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Responding to COVID-19

We began this book when the world was a different place. As we went to print, novel coronavirus disease (COVID-19) was crossing continents, and variants of the virus threatened populations worldwide.

After decades in public and social service, we decided to write about cross-sector collaboration because we believe that without it, we cannot effectively address the complex issues challenging our society. Yet we know from personal experience just how difficult this work is. So, we set out to show how spatially visualized data could be used to bring people together, highlight their interdependencies, and make it possible to coordinate across organizations. While we assumed that most of our audience would agree that cross-sector collaboration is critical, we felt we needed to make the case for using maps to support it. And so we gathered examples of organizations that effectively used location intelligence to form collaborations and manage and adapt their operations, hoping that their experiences would provide useful lessons for policy makers.

We believe our original hypothesis still holds. Working across organizational boundaries has never been more important. Only with cooperation across sectors and organizations will we get people back to work, and address the structural inequities and systemic weaknesses that COVID-19 has made so painfully obvious.

One of our driving assumptions, however, has changed dramatically. Before the pandemic, few leaders appreciated the power of geospatial visualization. Now, they do. Most people experience almost daily what GIS professionals have known for years. Map-based dashboards from Johns Hopkins University and the World Health Organization (WHO), to name two of the most ubiquitous, rapidly became the "public face" of the evolving COVID-19 pandemic. Early on, people everywhere watched the disease spread from country to country, city to city, block to block. For government leaders, researchers, the media, policy makers, and citizens alike, daily

changes in infections and deaths were immediately obvious in a visually powerful form that did not require numerical acuity.

Today, GIS is a key tool for understanding and responding to the pandemic. Governments, scientists, and healthcare providers use geospatial data to track cases, identify vulnerable populations, and design and implement workplace guidance. They can integrate predictive models and maps using information from multiple sources to forecast the curve of the ongoing phases of the pandemic and anticipate where and when COVID-19 patients will tax hospital system capacity in a given location. In turn, they can decide when and where to allocate resources and equipment and when to loosen or tighten local restrictions. Elected officials use maps to build narratives that drive actions and behaviors critical to mitigating the virus.

The virus and its variants constantly force difficult and controversial decisions concerning masking, vaccinations, hospitality restrictions, and many other daily choices. We don't know at this time which return-to-work strategies will ultimately be adopted. But we do know their implementation and timing will differ geographically based on community-specific conditions that include the ability to test, trace, and track infections, vaccination rates, immunity, and public sentiment. Hyperlocal mapping will play an important role in decision-making and in coordinating the efforts of federal, state, county, and city agencies, as well as health care systems, local nonprofits, and businesses.

We posit in *Collaborative Cities* that wicked problems such as homelessness, climate change, and poverty require cross-sector collaboration and that maps aid the formation, operation, and adaptation of the collective action required to take on these problems. Few public challenges are more complex than COVID-19; therefore, necessary responses demand difficult levels of overlapping coordination among government and nongovernment actors. COVID-19 placed our inherent interconnectivity on full display. Unsurprisingly, mobilization against the pandemic brought the extensive role of mapping to the forefront. The purpose of this chapter is to call attention to the variety of ways cross-sector leaders relied on GIS in fashioning COVID-19 mitigation strategies.

About collaboration

Cross-sector partnerships take many forms. Irrespective of form, most collaborations go through three phases: formation, operation, and adaptation. Maps facilitate action in each of these phases. In the formation stage, geospatial data creates a common reference point for potential partners to translate their unique views into shared understanding. In the operation stage, partners use geospatial data to target their interventions, to coordinate, time, and sequence action, and to allocate scare resources where they are likely to have the greatest impact. Effective collaborations constantly iterate and adapt their operations in response to new information.

While all the wicked problems discussed in *Collaborative Cities* have profound implications for humanity and demand our attention, COVID-19 requires local leaders to respond with the immediacy of the natural disaster it is. Collaborative partners have had to form, operate, and adapt their activities virtually simultaneously. Consequently, instead of addressing formation, operation, and adaptation separately as we did in the book, this online chapter focuses on how maps facilitated cross-sector action related to COVID-19.

Los Angeles: Calling residents to action

A critical component of leadership in a time of crisis is the ability of a leader to motivate people to take action.

