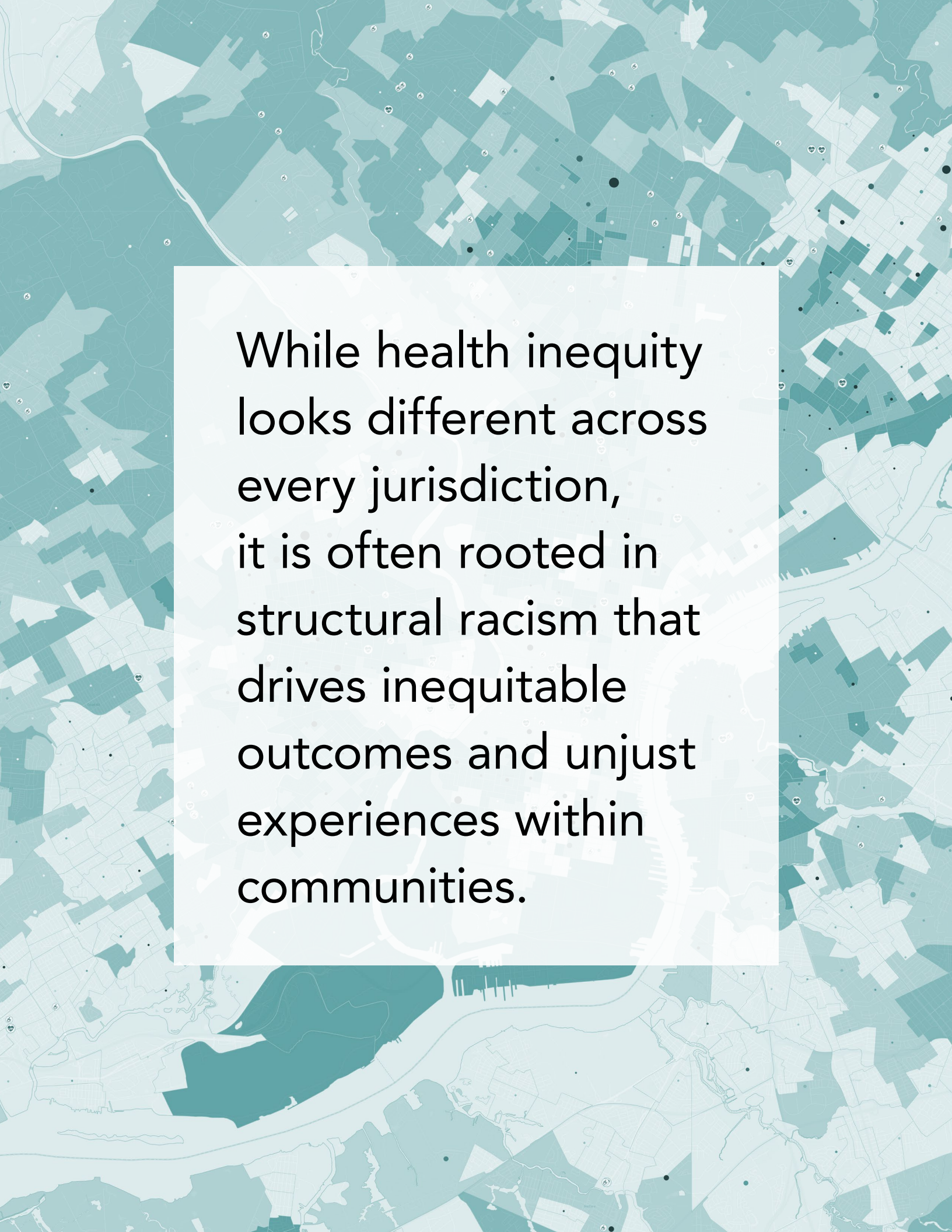
LOCAL HEALTH DEPARTMENTS ADVANCE HEALTH EQUITY WITH GIS

NACCHO
National Association of County & City Health Officials

esri
THE SCIENCE OF WHERE®



While health inequity looks different across every jurisdiction, it is often rooted in structural racism that drives inequitable outcomes and unjust experiences within communities.

