

# A Role for the Library in Public Research: The Global COVID-19 Dashboard

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**abstract:** As the novel coronavirus (COVID-19) spread, a team from the Sheridan Libraries and Museums at Johns Hopkins University (JHU) provided technical support to the JHU Global COVID-19 Dashboard. This paper reflects on the lessons learned from working on a highly publicized, heavily trafficked resource and explores the role of academic libraries in supporting research in the public interest. The authors argue that engagement with projects of this nature not only leverages the existing strengths and expertise of libraries but also positions them to contribute to cutting-edge opportunities in academic institutions.

## Introduction

As the world suffered the devastating impact of the COVID-19 pandemic, academic libraries adjusted their services to rapidly changing conditions by closing their physical spaces and turning to virtual methods of service delivery. At the Sheridan Libraries and Museums (Sheridan Libraries) at Johns Hopkins University (JHU) in Baltimore, Maryland, staff also contributed to pandemic-related endeavors aimed at a nonacademic global audience. These efforts leveraged existing staff expertise in geospatial data, geographic information systems (GIS), and IT infrastructure to advance vital projects during a global emergency. As rapidly reassigned staff learned more, the Sheridan Libraries developed and revised its policies and procedures to address the unique needs of public-facing efforts. The JHU Global COVID-19 Dashboard (hereafter the Global Dashboard) exemplifies an opportunity for academic libraries to make a broad and significant impact on issues of concern outside academia.



## Literature Review

The role of the Sheridan Libraries in the Global Dashboard lies at the intersection of multiple fields and frameworks. To provide adequate background, this literature review will cover: (1) academic libraries and the COVID-19 response; (2) GIS services in libraries; (3) public research in higher education; and (4) applications of GIS to the COVID-19 response. These areas inform the context of the libraries' role in this large-scale public project utilizing GIS technology.

### Academic Libraries and the COVID-19 Response

During the spring of 2020, academic libraries, along with the rest of the world, grappled with dramatic changes across academia and society caused by the COVID-19 pandemic. Lisa Janicke Hinchliffe and Christine Wolff-Eisenberg quickly started a survey of the academic library response to COVID-19 in the United States, tracking the resulting actions of libraries at 24 hours, 48 hours, and 10 days from March 11, 2020.<sup>1</sup> They found that libraries generally delayed closure of their buildings until after many university courses had shifted to online instruction. Some libraries shut down after 48 hours, and the majority reported closure or limited operations within 10 days.<sup>2</sup> Hinchliffe and Wolff-Eisenberg revisited the survey to gather data about the status of academic libraries for the fall 2020 term. They found that approximately half of respondents had reopened their libraries, in many cases with restricted access.<sup>3</sup> The fall survey marked the final analysis of this project, but academic libraries continued to function with adjusted operating policies.

Recent literature also features initial reports on how academic libraries adjusted their services in response to the COVID-19 pandemic. *Digital Library Perspectives* devoted portions of two volumes to a two-part special issue with reports from libraries around the world documenting the impact of the pandemic. Dipti Mehta and Xiaocan Wang describe a case study from Bridgewater State University in Massachusetts, sharing how libraries converted many services to a digital format.<sup>4</sup> An analysis of fall 2019 and spring 2020 consultations at Georgia State University in Atlanta found that holding

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consultations virtually due to the pandemic significantly increased their difficulty.<sup>5</sup> Mark Mattson, Emily Reed, and Victoria Raish discussed the ways in which the Penn State Libraries worked with stakeholders to address the unique needs of international students during the pandemic.<sup>6</sup> In coming years,

the literature will likely feature more stories about how academic libraries responded to the unprecedented challenges and opportunities the COVID-19 pandemic created.