Public health interventions such as stay-at-home orders are only effective if officials craft and communicate narratives that inspire shared responsibility—a challenge under the best of circumstances. During the pandemic, this challenge became even more acute as misinformation and mixed messaging proliferated. Distrust in local and national leaders alike threatened to derail necessary initiatives. As COVID-19 surged, waned, and surged again, leaders used maps to call convince residents to adopt constructive behaviors and to help catalyze a variety of cross-sector activities.

Near Christmas 2020, Los Angeles Mayor Eric Garcetti held a news conference calling on residents of the city to "do the right thing" and stay home. In support of this stern action, the mayor unveiled a map detailing COVID-19 positivity rates, cases, and deaths across the city's 139 neighborhoods. He urged residents to use interactive neighborhood maps as the city's positivity rate reached its highest point of the pandemic "so you can find out what's happening in your neighborhood with even greater precision." Researchers have not studied the effect of the initiative but USAFacts maps appear to show a sharper infection rate drop in LA than nationally.

Snohomish County, Washington: Helping the homeless

In times of crisis leaders must be willing to respond quickly. In January 2020, a man in Snohomish County, Washington, tested positive for COVID-19—the first known case in the United States. Upon receiving the man's test results, the county executive activated the Emergency Coordination Center. To protect the county's most vulnerable residents, city and nonprofit leaders formed the SnoCo Agencies for Engagement (SAFE) team—a cross-sector group of physicians, community paramedics, social workers, and law enforcement officers tasked with coordinating outreach efforts to individuals experiencing homelessness.

To ensure a targeted and organized approach to this outreach, the SAFE team used a mobile survey data collection tool to better understand the impact of the virus on the county's homeless population. The team layered the collected data onto maps of information the Human Services Department (HSD) had developed on homeless encampments as part of a Justice Department pilot launched in 2018. HSD had been using GIS data to inform its outreach strategy for several years before the pandemic hit.

"Within five days, we had the mobile application and data collection tools set up and the team ready to deploy," said Nate Marti, planning and evaluation division manager for HSD. "All we had to do was determine what our data collections needs would be and adjust the survey tool to reflect that." Using the mobile survey tool, SAFE team members collected data on the symptoms of those experiencing homelessness to determine whether COVID-19 had taken root in the encampments. The SAFE team also collected data related to the availability of food and water, likely to be impacted by the pandemic. The team entered the data through the survey tool and fed the information into a dashboard that showed the location of encampments and important information about each of the locations.

The results of the SAFE team's data collection efforts were surprising. The team found minimal spread of COVID-19 in the encampments. Instead, because many storefronts and public facilities were closed under stay-at-home and social distancing orders, the greatest challenge for

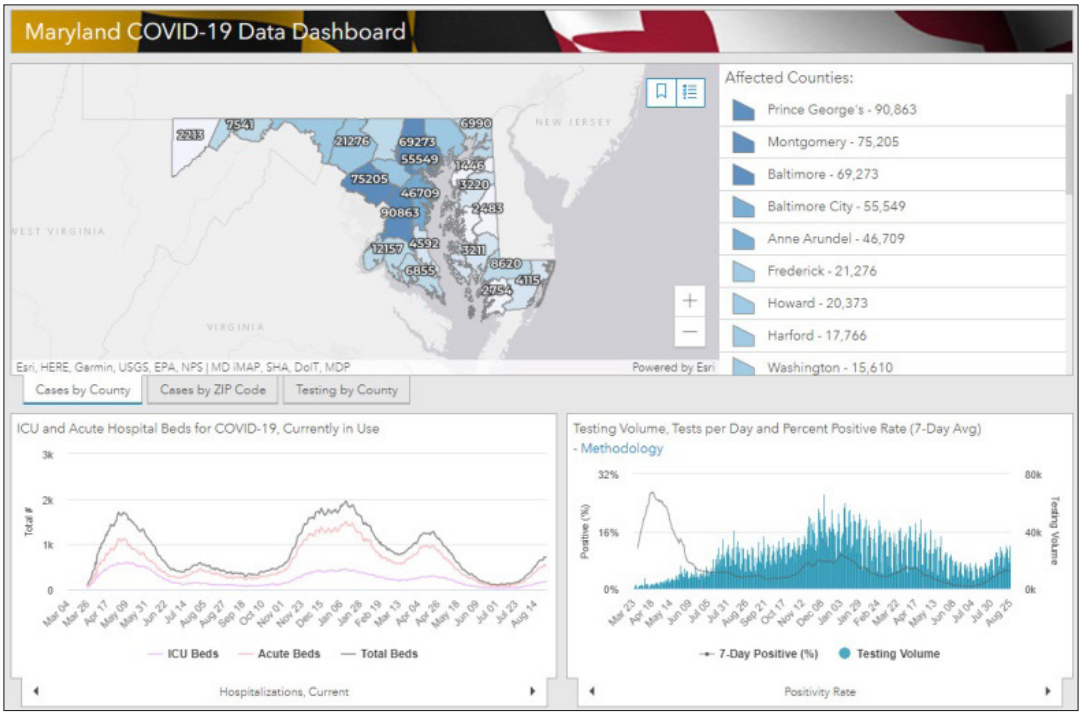
individuals experiencing homelessness in Snohomish County was the lack of access to basic needs and services such as food, bathrooms, sanitation, and water. With this new information, the participating public and nonprofit organizations reduced their emphasis on education and messaging and increased their emphasis on meeting basic needs by providing hygiene kits, sanitation stations, and access to food and water.

