Transforming Healthcare with GIS: A Strategic Blueprint for Future-Ready Hospitals

esri® | THE SCIENCE OF WHERE®

Executive Summary

The Blueprint for Future Healthcare: Mapping the Path to Success

In the ever-evolving landscape of healthcare, the ability to anticipate trends, address needs proactively, and differentiate services is paramount. It's no longer sufficient for health organizations to merely react; the stakes are high, with cost implications reaching beyond financial considerations to influence patient outcomes, quality of care, and overall system efficiency. Leveraging location intelligence is now a necessity, not a luxury. It enables health organizations to decode the intricacies of their market, understand the factors influencing health, tailor their marketing efforts, and strategically expand their reach. Probing questions like, "Where are we witnessing disparities in patient outcomes?", "Where are our current facilities and patients located?", "Where will our future patients be?", and "Where should our growth be directed?" invite innovative geospatial strategies that herald a paradigm shift in decision-making.

Geospatial Data: Unleashing the Power of Location Intelligence

Why turn to Geographic Information System (GIS) technology? The answer lies in the indelible link between geography and health. By understanding the hyper-local context, health organizations can tease out the intricate web of socio-economic factors that influence health outcomes. In the modern age, it's insufficient to merely overlay data onto maps. Instead, we must mine the untapped geographic intelligence buried within industry and patient data. With a strategic investment in GIS technology, health organizations can intersect GIS with their business processes, uncover previously unseen insights, disseminate geospatial intelligence, and ultimately, catalyze improved outcomes.

Unlocking the Potential of Geospatial Data: A Glimpse into the Future

This paper aims to equip the reader with the information and tools needed to harness the full potential of geospatial data. By integrating data, analytics, dynamic dashboards, and interactive maps, organizations can build a comprehensive profile of their patients, understand their markets in unprecedented depth, and tackle the social determinants of health with a robust understanding of patient needs and the alignment of their service network. Learn about creating a digital twin of your facilities to streamline operations, and how to exploit the full potential of digital technologies to elevate your strategic decision-making and management. A fully interconnected GIS software system can shatter data silos, fostering a shared knowledge base among stakeholders and establishing a common understanding. Welcome to the future of healthcare, where the journey to success begins with a map.

Geospatial Data is the Foundation for Healthcare Planning

Geospatial data forms the bedrock of healthcare planning. The deployment of data-informed decision making allows health organizations to navigate the complexities of the healthcare landscape with precision and confidence. Geographic Information Systems (GIS) enable the harmonization and analysis of various data streams, such as demographics, health metrics, and healthcare facilities information. This amalgamation of data helps paint an accurate picture of the current situation and enables health systems to forecast potential changes, effectively reducing the guesswork in strategic planning and business development. The application of GIS facilitates a deep understanding of a community's demographic and lifestyle profile, which forms the groundwork for creating robust and sustainable healthcare plans.

Population Health Management

Population health management is a critical application for geospatial data, particularly in identifying and targeting high-risk populations for intervention. By integrating geographic data with health metrics, GIS aids in stratifying risk across served populations and answering critical questions that influence healthcare interventions. Where are the high incidences of chronic diseases or the presence of risk factors leading to such diseases? What patterns of healthcare utilization are evident? How can these data guide targeted efforts to modify the factors that contribute to illness and disease exacerbation? Getting answers depends on the ability to disaggregate data thematically (like across races, genders, or age groups) and geographically (such as by block groups and neighborhoods rather than ZIP Codes or counties). GIS helps population health managers unmask hidden disparities and deliver the right care in the right places at the right time.

Type 2 Diabetes risk in a hospital service area. Combining CDC-defined risk factors in an index, a census block level map is created. Spatial analysis highlights areas where risk is statistically significantly higher.