Introduction

Local health departments (LHDs) play a central role in building better public health systems designed to increase access to health care and address the root causes of poor health. They are also effective promoters of community partnerships necessary to advance equitable public health systems. As community chief health strategists, LHDs bring expertise in data collection, analysis, and evidence-based approaches to improving population health and health equity.

While health inequity looks different across every jurisdiction, it is often rooted in structural racism that drives inequitable outcomes and unjust experiences within communities.

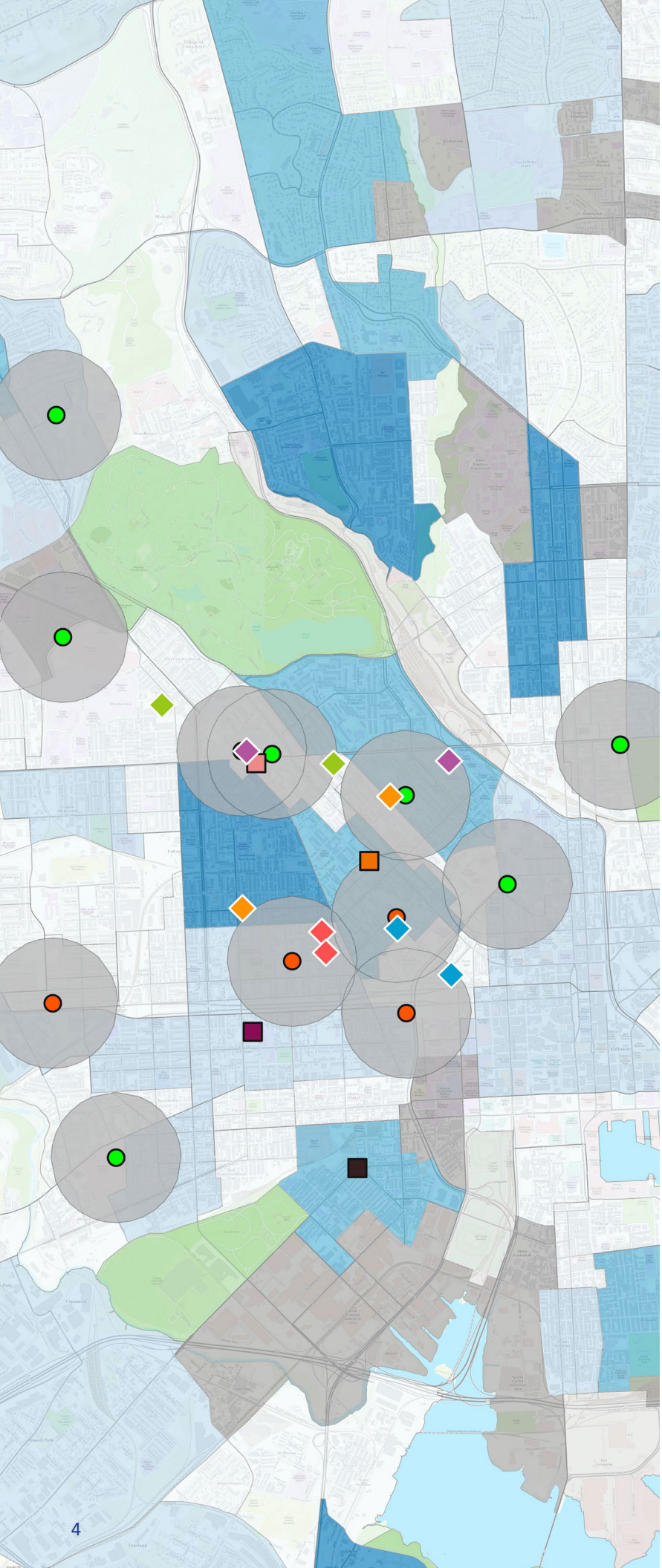
Measuring inequality requires an examination of the social determinants of health (SDOH)[1]—including social and economic factors, cultural norms and behaviors, the physical environment, and access to clinical care—that will help us understand barriers people face accessing community resources.