### Library GIS Services

Geographic information systems (GIS) services accelerated as a function of academic libraries during the 1990s, following the widespread adoption of geospatial desktop

software. A partnership between the Association of Research Libraries (ARL) and Esri, a major commercial provider of GIS software, solidified the role of GIS support as an important part of the research library service model.<sup>7</sup> Since then, libraries continued to expand the breadth and depth of their GIS offerings.<sup>8</sup> Marcy Bidney and Nathan Piekielek posit that the field may be undergoing a paradigm shift characterized by the increasing prominence of geospatial techniques across research disciplines and formats. These changes, in turn, place increasingly diverse demands on geospatial professionals in libraries.<sup>9</sup>

Academic libraries' role in research projects that utilize GIS and geospatial technologies points to a new trend that is seldom described in the literature. Increasingly, library staff serve as embedded team members within projects aimed at a general audience and with an explicit aim to influence public policy. The Mapping Prejudice project, based at the University of Minnesota in the Twin Cities, provides one such example.<sup>10</sup> This initiative utilizes a combination of methods to build and share a database on racial housing covenants in Minneapolis and the surrounding area. Racial covenants consisted of language inserted into property deeds throughout the twentieth century aimed at restricting ownership to white people. Such mapping projects, though often challenging, can have a transformative effect on community stakeholders.<sup>11</sup> The John R. Borchert Map Library at the University of Minnesota serves as the administrative home of Mapping Prejudice. The head of the Borchert Map Library, Ryan Mattke, codirects the project alongside history faculty member Kirsten Delegard. The project team works closely with stakeholders in the public and nonprofit sectors, seeking to influence government policy in the region. This effort represents a shift in academic libraries' role, from that of providers of geospatial consultation, instruction, technology, and collection services, to that of partners in the conduct of research in the public interest.<sup>12</sup>

### Higher Education and Public Research

Mapping Prejudice builds on the work of other research projects using GIS and geospatial techniques. These include Mapping Inequality,<sup>13</sup> based in the Digital Scholarship Lab at the University of Richmond in Virginia, and Segregated Seattle,<sup>14</sup> established by the Seattle Civil Rights and Labor History Project at the University of Washington. At JHU, the Centers for Civic Impact partners with nonprofits and local governments to carry out research for the benefit of their communities.<sup>15</sup> In 2019, Civic Impact launched the Center for Applied Public Research to assist governments and nonprofits in the use of research findings to guide policy and program decisions.<sup>16</sup> Similarly, the Digital Research and Curation Center, a team within the Sheridan Libraries and Museums, runs JHU's Open Source Programs Office, the first such office in an academic institution in the United States.<sup>17</sup> The office collaborated in 2019 with the St. Francis Neighborhood Center in Baltimore to set up a Web-based platform showing city and community services in the city.<sup>18</sup> These projects highlight the growing trend in academia toward research in the public interest. As this movement continues, academic libraries must decide how they will engage with and contribute to these research efforts at their respective institutions.



## Applications of GIS to COVID Response

The application of GIS and geospatial technologies to the study of infectious diseases such as COVID-19 is not a new practice. Charlotte Smith and Jeremy Mennis point out that “the spread of infectious disease is inherently a spatial process” and note that applications tracking COVID-19 build on lessons learned from a history of applying GIS to public health initiatives.<sup>19</sup> John Snow’s mapping of the cholera epidemic in London in 1854 is one of the earliest known examples of data visualization informing decision-making in public health.<sup>20</sup> With technological developments in modeling algorithms and spatial data infrastructure, the number of projects applying GIS to public health initiatives has increased significantly.<sup>21</sup> COVID-19 studies employ such techniques as real-time tracking of the spread of the virus, predictive modeling of its behavior, and analyses of the correlation between outbreak clusters and demographic markers. These efforts demonstrate the role that GIS can play in the mitigation of the COVID-19 pandemic, as well as future disease outbreaks.<sup>22</sup>

COVID-19’s global reach, coupled with advancements in GIS technology, has prompted greater awareness of GIS among the public.<sup>23</sup> Developments in GIS have generated a proliferation of geospatial Web applications and tools developed specifically to advance information about the spread and impact of COVID-19. The Global Dashboard is recognized as the first and most widely referenced GIS tracker following the virus, but it is not the only one. Others include those created and maintained by the *New York Times*,<sup>24</sup> Google,<sup>25</sup> and the World Health Organization (WHO).<sup>26</sup>