Health System Growth

When considering growth strategies, geospatial data can inspire confidence in investment decisions. Healthcare systems can make critical determinations about where to site new facilities, expand existing operations, or deploy modern service delivery models such as telehealth services or hospitals at home. By evaluating the need and anticipating population changes, GIS can inform strategic decisions, ensuring resources are deployed where they are most needed. Moreover, by analyzing the distribution of healthcare providers and allied health services in relation to health trends, healthcare systems can decide where to recruit, partner, and refer.
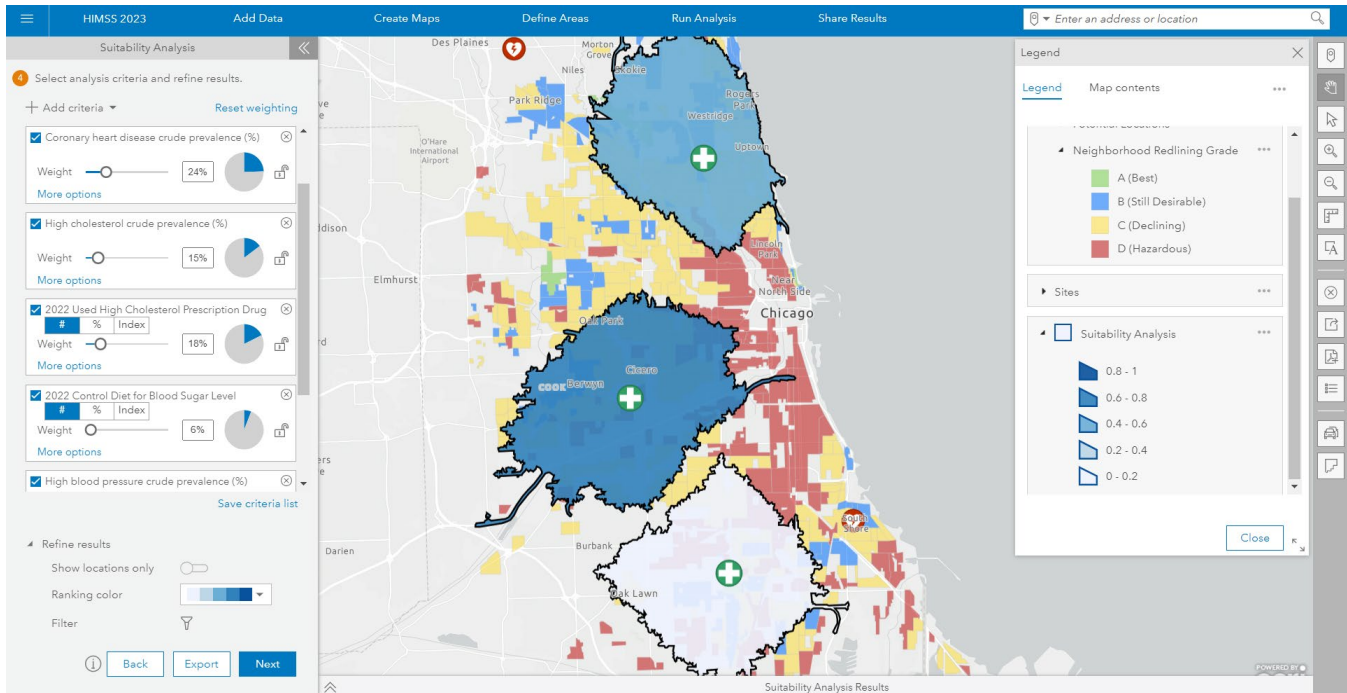
Determine Suitable Locations for Growth. Three prospective sites for expansion are analyzed based on a travel time service area, which serves as a boundary for accumulating essential data. Factors for analysis include chronic disease prevalence, population growth rate, extent of health insurance coverage, and percentage of area subjected to historical redlining. These weighted variables guide decisions regarding hospital expansion.

Optimizing Service Mix

Planning the service mix requires a deep understanding of the populations served and the community's characteristics. Esri's ArcGIS Living Atlas of the World contains tens of thousands of data resources you can use to understand things like home age, crime indices, urban heat impacts, poverty levels, nearness to supermarkets, noise pollution, availability of greenspaces, public transportation accessibility, and much more. Providing exceptional healthcare starts with organizations comprehending the unique needs of their patient population and the communities they reside in. Does the population trend toward young families or empty nesters? Should the health system hire more OB/Gyn specialists or geriatricians? When considering population demographics and plans for expansion, healthcare systems can align their service offerings by providing the right mix of services in the right places, facilitated by the insightful use of geospatial data.