Ongoing crises—including the COVID-19 pandemic, the opioid epidemic, increased prevalence of natural disasters due to climate change, and increased awareness of racial inequity magnified by police violence against Black men and women—demonstrate the importance of finding solutions that address long-standing inequity. In response to growing inequity, some city and state governments, in collaboration with health departments, have declared racism a public health emergency.[2] They recognize the unjust treatment of Black, Indigenous, and People of Color and commit jurisdictions to address racial, economic, and social inequities through public policies and equitable practices.

A critical tool in advancing these efforts is geographic information system (GIS) technology. GIS solutions can connect SDOH, inequity, and geographic space data from which health departments can make strategic decisions supporting systematic change. When analyzing and communicating the state of health equity in a city or county, geospatial data can guide where more collaboration is needed and how to prioritize programs and policies. GIS is more than a technology; it is a way of thinking about the spatial relationships that drive health inequities where people live, work, learn, and play.

GIS helps tell the story of inequities by demonstrating how the shadow of historical oppression and policies that unfairly distributed assets across the built and natural environments continues to drive poor health outcomes and population disparities along racial lines. Some opportunities to use geography to address inequity include the following:

- Prioritizing resource allocation according to hyperlocal needs
- Designing and modeling communities that seek to rectify historical injustices (e.g., redlining); address structural drivers; and improve economic opportunities, recreation, and access to essential services and resources
- Establishing storytelling mediums to better understand lived experiences and communicate findings to decision-makers and the broader community
- Identifying partners to collaborate with and share data and resources in a safe space
- Collecting new data in real time to inform policy and program adjustments
- Monitoring health conditions block by block



What Is Health Equity from a Geographic Perspective?

According to the Robert Wood Johnson Foundation (RWJF), "Health equity means that everyone has a fair and just opportunity to be as healthy as possible."[3] Achieving equity requires removing obstacles barring any person from attaining their full health potential. Many of those obstacles cluster geographically such as inaccessibility to health care, discriminatory policies, toxic exposures, unsafe environments, and the absence of health-promoting resources in a community.

A geographic perspective provides the background of where inequities occur and overlap, creating an undue burden on communities. For example, Clean Air Carolina (CAC), a nonprofit out of Charlotte, North Carolina, used geographic data to analyze the clustering of socioeconomic, health, and environmental variables in the Historic West End community.[4] CAC used geographic data, including real-time air quality data, to tell the story of the Historic West End community—a predominantly Black community oppressed by years of housing discrimination, redlining, disenfranchisement, industrial zoning, highway construction, and disproportionately high exposures to air pollution.[5]

This data-driven community narrative led to community education, partnerships with local schools, distribution of air quality instruments, establishment of an official air-monitoring station, and implementation of policy changes. *[Notably, one high school student involved in the training program presented a narrative to school administrators that resulted in a new bus idling policy at their school.]* In west Charlotte, a geographic focus explicitly highlighted inequities and resource gaps, linked root causes to poor health, informed solution designs tailored to different communities, supported strategic resource allocation, and contributed to monitoring outcomes for remediation and improved equity.

Evidence That Geography Influences Health Outcomes

Location Unveils Opportunities for Collaboration

Many health and human services professionals argue that health care is a fundamental right of all people. Yet not all people have adequate access to health care and health-promoting resources. Addressing inequities requires the removal of the barriers that hinder an individual's access to these programs and services to generate positive health outcomes. For example, individuals living in rural areas served by only one public hospital can experience delays in preventive care and life-saving emergency services, especially when the travel time to receive treatment is excessive.

In other communities, access to grocery stores with fresh fruits and vegetables might be limited compared to a plethora of processed, high-calorie food options from convenience stores that contribute to higher rates of diabetes. Similarly, communities with fewer parks, green spaces, or walkable areas have fewer options for physical activity or social interactions among community members. In each scenario, an individual is constrained by what is or is not available in their community to support positive health outcomes.