Researchers note that subsequent trackers follow the Global Dashboard in design and infrastructure.<sup>27</sup> Many use Esri’s ArcGIS Online (AGOL) platform, an online platform hosted by Esri for Web-based GIS work. Many also employ the Esri dashboard template popularized by the Global Dashboard. Esri’s COVID-19 resource page demonstrates the diversity of adopters of GIS technology, including international organizations, government agencies, private companies, nonprofit organizations, and individuals. The page also indicates the range in how GIS is applied to understand aspects of the COVID-19 pandemic.<sup>28</sup> For example, the state of Maryland uses the AGOL platform to provide a dashboard showing state-specific information, such as cases by county and zip code, testing rates, and ICU and acute hospital beds occupied by COVID-19 patients.<sup>29</sup> The city of Rochester, New York, utilized an AGOL template to show meal pickup locations during pandemic-related school closures.<sup>30</sup>

## The Global Dashboard serves as an example of changes to the role of academic libraries and academic research in the public interest.

While the diversity of creators and applications reflect the widespread adoption of GIS technologies and platforms, the Global Dashboard serves as an example of changes to the role of academic libraries and academic research in the public interest. The attention drawn

by the Global Dashboard, as well as new dashboard projects managed by other research groups at JHU, suggests opportunities for libraries to reframe their GIS-related services. As institutions of higher education grow increasingly supportive of research in the public interest, projects such as Mapping Prejudice demonstrate opportunities for libraries to

play a role in such initiatives. Libraries have established themselves as resource centers for geospatial mapping and analysis, tailoring their services to the research needs and interests of their parent institutions.<sup>31</sup> Tara LaLonde and Nathan Piekielek document Penn State Libraries' increasing demand for GIS-related services in their reassessment of the needs and interests of their library patrons in 2018.<sup>32</sup> Academic libraries must adapt and respond to technological developments and the increasing demand for GIS applications in the service of public-facing research.

### The Sheridan Libraries and Museums

The Sheridan Libraries and Museums are comprised of five libraries, two historic house museums, and the Center for Educational Resources at Johns Hopkins University. The Sheridan Libraries offer a rich suite of collections and services to JHU affiliates in support of their research and teaching. Three units of the Sheridan Libraries provide services and infrastructure for data, applications, and software: the Digital Research and Curation Center (DRCC); the Library Applications Group; and Data Services.<sup>33</sup> Staff from both the DRCC and Data Services work on the Global Dashboard.

The three groups work collaboratively to support the needs of the library and university. The DRCC primarily focuses on developing and maintaining open-source software, applications, systems, and infrastructure. The Library Applications Group administers and runs the libraries' core systems, including the catalog and digital repositories. The DRCC supports open scholarship by developing digital infrastructure and applications that support the research needs of affiliates across the divisions of the university. Comprised of software engineers, systems architects, and project managers, the DRCC serves as the research and development arm of the Sheridan Libraries. In 2019, the DRCC launched the university's Open Source Programs Office, which coordinates and assesses open-source programs and activities at JHU.<sup>34</sup>

Complementing the work of the Library Applications Group and DRCC, JHU Data Services focuses on providing direct user-facing support. The team works with JHU researchers, faculty, staff, and students throughout the research life cycle, helping them find, use, visualize, manage, and share data in their academic and scholarly pursuits.<sup>35</sup> Data Services also manages the underlying infrastructure for geospatial research and education at Johns Hopkins University through Esri.<sup>36</sup> JHU Data Services maintains the contract that provides university affiliates with access to Esri's suite of geospatial tools and software. Members of the Data Services team monitor usage and provide technical support to the university. This includes administering the university's AGOL organizations. AGOL organizations are closed networks within AGOL, maintained by a group. Members of the group are granted user accounts and can share their data, maps, and resources with other members of the group or publicly. Data Services administers an AGOL organization for all JHU affiliates to use for their research and educational pursuits. The institution's license agreement with Esri also provides the provisioning of additional AGOL organizations.