GIS Enables Hospitals to Leverage Regulatory Requirements for Strategic Decision-Making

Navigating the intricacies of regulatory requirements is an essential aspect of healthcare administration, given the highly regulated nature of the industry. The innovative application of GIS offers a unique opportunity to leverage regulatory obligations for strategic advantage. An exemplary use case is the integration of GIS in the conduct of community health needs assessments (CHNAs). This process not only aids in maintaining situational awareness, challenging or substantiating assumptions about the served communities, and understanding community health needs, but it also promotes a dynamic approach to addressing health challenges, informed by real-time insight. With GIS, the CHNA transcends from a mere compliance document (a binder on the shelf) to a living document that informs key strategic decisions.

Fulfill the CHNA Requirement

Hospitals operating under the 501(c)(3) status are required to comply with specific provisions to maintain their tax-exempt status, one of which is Section 501(r)(3), mandating a Community Health Needs Assessment every 3 years. Utilizing GIS in this process provides numerous benefits, including aiding in the geographic definition of the community served, mapping demographic and contextual factors across local neighborhoods, and supporting the public availability of results. Moreover, GIS can be instrumental in engaging community members in the data collection process, fostering a participatory approach to community health assessment.
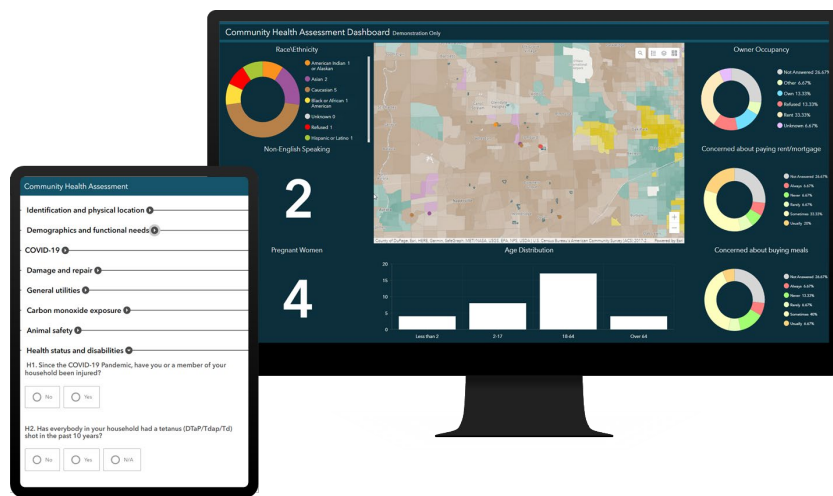
A pre-populated digital survey makes it easier to move quickly to complete the required community health needs assessment. With connected dashboards, data are available in real-time as each survey is submitted. Extend the use of your data by including it in other analyses and applications.

Going Beyond Requirements

The integration of GIS into the CHNA process offers more than just compliance with regulatory requirements. It facilitates a deeper understanding of the community, leading to strategic advantages by focusing your services and efforts where they are needed the most:

- Align decisions with actual need: By providing a detailed geographical and demographic breakdown of the community, GIS allows for a more precise alignment of hospital resources with community needs.

- Support your Community Benefit Program: A robust community investment strategy benefits from a place-based perspective, made possible through the application of GIS.

- Hospital strategy: GIS-enhanced CHNAs enrich already collected data with lived experience data, leading to more comprehensive and nuanced hospital strategies.

- Promote intentional collaborations: The detailed community insights provided by GIS foster strategic collaborations and partnerships, addressing both population health needs and healthcare system requirements effectively.

By embracing the potential of GIS to inform the CHNA process and beyond, healthcare organizations can transform regulatory necessities into strategic advantages, enhancing their community impact and their ability to meet community health needs effectively.