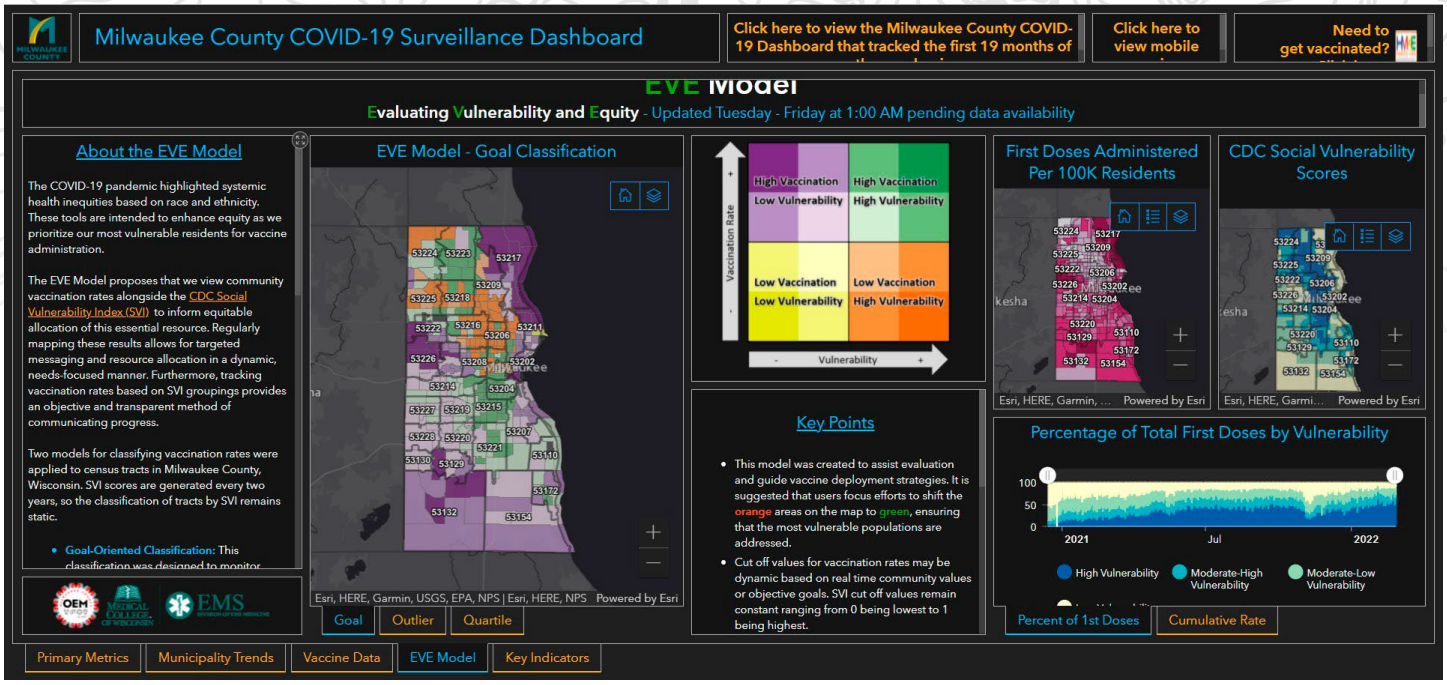
One could argue that the location of ***where you live and work*** is the single most important factor for your health and well-being. But for an individual or family, it may be difficult or near impossible to relocate from an under resourced area into one with many accessible amenities. Public health departments, however, can help. Using geospatial data to visually represent the absence or presence of resources helps connect SDOH data from multiple sectors to their negative or positive health impacts and plan targeted actions to remediate problem areas. GIS can be the single, most effective tool to help health departments and other human services professionals identify disparities and understand their root causes neighborhood by neighborhood.

Health departments can also leverage geospatial thinking and methods to build collective will across community sectors to support data-driven policy agendas and action plans. Removing the barriers to health equity is the responsibility of all public-serving entities in a community and cannot be achieved without partnerships and a shared vision of success. Mobility and housing, economic development and revitalization, education and training, voting, law enforcement, safe water, and eradicating vector-borne diseases are examples of joint efforts among a cross-sector of collaborators.