"Collecting this data in real time and plotting it on a map allowed us to maintain situational awareness and meet the varying needs of different encampments and to make the best use of extremely limited resources," said Alessandra Durham, a senior policy analyst in the County Executive's Office who helped oversee the SAFE team. "Using GIS, data, and evidence-based practices allowed us to get out into the community faster, and in a way that was most effective and helpful to the communities we were trying to serve."

Maryland: Coordinating city and state efforts

One way to ensure effective collaboration during a crisis is for a governmental entity to provide essential maps to public and private organizations engaged in collective action.

Maryland, long a leader in incorporating GIS into policy and operations, benefitted from a reorganization that occurred years before the pandemic broke out. In 2009, Governor Martin O'Malley centralized the state's GIS resources, which included building data-sharing pipelines from the state to the local level. In the Maryland structure, state government GIS officials report to the geographic information officer (GIO) and are assigned to support different regions of the state. Maryland's matrixed operating structure allowed officials to pivot quickly and support information sharing and collaboration among state and local partners in response to COVID-19.



Dashboard from Maryland's COVID-19 hub site.

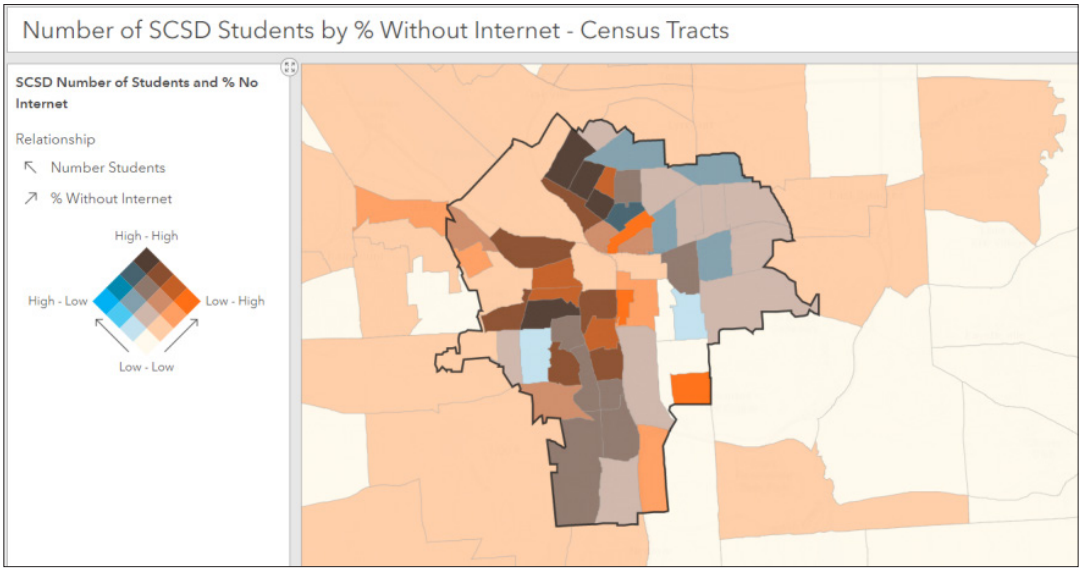
As the pandemic evolved, the GIO's office built operational dashboards for contact tracing, personal protective equipment (PPE) supply chain tracking, monitoring viral trends in nursing homes and schools, and identifying emerging hotspots to inform the placement of testing sites. The state's coordinated GIS effort put more than 40 data layers on a mapping platform, giving local and state leaders a more complete and timely view of current and evolving conditions. Government leaders at all levels and their nonprofit partners relied on the state's expert spatial work to support cross-sector efforts to confront the impacts of the virus.