Market and Consumer Analysis Inform Your Network Health and Equity Initiatives

Spatial analysis serves as a robust tool in unravelling the complexities of healthcare network performance and understanding the impact of social determinants of health (SDOH). By representing data in a geographic context, GIS allows health systems to identify trends and patterns that might otherwise remain obscured. This is because spatial analysis differs from traditional methods. It depends on the assumption that your data are related (not independent) such that nearer things are more alike than distant things. Embracing this first law of geography opens a world of insight into how community conditions and attitudes cluster in meaningful ways. Reviewing market trends, assessing outcome disparities, and calculating travel time parameters are just some of the invaluable analytical capabilities that GIS facilitates. Thus, geospatial data becomes pivotal in the identification of underperforming facilities, untapped markets, and service gaps, thereby guiding targeted strategies for expansion and improvement.

Monitor Market Trends
Employing GIS as a tool for monitoring variations in market trends can illuminate and direct patient needs, leading to potential opportunities for expansion or a reassessment of service mix. Moreover, GIS can provide a shared knowledge base for strategic decision-making, enabling healthcare organizations to respond swiftly to changing market dynamics. Understanding market potential, consumer preferences, and demand for specific services are among the many insights GIS offers. A spatially oriented analysis is vital to appreciate how consumer behavior and preferences vary across a healthcare organization's service area. And by the way, GIS can also help you define the service area more precisely.

Assessing Patient Access to Care

Understanding and enhancing patient access to care is inherently a geospatial problem. With modern GIS technology, analysts can create very accurate measures of accessibility beyond Euclidean distance (straight line) measurements, to a more precise model that accounts for factors such road networks, travel modality (driving, walking, public transportation) and common traffic patterns, providing rooftop-to-rooftop time and distance calculations. GIS can aid health systems in pinpointing areas with limited access, thereby guiding the optimal placement of new facilities and services. For healthcare organizations that are also health plans, these calculations will be the foundation for your network adequacy calculations and reporting.

Network Health and Optimization

Examining the health of a system's network goes beyond individual patient level access calculations. GIS supports further examinations of the network to pinpoint opportunities for optimization. Prioritizing areas of focus for growth, consolidation, or service expansion can be informed by an assessment of network configuration and profitability alongside patient mobility and vulnerability. Identifying untapped markets within your catchment area, expanding market reach, and evaluating scenarios such as facility closure and workforce recruitment, or relocation impacts can be conducted with the analytical support provided by GIS. In all these endeavors, spatial analytics draw on strong data foundations combined with value-based questions about 'where'.

Social Determinants of Health

Addressing health inequities and the social determinants of health is a paramount concern in the current health landscape. Leveraging GIS can assist in mitigating the impacts of SDOH and addressing acute social needs. Whether it is empowering patient wellness through a resource locator or allocating resources where need is highest, GIS can facilitate these initiatives. Patients and the community benefit from increased engagement with supportive health services, improved continuity of care, and a consistent referral database. Additionally, local economies can see stimulation as patients use local resources more frequently. By blending the best of technology and humanity, care becomes more convenient and accessible, while the health system and community reap the benefits. Everyone wins.

Location Intelligence Can Make Your Healthcare System Run Better

Harnessing the power of GIS can significantly improve the operational efficiency of your healthcare system. From facility management to emergency preparedness plans, GIS offers a common reference point for shared business metrics, measures, and goal tracking, thus facilitating informed decision-making and smooth operational management.

Indoor GIS

With Indoor GIS, health organizations can assess whether their campuses and facilities are providing optimal return on investment. Incorporating Building Information Modeling (BIM) and computer-aided design (CAD) floorplans into an ArcGIS Indoors dataset, organizations can create a digital twin (a digital representation) of their hospital or campus. This advanced location intelligence technology can significantly enhance the patient's experience, easing anxiety and frustration, with smooth navigation and wayfinding. Indoor GIS also facilitates real-time facility maintenance, management, inspections, capacity management, and