Geographic data offers a key opportunity to integrate multisector perspectives and provide a foundation for collaborative approaches. For over a decade, the Scott County Health Department (Iowa) has been using GIS to both promote environmental justice and health equity and to identify community partners to support these efforts. One of the department's earlier mapping efforts was a project with Augustana College focused on childhood lead poisoning. The Scott County Health Department used five factors to map the variable risk of lead exposure within neighborhoods across the county.

The map highlighted the stark environmental inequities that were known anecdotally using a visual representation of high-risk areas that predominantly clustered in African American communities. Being able to share the data in this way sparked a community-based coalition to seek federal funding that supported lead abatement programs. More recently, during the COVID-19 pandemic, the health department once again turned to GIS as a means of identifying and unifying community partners.

Using the Centers for Disease Control and Prevention's (CDC) Social Vulnerability Index (SVI) combined with additional data variables, the health department was able to target vaccine messaging and outreach efforts to their most vulnerable ZIP codes by mailing COVID-19 vaccine information to every address. It also identified strategic partnerships in those areas including Federally Qualified Health Centers (FQHCs), churches, hospitals, and the local Latin American Council to support vaccination messaging and uptake. Scott County Health Department deputy director Brooke Barnes noted that mapping has been a key driver in gaining buy-in from community organizations and residents for health equity initiatives in their community.



Place-Based Interventions

Health departments can apply geospatial knowledge to their strategic planning by focusing on places where resources have been stripped by disinvestment and unjust community planning practices, whether intentional or not. Place-based interventions offer the ability to look at overlapping factors contributing to inequities by using geography as the common denominator. This approach is already reshaping transparency, accountability, and equity by elevating neighborhood data and prioritizing interventions that produce measurable outcomes.

More than a year after being the first county to declare racism a public health crisis, Milwaukee County, Wisconsin, applied its place-based approach to COVID-19 response efforts and vaccine allocation.[6] As the pandemic exacerbated health inequities across the world, Milwaukee County used Esri's technology and the CDC's SVI to develop the ***Evaluating Vulnerability and Equity (EVE) Model*** tool to identify and support the most vulnerable populations in its county.[7] When vaccines first became available in the United States, the county used the EVE Model to identify the 10 most vulnerable ZIP codes, opening vaccine eligibility in those places first. As the vaccine rollout continued, door-to-door vaccination efforts and mobile vaccination units were strategically placed in neighborhoods based on continually updated data in the EVE tool.

The positive impact of these ongoing and iterative efforts was realized as larger proportions of Black Milwaukee residents continued to get vaccinated in the fall of 2021. Using a place-based approach to planning and evaluation can also inform tough decisions about prioritizing emerging needs alongside long-standing historical trends of disparate health outcomes. Place-based data can be examined over time to demonstrate the uniqueness of each neighborhood and the different assets and challenges from block to block, year to year. Health departments can use trend data to monitor the effectiveness or harm of long-standing policies and adjust or balance policies that may only benefit part of their jurisdiction. This provides flexibility and agility in the allocation of programs and resources, ensuring that community members most in need receive the services essential to achieving optimal well-being.

For example, Baltimore, Maryland's approach is transforming transparency, accountability, and equity by highlighting neighborhood data and prioritizing the unique needs of each neighborhood.[8] Using CoDeMap, the City of Baltimore has been able to create a centralized data hub overlaying property information, socioeconomic data, and other key variables to better understand housing policies and take multilevel approaches to support the city's most vulnerable neighborhoods.[9]

The city has continued to enhance the tool for both internal and external purposes, allowing users to analyze data in all 270 of Baltimore's neighborhoods over the last five years to visualize the impact of their interventions and opportunities for innovative place-based solutions. Alice Kennedy, Baltimore City Department of Housing and Community Development commissioner, noted that "GIS has given us the opportunity to bring all relevant data into the picture and to put a face to each neighborhood."