## History and Evolution of the Dashboard

The Global Dashboard was created in January 2020 by Ensheng Dong, a first-year PhD student in the JHU Whiting School of Engineering, and his adviser, Lauren Gardner. That same month, several countries reported confirmed cases of a novel coronavirus strain, and the Pan American Health Organization/World Health Organization Regional Office for the Americas issued the first of what would become many epidemiological alerts about COVID-19.<sup>37</sup> Meeting over coffee to discuss spring semester plans, Dong expressed interest in tracking the spread of the virus. With Gardner's encouragement, he created the first iteration of the Global Dashboard, which Gardner shared publicly on January 22, 2020.<sup>38</sup>

In early 2020, information on the spread of COVID-19 was difficult to find in an accessible format and centralized location. The Global Dashboard, an interactive platform combining regular updates on the virus in map, tabular, and graphic form, quickly became a vital source of information.<sup>39</sup> The dashboard was viewed over 1 million times and received approximately 30,000 hits per second in its first week. By January 30, 2020, when WHO declared the novel coronavirus outbreak a Public Health Emergency of International Concern, the Global Dashboard had reached over 63 million views.<sup>40</sup>

Gardner and Dong developed the Global Dashboard on JHU's AGOL organization. They designed it to feature a user-friendly and interactive interface that would be acces-

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sible to researchers, public health authorities, and the public.<sup>41</sup> Between January 22 and January 31, 2020, Dong collected and processed the data for the dashboard manually twice per day. This process involved appending new data to locally stored shapefiles, a common geospatial file format, and then connecting to AGOL to update the shapefiles' corresponding

hosted feature layers, a Web-based geospatial file format native to AGOL. The data were also shared freely in tabular format using Google Sheets.<sup>42</sup> Updating this information manually became an overwhelming task as interest in the Global Dashboard and COVID-19 skyrocketed. Increasing numbers of visitors to the dashboard also resulted in performance complications for the underlying AGOL platform.

An immediate priority was transitioning the workflow from a manual to a largely automated one, albeit one undergoing continual remediation and refinement. By the second week of the Global Dashboard's existence, three groups had joined Gardner and Dong, as well as other graduate students, to provide technical support. The Large-Scale Analytics Systems Group at the JHU Applied Physics Laboratory (APL), led by Aaron Katz and Tamara Goyea, concentrated on automating data collection. A team from Esri led by Sean Breyer, manager of the ArcGIS Living Atlas of the World program, worked on stabilizing the platform and automating data updates to the Global Dashboard. Finally, the Sheridan Libraries formed a team from Data Services and the DRCC to manage Esri support and licensing and to set up and oversee a server for the processing of collected data.



Additional teams and individuals joined as demand for the Global Dashboard and its data grew. They provided critical support in such areas as communications outreach, project management, and coordination with other JHU-affiliated research projects concerning COVID-19. For the purposes of this paper, the authors distinguish between project management support and technical support, focusing on the latter. Technical support is provided by four groups: (1) the Center for Systems Science and Engineering (CSSE), a research unit within JHU’s Department of Civil and Systems Engineering, led by Gardner and Dong; (2) the APL; (3) Esri; and (4) the Sheridan Libraries.

As additional countries suffered COVID-19 outbreaks and announced subsequent emergency measures, interest in the Global Dashboard grew exponentially. By the end of February 2020, the dashboard had been viewed over 235 million times; by the end of March, views totaled over 1 billion. In April 2020 alone, it was viewed just under 995 million times, bringing the total number of views to just over 2 billion. The technical support teams worked around the clock to manage and meet this staggering level of demand. This quickly became a juggling act: staff had to handle the work of maintaining existing workflows and systems while simultaneously designing and implementing improved processes and infrastructure. This effort was, as Katz commented, akin to flying a plane while simultaneously building it.<sup>43</sup>

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General Workflow

The process from data collection to visualization involves several platforms and infrastructure. The workflow for the Global Dashboard continues to change over time, but it generally consists of four main components: (1) data processing servers, (2) the CSSE COVID-19 GitHub repository, (3) AGOL, and (4) the JHU Coronavirus Resource Center.