space planning. It helps ensure safety and security by providing situational awareness of the built environment and fostering asset management, with the capability of tracking over 100,000 assets.
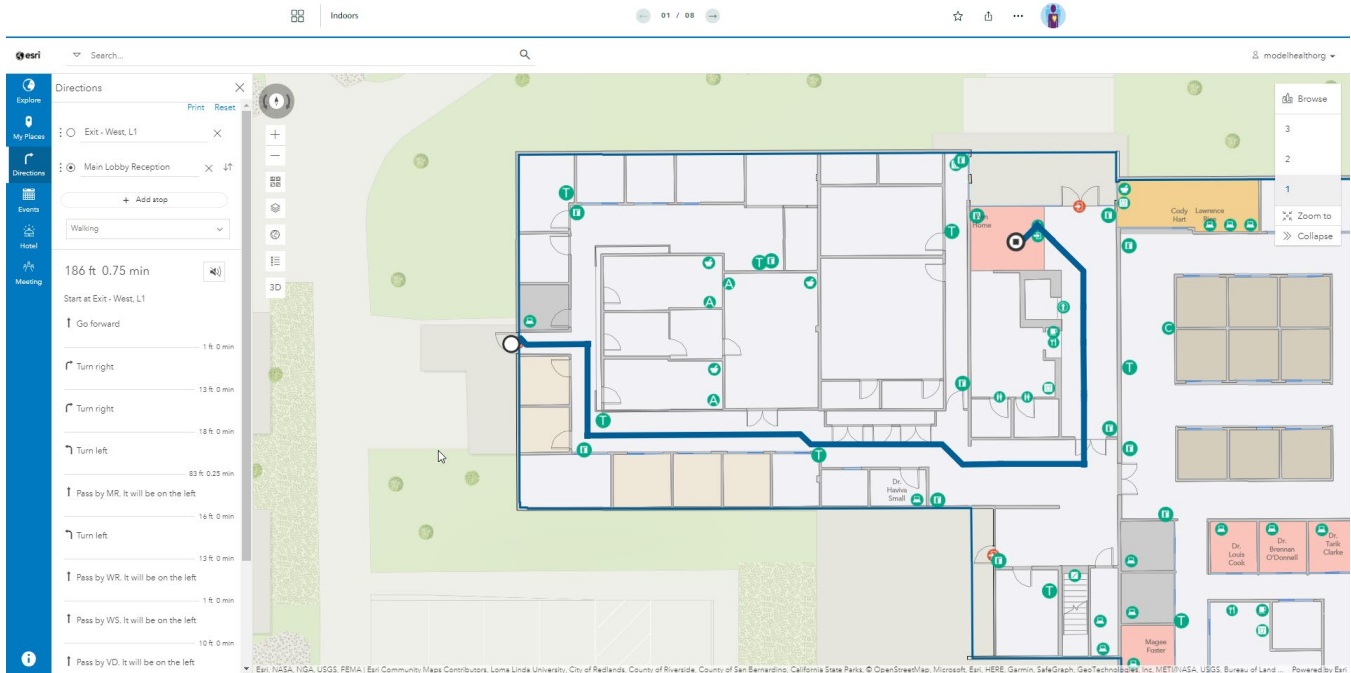
With your hospital campus digital twin, you can streamline wayfinding for patients and visitors and help them find points of interest, such as elevators, cafeterias, chapels, and restrooms.

Hospital Preparedness and Response

When it comes to emergency preparedness and response, GIS becomes an invaluable tool. It can model and predict the potential impact of natural disasters, disease outbreaks, or other emergencies, enabling health systems to plan and respond more effectively. Your campus's digital twin can strengthen the coordination and response to emergency operations, ensuring no patient falls through the cracks. Nowadays, that may require you to also look outside your healthcare system walls to include your homebound and hospital at home patients.

Measuring and Monitoring Operations and Initiatives

Tracking strategic initiatives is made simpler with GIS visualizations, analysis, and map-based dashboards. Organizations can monitor and evaluate the effectiveness of strategic initiatives, providing valuable insights for future planning and decision-making. In an ever-changing environment, GIS becomes the foundation for scenario modeling, prioritization, performance gap identification, and budget management. Amid a plethora of investment opportunities, GIS can help you decide which ones deserve priority and assist in securing the necessary infrastructure, personnel, processes, and tools for managing the change that comes with implementation.

Whatever metrics you monitor, ArcGIS Dashboards makes visualization of progress easier.