Syracuse, New York: Closing food and broadband gaps for students

Maps bring attention to problems in ways that help municipal agencies and social and private sector partners implement collaborative solutions. When stay-at-home orders took effect and schools closed, many students in the Syracuse, New York, public school system lost access to school breakfast and lunch programs, exacerbating the food insecurity they already faced. Many of these students also lacked at-home access to quality, high-speed broadband and could not join classes remotely.

Syracuse's Data Team partnered with the school district and the city's Innovation Team (iTeam) to determine which students were most in need of immediate food and broadband support. When the teams turned to maps to help understand the challenge, they revealed the wide-ranging and dynamic geographic scale of these problems.

The Mayor's Office asked the school district to share the addresses of students on free or reduced cost lunch with the data team to determine where to locate food distribution sites. The only requirement was that students and families needed to be able to safely walk to a food distribution site (up to but no more than a mile). Using the address information provided, city officials in partnership with nonprofits identified the best locations in Syracuse to establish food distribution sites. The school district website published a map to help families find the nearest locations. The data team worked closely with the school district to monitor the use of food distribution sites so that they could increase or decrease capacity as demand changed.



Map showing the percentage of Syracuse City School District students without internet access.

In conjunction with its analysis of food insecurity, Syracuse's data team also looked at households with public school students under the age of 18. The team found that only one quarter of the households in low-income neighborhoods had access to high-speed broadband at home. Again, the school district provided student addresses, and the data team layered them onto maps with US Census and American Community Survey data and other data on demographics and poverty. The school district used this information to determine which households needed support to get students online and targeted resources to them.

Using maps to uncover and respond to disproportionate risk

The effects of COVID-19 are not equally distributed across populations. Some groups face disproportionate risk. Across the United States, city and state efforts to address equity have relied on geospatial data to map case and death rates and responses by race/ethnicity.

- To enlist a broad set of partners in the development of hyper-localized community outreach and public engagement, Denver and Milwaukee identified health disparities down to the neighborhood level.
- To spur action, Baltimore built a COVID-19 Asset Map. The map was designed to aid local groups in organizing interventions and to assist residents—particularly those in lower-income areas—find nearby critical resources, such as food distribution sites, primary care facilities for the uninsured, and COVID-19 testing sites.
- To address disparities in health infrastructure—insufficient, unequal, and in many places overwhelmed by the scale of the coronavirus pandemic—health leaders needed to ensure more equitable allocation of resources. To assess need, Pennsylvania built the Hospital Preparedness Dashboard, which shows where hospital demand is surging and tracks related ICU, isolation room, and ventilator capacity. This mapping exercise helped public and private organizations allocate resources to areas of greatest need.

Lessons for cities

As information and conditions change during a crisis, managing collaboration in dynamic and adaptive ways is a must. Maps overlayed with a range of different data points allow us to form, operate, and adapt response efforts by providing a platform for collaborative decision-making and action.

COVID-19 was a threshold moment for GIS. The crisis thrust maps into the spotlight as a critical tool in the development of collaborative responses to a public-health crisis that spanned the globe. Early in the pandemic, testing resources were in desperately short supply. It took as much as three weeks to get test results back. This meant that any dashboard showing case data alone was up to three weeks out of date. Spatial analytics and visualizations that integrated data from hospitals on emergency room visits, ventilator availability, ICU bed vacancy, and PPE supply played a key role in helping nonprofits, public health organizations, and the public coordinate their response in near-real time. As the pandemic has continued, geospatial data has shaped hyper-local and regional action in a wide variety of spheres from mask mandates

to food distribution, broadband access, bus route planning, and the allocation of scarce health care resources.

A pioneer of epidemiology, John Snow, first used maps to understand and combat cholera in the 1800s. His work set the stage for the GIS-centric response that has come to characterize infectious disease control today. Nearly 200 years later in response to COVID-19, data layered on maps has given rise to understanding and inspired action—both critical components of any effective response.