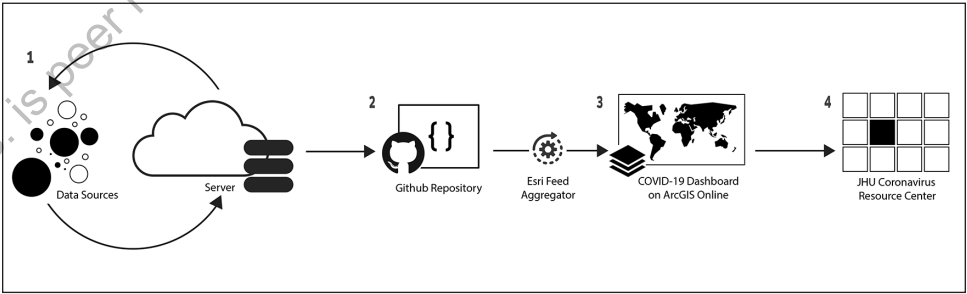


Figure 1. A diagram showing the workflow for the collection, cleaning, and sharing of data for the Global COVID-19 Dashboard at Johns Hopkins University.



As Figure 1 shows, servers host and regularly run scripts that pull, clean, and compile data from a variety of sources. These scripts are actively reviewed and maintained by both CSSE and APL. The main production server regularly pushes a cleaned and compiled data set to the CSSE COVID-19 GitHub repository, a public data store hosted by GitHub containing daily reports from the world and the United States as well as time series data.<sup>44</sup> The Esri Living Atlas team manages a feed aggregator, a program that regularly pulls data from the CSSE COVID-19 GitHub repository into hosted feature layers stored in JHU's AGOL organization. These hosted feature layers are shared publicly through Esri's Living Atlas of the World program,<sup>45</sup> and they appear on the Global Dashboard. A series of Web maps display stylized versions of these hosted feature layers, refreshed at regular intervals. The dashboard's interactive maps and tables draw directly from these Web maps. Finally, the dashboard itself is embedded into the JHU Coronavirus Resource Center, integrating the Global Dashboard with other resources produced by the university.<sup>46</sup>

The distinction between the Global Dashboard's underlying data and the dashboard itself is important to understand. The Global Dashboard is built using Esri's dashboard application, a Web-based data visualization and geospatial analytics tool on AGOL.<sup>47</sup> The Global Dashboard serves as a medium through which users can interact with the underlying data. The data, however, are processed and accessible outside AGOL. Members of the public can find and retrieve the information collected by CSSE and its technical support partners in three ways:

1. Users can directly download the data in tabular format through the CSSE COVID-19 GitHub repository.
2. Alternatively, users with AGOL accounts can pull hosted feature layers through Esri's Living Atlas program into their own Web maps and applications.
3. Finally, users can explore the data by viewing and interacting with the Global Dashboard.

### The Sheridan Libraries' Role

The Sheridan Libraries played a major role in both the collection of data and the hosting of the Global Dashboard. While APL and CSSE focused on refining data collection

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streams and cleaning the resulting data, the Sheridan Libraries team provided and maintained back-end infrastructure. In March 2020, the DRCC set up a data processing server for APL and CSSE team members. As conditions around the world changed in response to the pandemic, both the nature and availability of COVID-19-related data also shifted. APL and CSSE team members had to regularly modify

their data collection and cleaning methods. The continuously revised data automation workflow required manual checks and revisions. Members from both the DRCC and Data Services monitored the data processing server nearly 24 hours per day, seven days a week, on behalf of APL and CSSE team members. This work included overseeing se-





curity and user access, monitoring error logs, notifying APL and CSSE team members of errors in scripts, and working with APL and CSSE on needed revisions to the data collection process.

The Global Dashboard team spent much of early 2020 in a juggling act, balancing meeting the public’s need for information with continuing to refine the dashboard. After joining the technical support team, Sheridan Libraries staff quickly set up back-end infrastructure for the collecting, cleaning, analyzing, and sharing of data. From March to June 2020, the Sheridan Libraries server operated as the primary server for the Global Dashboard’s data processing workflow. In the meantime, team members from APL set up additional back-end infrastructure. In July, the technical support team for the dashboard switched the main data processing server from the libraries’ server to APL’s. The Sheridan Libraries server continues to run as a backup.

Concerning AGOL, the Data Services unit in the Sheridan Libraries manages the Esri Education Site License for JHU. The unit’s responsibilities include administering geospatial desktop software licenses, managing the institution’s AGOL organizations, consulting with university affiliates on their GIS-related needs, maintaining communications with Esri, and ensuring that the university’s use of Esri products falls within the provisions of its Education Site License agreement. As the Global Dashboard is built on Esri’s Web platform and relies heavily on resources from the university’s Education Site License, Data Services provides administrative support for the dashboard team. This work involves negotiating additional Esri technical support and resources outside the license agreement, managing configurations in the institution’s AGOL organization, and monitoring views of the Global Dashboard and requests on its hosted feature layers in AGOL.