Place-Based Targeting Gives You a Competitive Advantage, Enhancing Your Market Development

Location intelligence through GIS can provide a significant competitive advantage for market development in the healthcare sector. By targeting markets based on location, healthcare systems can achieve unprecedented growth. GIS helps identify under-performing markets, discover where target customers and patients live, and facilitates sharing of market research across the organization. It equips healthcare organizations to succeed in a competitive landscape, enhancing their role as trusted partners for community health. This competitive edge is achieved through developing spatial awareness of the competition, informing location planning to prevent patient leakage, identifying under-performing markets, and using maps and applications to advise leadership and key stakeholders.
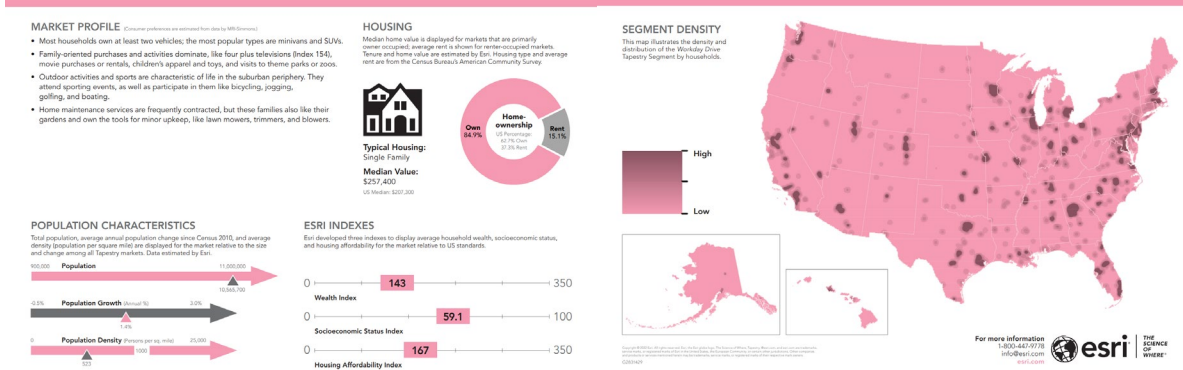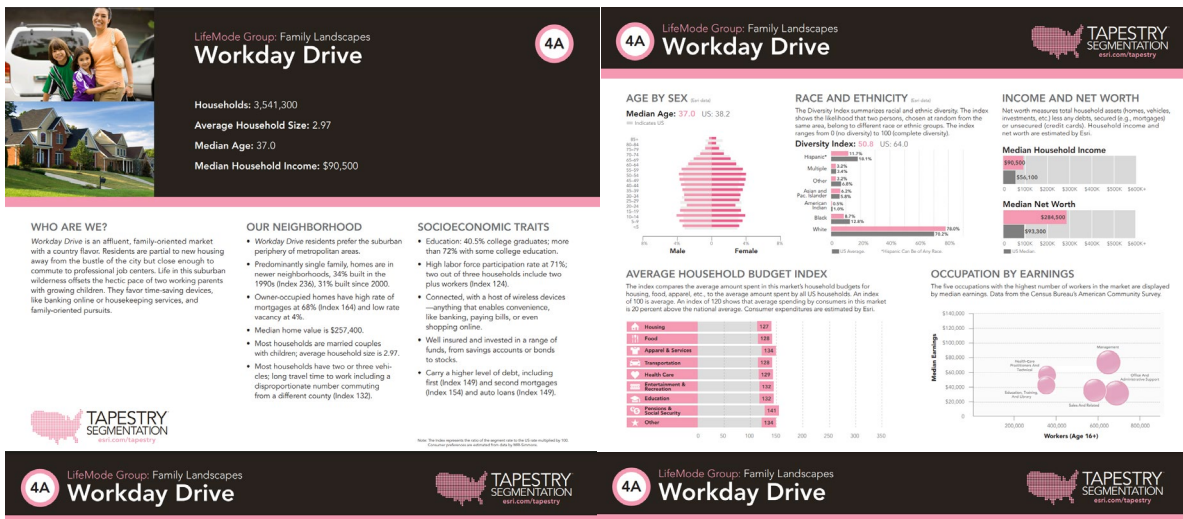
Esri's Tapestry Segmentation product provides reports and data across 67 market segments down to the block group level, providing insights about lifestyles and behaviors to help you tailor your marketing messages. The Workday Drive segment, for example, is composed of suburbanites who own their homes, love their technology, and enjoy outdoor sporting events and activities with family.