GIS Provides the System to Apply Place-Based Intervention

Acknowledging the value of geospatial data in your health department's strategy is the first step in establishing a place-based intervention approach. GIS provides the ability to organize and combine SDOH data with other health and contextual data by using location as the means to link information from various sectors and sources. The result is new insights that could not have been realized through standard data analysis or community outreach.

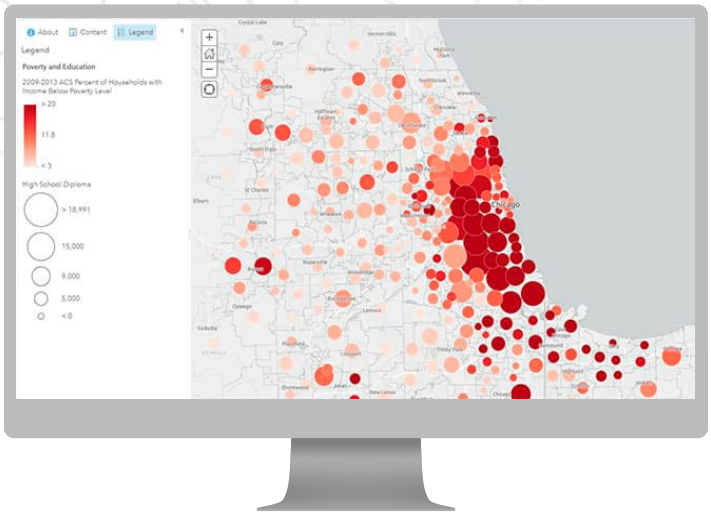
GIS technology expedites a health department's ability to monitor broad jurisdiction-wide trends as well as specific geographic trends within ZIP codes, census tracts, neighborhood segments, or custom areas of interest. GIS technology can streamline and improve community health needs assessment processes, create efficiencies in data collection and reporting, and enhance the overall communication of data through easy-to-interpret interactive maps that are more compelling than standard reports.

GIS technology leverages the locational component in all data, whether collected from community members, authoritative agencies (e.g., CDC, Health and Human Services [HHS], and National Oceanic and Atmospheric Administration [NOAA]), secondary data sources (e.g., Census Bureau or National Health and Nutrition Examination Survey [NHANES]), administrative data, or other data curated by Esri (including demographics, income, education, purchasing patterns, and locations of registered organizations and businesses) to realize and humanize the needs and characteristics of a community.

Connecting the issues through geospatial data provides insights into actions that can be taken today to correct historical injustices by identifying where disparities exist and the structures causing them. Highlighting disparities with geospatial data also facilitates conversations around why disparities exist, why they cluster in specific places or communities, and what can be done to support those communities experiencing disparate health outcomes. Our civic leaders can look at the interrelationships of factors creating an environment that does not support optimal health for every resident within their jurisdiction and approach solutions in a new data-driven way with geospatial data.

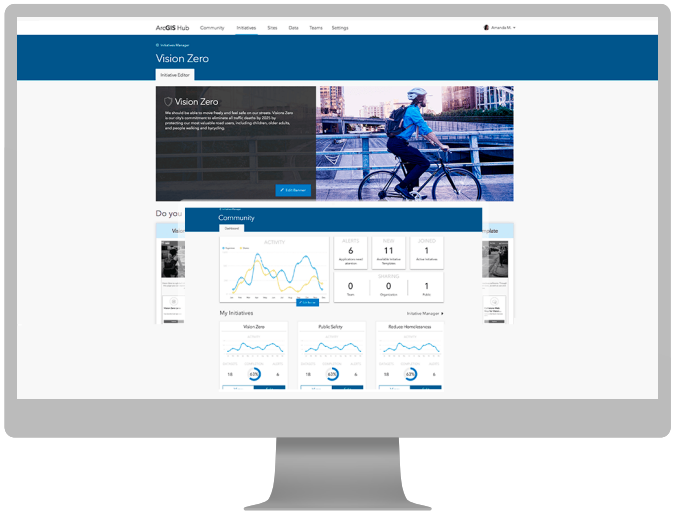
Getting Started

Taking a geospatial approach to addressing health equity can help drive efficient, effective, and equitable outcomes, but where do you start? What steps do you or your organization need to take toward understanding how *where* makes a difference in your decision process? How can you be sure that the decisions you make are based on accurate and authoritative information? What action do you need to take to result in optimal outcomes? Finally, how do you know that the action taken had the intended results? In the past, these might have been daunting or even paralyzing questions. But with tried, tested, and proven processes for taking a geographic approach, you can make measurable progress toward health equity.