Data Services staff also consulted with other groups from JHU on configuring the Global Dashboard, as well as details of the Esri Education Site License agreement. The staff coordinated access and reviews of the dashboard’s security with IT teams across the university and consulted with outreach teams on media inquiries related to the dashboard. Prior to the development of a dedicated communications team operating on behalf of the JHU Coronavirus Resource Center, Data Services also helped to field questions and comments from visitors to the Global Dashboard.

Service Area	2019	2020	Percent Change
Archiving/Sharing	146	224	↑ 53.4
Data Access & Discovery	99	105	↑ 6.1
Data Management, Analysis & Visualization	156	329	↑ 110.9
GIS Services	472	551	↑ 16.7
Maps	62	47	↓ -24.2
Other	266	240	↓ -9.8

Figure 2. Total consultations by service area, as well as percentage changes, from 2019 to 2020 for the Data Services unit at Johns Hopkins University.

Service Area	2019	2020	Percent Change
Archiving-related Consultations	146	224	↑ 53.4
Archived Datasets	28	38	↑ 35.7

Figure 3. Archiving-related consultations and total archived data sets, as well as percentage changes, from 2019 to 2020 for the Data Services unit at Johns Hopkins University.

### Balancing the Global Dashboard with the Transition to Remote Learning

During this time, the Data Services staff also faced the same concerns and priorities as colleagues in other academic libraries. The Sheridan Libraries closed to the public and transitioned to remote services in March 2020. Data Services quickly adapted to offer consultation, instruction, and archiving services virtually, supporting patrons via e-mail, Zoom, and instant messaging or chat service. Instructors converted workshops and instruction sessions formerly taught in person to a webinar format offered through Zoom.

Overall, demand from library patrons climbed during the provision of remote services. As Figures 2 and 3 show, consultation and data archiving requests increased significantly from 2019 to 2020. Consultations on data management, analysis, and visualization surged by 110.9 percent. Discussions about archiving data rose by 53.4

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percent, and data submissions to the JHU Data Archive increased by 35.7 percent over the year. Inquiries specifically related to GIS grew by 16.7 percent between 2019 and 2020. With the closing of the university's physical premises, patrons no longer had access to computers installed with resource-intensive geospatial desktop software such as ArcGIS Pro. As a result, many more users needed guidance on software installation and remote access options. Data Services staff assisted patrons with installation and worked with IT colleagues to set up cloud-based access to ArcGIS desktop software.

Workshop Topic	2019	2020	Percent Change
GIS	111	343	↑ 209
Data Management	477	732	↑ 53.5
Research Computation and Coding	389	535	↑ 37.5

Figure 4. Total number of workshop attendees by topic and percentage changes from 2019 to 2020 for the Data Services unit at Johns Hopkins University.

Another impact of the Global Dashboard was growing awareness and interest, both across Johns Hopkins and globally, regarding GIS and its potential applications.<sup>49</sup> As Figure 4 demonstrates, workshop attendance for GIS topics increased by over 200 percent from 2019 to 2020. Data Services staff also fielded multiple inquiries from other research groups at JHU interested in setting up public-facing dashboard projects utilizing Esri or similar technology. Some of these inquiries developed into projects, such as COVID Control, a smartphone application that tracks COVID-19 related symptoms and presents clusters of symptoms on a map display.<sup>50</sup> Data Services and DRCC staff also consulted with the JHU Coronavirus Resource Center and the Centers for Civic Impact to develop the COVID-19 United States Cases by County dashboard and accompanying infographics.<sup>51</sup>

By late spring of 2020, Data Services staff began to develop internal policies and procedures to manage inquiries from other research groups interested in similar public-facing projects. These guidelines directly addressed technological and staffing resources, outlining the technical setup required and defining the roles and responsibilities of staff members. The procedures aimed to establish successful research groups while maintaining a sustainable staffing model for Data Services. As recommended practices continue to emerge for this new area of endeavor, the Data Services team updates guidelines and works with interested research groups on a case-by-case basis. The department makes general guidance available via the ESRI Software Access LibGuide at [https://guides.library.jhu.edu/gis/important\\_policies](https://guides.library.jhu.edu/gis/important_policies).