Minimize competitive pressures

By developing spatial awareness of the competition, healthcare organizations can be more intentional about how they expand their referral networks, decrease patient leakage, and prevent cannibalization of their own services by growing the network in the wrong places. GIS helps organizations anticipate market changes ahead of their competitors.

Market development

Enhancing market development becomes achievable through GIS. Identifying under-performing markets and adjusting, improving community awareness of offerings, entering new healthcare industry segments, and marketing directly to consumers become feasible and efficient. Micro-targeting based on the psychographic and demographic makeup of the market provides block group level insights and improves the return on investment of marketing and outreach. By gaining insights about patients' buying habits, outmigration patterns, lifestyle choices, and core values, healthcare organizations can deploy tailored marketing tactics that resonate more deeply with their target audience.

Patient and community engagement

Today's healthcare consumer is tech-savvy and connected, wanting involvement in their care delivery, and desiring more than just a transactional relationship with their primary care physician. To cater to such patients, health systems are developing strategies focusing on the connected consumer. This includes the development of information hubs and digital health apps that provide connectivity between patient and institution. GIS enables health systems to share data and information, interact through surveys and events, and create digital stories that strengthen the systems' ties with the community they serve.

ArcGIS Products and Solutions

Venturing into the suite of ArcGIS Products and Solutions, it's useful to understand that these tools are not isolated entities; rather, they represent a harmonious and interconnected ecosystem designed to support the complex workflows in healthcare. These solutions draw their strength from their collective functionality, where each tool complements and fortifies the others. This paper underscores how these synergistic relationships transpire in real-world scenarios, cultivating a more streamlined, data-centric, and patient-focused approach to healthcare delivery. By capitalizing on the unified power of these interconnected tools, healthcare organizations can make significant strides in service efficiency, patient outcomes, and strategic decision-making.

Global Data Resources

ArcGIS Global Demographic Data

Demystify intricate patterns and glean profound insights with the help of ArcGIS's Global Demographic Data. With access to over 15,000 ready-to-use demographic and psychographic data variables, organizations can dive deep into trend analysis, better understand the dynamics of their patient base, and formulate more impactful, targeted strategies. This wealth of data paves the way for healthcare organizations to enhance patient outcomes and optimize their operations. Learn more.

- Try out the Esri data browser and see what's available in the United States or in any of 170 countries.

- Esri Tapestry Segmentation is your resource for lifestyle and behavior information subdivided into 67 market segments.

- The ArcGIS Living Atlas of the World is a rich open data resource from authoritative organizations.

Geocoding Reference Data & Security

ArcGIS StreetMap Premium

Geographic data necessitates the translation of place-based data to map coordinates, aka the process of geocoding. But not all geocoders are equal. First, you want to ensure you're using complete and consistently updated reference data. Reference data includes the streets, their directionality, speed limits, address numbering, and more. This is critical to achieving high accuracy in your geocoding results. You also want a geocoding process that offers you confidence in the security of your data. ArcGIS StreetMap Premium, as a part of your Enterprise system, stays behind your firewalls and security infrastructure. These essential qualities not only protect sensitive patient data but also cultivate a culture of trust among stakeholders, a critical ingredient for any successful healthcare organization.
Learn about ArcGIS StreetMap Premium.

Review Esri Trust Center

ArcGIS Indoors

ArcGIS Indoors is your key to effective facilities management. This comprehensive indoor mapping system supports an array of facets in facility management, including maintenance, utility network mapping, asset tracking, emergency and security operations, wayfinding, and navigation, acting as a catalyst for operational efficiency, enhancing patient care, patient, and visitor experience, and creating a supportive environment for healthcare providers. Learn more.