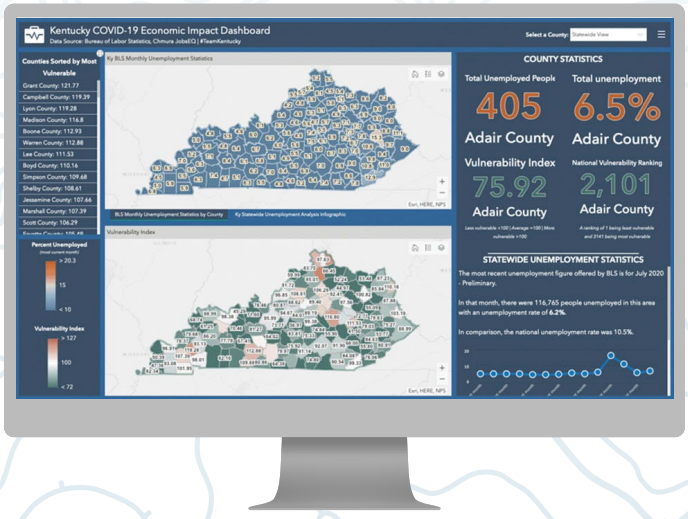
1. **Address the following questions:** Who are the people that you serve? Where do they live, grow, learn, work, shop, eat, play, and receive services? You must understand these elements to take action and make a positive change. To meet this need, you must build your foundational data infrastructure. The truth is that most jurisdictions have more data than is often realized. And finding and accessing relevant data is easier now than ever. Authoritative data can be accessed and used from several resources including the National Association of County and City Health Officials (NACCHO),[10] Health Resources and Services Administration (HRSA),[11] CDC,[12] Census Bureau,[13] and ArcGIS® Living Atlas of the World.[14]

2. **Authoritative data needs to be turned into actionable information**. Through the power of GIS, seemingly unrelated data can be transformed into relevant information products that communicate patterns and trends across a community that would not be evident through traditional data analysis. By applying a geospatial approach to data analytics and visualization, you can better understand the population you serve and their challenges in accessing critical goods and services and address gaps to meet their needs. With advances in GIS, these capabilities are available to everyone, from the executive who accesses common dashboards presenting key performance indicators of interest to the program specialist using curated geospatial data from Esri's extensive data repository to perform an environmental scan of food banks in their jurisdiction.



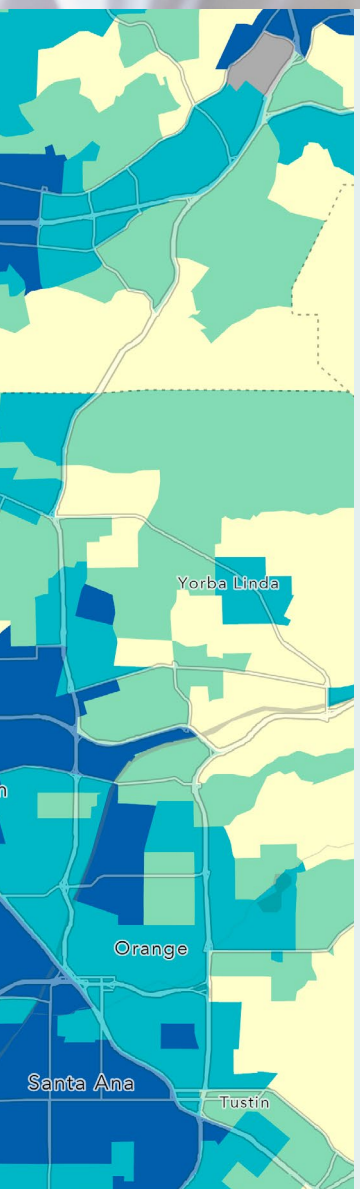
3. **The best data and analytics available are useless unless a solution is taken**. Along with any solution, the communication aspects are equally important. Effective and efficient communication prior to, during, and after addressing the issue requires delivering the information through the appropriate channels—the channels your audience depends on and trusts (e.g., social media versus cable TV, newspapers, or other channels). GIS technology can help you achieve this by providing communication and collaboration tools like ArcGIS Hub℠ and ArcGIS StoryMaps℠ that help you present complex information in a clear and digestible format.