The JHU Data Services team balanced providing direct support for the Global Dashboard along with other COVID-19-related research, transitioning to remote education, and maintaining essential library services to patrons. The heavy demands of supporting public dashboard projects in addition to increased demand for Data Service offerings during the pandemic delayed work on key projects the team had expected to begin.

It was an easy decision to make. Providing continuity of services to patrons during an unprecedented time aligned with the priorities of the Sheridan Libraries and the institution at large. Likewise, offering essential support to public COVID-19 research projects aligned with the general mission of the libraries to connect people to information. The Global Dashboard is an invaluable service providing access to relevant and timely information. The Sheridan Libraries was proud to support Gardner and Dong, as well as the rest of the dashboard team, in realizing this mission.

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### Lessons Learned

The Sheridan Libraries team identified some recommended practices for working with large-scale, public-facing projects utilizing GIS technology. The lessons learned fall into two overarching categories: project and program management, and technical setup and technology.



## Project and Program Management

Many of the lessons learned by the Sheridan Libraries team center around efforts to effectively structure and manage public-facing research projects. Rooted in the traditional library reference interview, the authors first and foremost recommend conducting a thorough intake meeting with teams interested in pursuing public research projects. This preliminary meeting serves multiple purposes: first, the library staff gains an understanding of the aims and plan for the project; second, the staff communicates clearly with the research team about institutional and library-specific policies and guidelines for public-oriented research projects and flags any areas for further attention; and third, the research team has ample opportunity to ask questions.

Library staff must maintain an awareness of campus rules and policies relevant to public-facing projects, keeping in mind that such policies may change. Just as the Global Dashboard's workflow underwent significant revision over the course of a year, so, too, did JHU's internal policies regarding projects associated with the Coronavirus Resource Center. Thus, library staff must maintain communication with other institutional teams to remain up-to-date on policy changes that may affect the development and launch of public research projects.

The Sheridan Libraries suggests clearly delineating roles and responsibilities for library staff working with a research team pursuing a public project and for the team's members. It is important to determine internally the scope and level of support that library staff can provide and to clearly communicate both to interested research groups.

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The Sheridan Libraries now provides formal documentation to outline this information and record relevant policies, as well as agreed-upon roles and responsibilities for both library staff and research teams. For example, JHU Data Services now requires research teams to have a designated member serve as their AGOL leader and main communicator with the Data Services GIS administrator. The Data Services GIS administrator consults with this team member

and provides recommendations on key platform configurations, workflow setup, and other GIS-related concerns. The team's GIS leader is expected to manage the daily maintenance and upkeep of the project, with consultation help from the Data Services GIS administrator. The authors recommend working closely with research teams to create plans that anticipate potential growth and associated staffing needs. They also urge staying in close communication as the project progresses.

## Technology Setup

On the technical side, public research projects following the JHU Global COVID-19 Dashboard are maintained on separate AGOL organizations, to which JHU Data Services retains administrative rights. This arrangement separates research projects with potentially high visibility and demand from the institution's main AGOL instance, which is meant to serve predominately as a space for JHU patrons to teach and learn GIS skills.

Effective communication and documentation are key for recommended technical processes as well. JHU Data Services maintains internal documents covering Esri-related software and platforms. Over the past year, the team drafted additional recommendations and details on administrative configurations for AGOL organizations (such as security settings, custom user roles and privileges, and share settings for groups), as well as a recommended workflow for teams interested in creating dashboards. These documents outline the scope and restrictions of the institution's Esri Education Site License agreement. In anticipation of the need for scaling up infrastructure, these guidelines also set out platform-specific resources and costs for research groups to consider purchasing, if the need arises. For groups interested in using AGOL but with little prior knowledge or experience, JHU Data Services staff prepared an introduction that provides background on the platform and links to training resources hosted by Esri. Data Services staff share the detailed documentation after a research group makes an initial inquiry; general guidelines are shared through the Sheridan Libraries' LibGuide on Esri software access.<sup>52</sup> The authors recommend preparing similar documents, specific to each institution's GIS setup, and sharing them with interested research groups.