ArcGIS Indoors

ArcGIS Pro

Leveraging the power of ArcGIS Pro, organizations can integrate multiple data sources, creating maps that are as insightful as they are visually compelling. It's comprehensive analytical tools for 2D, 3D, and 4D data empower healthcare organizations, their analysts, and data scientists to identify patterns, generate accurate predictions, and address crucial questions. It also promotes swift sharing of projects and information within the organization, online, and through mobile apps, bolstering connectivity and collaboration. Learn more.

ArcGIS Pro

ArcGIS Business Analyst

Elevate your decision-making process with ArcGIS Business Analyst. By integrating Esri Tapestry Segmentation and census data with potent analytics, organizations can make strategic decisions about market planning, site selection, and patient segmentation. This confluence of data and analytics found in the software package drives efficient and effective operations in the healthcare sector. Learn more.

ArcGIS Business Analyst

ArcGIS Online

ArcGIS Online is a web GIS that seamlessly integrates various applications, including dashboards, community hubs, and digital surveys. This cloud-based client enables the sharing and analyzing of geographic information in a collaborative, dynamic environment, fostering informed decision-making. Learn more.

ArcGIS Online

ArcGIS Solutions – Community Health Assessments

The ArcGIS Community Health Assessment solution equips healthcare organizations with a comprehensive toolset to gain perspective on the health status and needs of their community. This workflow-oriented solution aids in identifying community health trends (through a pre-configured community survey and field team coordination applications), prioritizing areas of need and revealing potential interventions (via visualization in map-based dashboards). By providing tools to analyze and visualize data related to health outcomes, contributing factors, and available resources, it offers a holistic overview of community health. Learn more.

ArcGIS Solutions

Next Steps

The journey toward harnessing the full power of GIS in healthcare is a progressive one, often requiring capacity-building efforts and tailored support. As your organization ventures into the realm of GIS, consider these initial steps to amplify your proficiency and effectively deploy this powerful technology.

Connect with an Account Executive

For advice tailored specifically to your organization's needs, schedule a consultation with an Esri Account Executive. They can provide you with a demonstration of how GIS can best be utilized within your specific context and answer any questions you might have. They will be your point of contact for everything you need from software to support services to training.

Connecting with an Account Executive ensures you have an ongoing resource as your organization's GIS journey evolves. Send an email to healthinfo@esri.com to connect.

Build Capacity with GIS
Investing in the knowledge and skills of your team is a fundamental step towards leveraging the advantages of GIS. Esri provides a host of training resources designed to foster a robust understanding of GIS and its applications in the healthcare sector. These resources range from beginner-friendly introductory courses to more advanced topics, catering to varying levels of proficiency.

As you contemplate the road ahead, you can start to get your hands on the software right away with Esri's curated health GIS curriculum. This no cost training is a great beginning step in the transition toward a modernized health information system. It provides a structured roadmap to navigate the various GIS applications relevant to healthcare. You can access the curriculum here.

Next Steps
By following these steps, your organization will soon be ready to leverage GIS effectively. The potential benefits are immense, offering the opportunity to improve patient outcomes, streamline operations, and enhance strategic decision-making. Take the leap and start integrating GIS into your healthcare organization today.

About the Author

Dr. Este Geraghty, the Chief Medical Officer at Esri, is a passionate advocate for leveraging GIS in the health sector. A visionary strategist, she plays a pivotal role in Esri's strategy development and messaging across the Health and Human Services industry. Over the years, she has helped health organizations globally to utilize location intelligence to confront health crises, including the Zika virus, polio, and the opioid epidemic, to grapple with homelessness, and to improve health preparedness and response. Through her efforts, organizations have been able to inform their strategic planning, optimize healthcare access, navigate the challenges of the COVID-19 pandemic, and address inequities.

Dr. Geraghty also brings a wealth of practical health experience, having served both in academic medicine and public health leadership. She holds a medical degree, a master's degree in health informatics, and a master's degree in public health from UC Davis. Additionally, she is a graduate of two fellowship programs, one in primary care outcomes research and the other in healthcare leadership. As a board-certified professional in public health (CPH) and a Geographic Information Systems Professional (GISP), Dr. Geraghty has a robust, multidisciplinary background that serves to enrich her contributions to the field of health information and technology.

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.

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

For more information, visit
esri.com/health.