4. **For any organization to understand the true impacts of an action**, whether short term or long term, ongoing monitoring and evaluation of the conditions need to take place and be reported. The accuracy and timeliness of reporting are critical to make appropriate adjustments when necessary and to share short-term progress toward long-term goals. GIS-supported dashboards can communicate real-time and near real-time data collected by staff, community members, or other partners and provide insights into important outcomes or key performance indicators, empowering decision-makers to act quickly, effectively, and equitably.



Local public health professionals serve at the front lines, supporting the health and well-being of their communities. The greatest opportunities for positive change exist at those front lines, in consideration of each neighborhood and its unique characteristics. Solving health inequities is a grand challenge and will require the best tools, the deepest insights, and the most thoughtful actions possible. Using GIS will give local public health departments those advantages and more.

When Esri was founded in 1969, we realized even then that GIS technology could make a difference in society. Working with others who shared this passion, we were encouraged by the vast possibilities of GIS. Today our confidence in GIS for health applications is built on the belief that geography matters in people's lives—it connects our many cultures and societies and influences our way of life. GIS leverages geographic insight to ensure better communication, collaboration, and decision-making. Esri® software is deployed in more than 350,000 organizations globally, including Fortune 500 companies, government agencies, health systems, nonprofits, and universities. Esri engineers the most advanced solutions for digital transformation, the Internet of Things (IoT), and advanced analytics to help meet the world's toughest challenges. We hope you will be inspired to join the Esri community in using GIS to create a better future. Visit us at esri.com/health.



References

[1] US Department of Health and Human Services, "Healthy People 2030".

[2] American Public Health Association, "Racism is a Public Health Crisis".

[3] Robert Wood Johnson Foundation, "What is Health Equity?"

[4] Habitat Map, "Clean Air Carolina".

[5] Clean Aire NC, "Clearing the Air in the Historic West End".

[6] Drake Bentley, *Milwaukee Journal Sentinel* "Racism was declared a public health crisis in 2019 in Milwaukee County. Now, officials look to address it during COVID-19."

[7] Milwaukee County, "Milwaukee County COVID-19 Dashboard".

[8] Esri, "City of Baltimore Leads with Place-Based Housing Interventions".

[9] CoDeMap, "Baltimore Housing".

[10] National Association of County & City Health Organizations, "NACCHO's 2019 Profile Study Interactive Report".

[11] Health Resources & Services Administration, "Maps".

[12] Centers for Disease Control and Prevention, "State System-Interactive Maps".

[13] United States Census Bureau, "Interactive Maps".

[14] Esri, "ArcGIS Living Atlas of the World".

esri | THE SCIENCE OF WHERE®

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results.

Founded in 1969 in Redlands, California, USA, Esri software is deployed in more than 350,000 organizations globally and in over 200,000 institutions in the Americas, Asia and the Pacific, Europe, Africa, and the Middle East. Esri has partners and local distributors in over 100 countries on six continents, including Fortune 500 companies, government agencies, nonprofits, and universities. With its pioneering commitment to geospatial information technology, Esri engineers the most innovative solutions for digital transformation, the Internet of Things (IoT), and advanced analytics.

Visit us at esri.com.

Please visit us at
esri.com/health

Contact Esri

380 New York Street
Redlands, California 92373-8100 USA

1 800 447 9778
T 909 793 2853
F 909 793 5953
info@esri.com
esri.com

Offices worldwide
esri.com/locations

Printed in USA

G2899375