Additionally, participants should designate leaders from both libraries staff and from the research team. For projects following the Global Dashboard, JHU Data Services staff required that research teams identify a team leader to serve as their project's dedicated AGOL administrator. While JHU Data Services retains responsibility for initial setup and deployments of new AGOL organizations, the research team leader oversees the day-to-day maintenance of the project's AGOL organization. The lead AGOL administrator from the Sheridan Libraries retains an administrative account on each additional AGOL organization and provides technical assistance as needed to the research team leader.

The specific details of how to configure an AGOL organization and the underlying workflow for a public research project will depend on each institution's policies, as well as the research team's experience, resources, and priorities, not to mention each academic library's internal resources and staff expertise. The lessons learned and recommended practices shared here continue to evolve for the Sheridan Libraries; this is an iterative and reflective process.

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### Current State and Continuing Involvement

In July 2020, Esri recognized the contributions and efforts of Gardner, Dong, and the rest of the Global Dashboard team, awarding the project its Making a Difference Award.<sup>53</sup> Further recognition came in November 2020, when the JHU Coronavirus Resource Center was recognized as "2020's Go-To Data Source" by *Time* magazine.<sup>54</sup> The dashboard





continues to be an important resource in the fight to mitigate the spread of the novel coronavirus.

When the Global Dashboard launched in January 2020, few resources provided comprehensive data on the spread of the virus. Today, the landscape of COVID-19 information has changed significantly: most government agencies, as well as news organizations, have some version of a COVID-19 dashboard or tracker. Niche dashboards and other applications focusing on aspects of COVID-19, such as its impact on school closures, have also developed. The creation of additional resources has slowed traffic to the Global Dashboard; from a record high of over 994 million views in April 2020, the monthly median of dashboard views dropped to approximately 85 million. As of April 27, 2021, the total number of views for the dashboard exceeded 3.3 billion.

While Global Dashboard use has steadied, demand remains high for the underlying data. Feature layer requests, a measurement of the level of interaction users have with the underlying data on the dashboard, total over 215.3 billion, with a monthly median of 4.7 billion requests. This suggests that Global Dashboard visitors continue to explore its data at a staggering rate. Additionally, the CSSE COVID-19 Data Repository remains heavily trafficked and cited.

The Sheridan Libraries team continues to support the Global Dashboard. While no longer actively monitoring it 24 hours a day, the team continues to maintain the

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**The Global Dashboard's layout and available information has changed over time and will continue to change and reflect new developments concerning the novel coronavirus pandemic. The Sheridan Libraries will proudly support its ongoing development.**

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backup data collection and cleaning server. The team also coordinates with CSSE and Esri on issues related to the AGOL platform and the dashboard's configuration, and it provides additional assistance as needed to CSSE, APL, and Esri. With each new development—the emergence of new variants of COVID-19, the production of vaccines and the subsequent vaccine rollout, and revisions to historical data as definitions are reexamined and changed—the team behind the Global Dashboard responds with

changes to the dashboard's interface. The Global Dashboard's layout and available information has changed over time and will continue to change and reflect new developments concerning the novel coronavirus pandemic. The Sheridan Libraries will proudly support its ongoing development.

## Conclusion

The COVID-19 global pandemic impacted and continues to touch every level of society. Academic libraries faced challenges and opportunities in adapting to the unprecedented conditions brought on by the pandemic. Leveraging the strength and expertise of its data and digital curation teams, staff at the Sheridan Libraries helped to create and still maintain the Global Dashboard. The dashboard represents the increasingly common trend across academic institutions and disciplines to pursue research in the public inter-



est. Staff at the Sheridan Libraries field a growing number of inquiries around project planning to conduct such research.

The staff at the Sheridan Libraries work continuously to adapt their service models in response to this trend and deploy members to contribute to these research projects. This work positions the library to fulfill its mission to support the research enterprise and public service goals of JHU. As academic research ever more strongly demands access to information that benefits the public interest, academic libraries face the challenge and opportunity of adapting their service models to fulfill these needs.

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