Libraries as Resilience Hubs: Assessing Social Impacts and Learning from Best Practices

1. Project Justification

Problem statement: Despite a $12 billion annual investment in 9,000 public library systems nationwide and despite their important service to vulnerable individuals and communities (our study's intended beneficiaries), research assessing the effects of public libraries on local communities is scarce. Gilpin et al. (2021) recently documented libraries' impacts on patronage, students' achievement, and housing values, and found some (limited) positive impacts (see bibliography in Appendix 4). However, the impacts of libraries on resilience in times of crises, their innovations, successes and shortcomings have not been systematically assessed yet. This is a lost opportunity, especially for library scholars and practitioners interested in alleviating climate, social, economic, and political community vulnerabilities (our target groups). Assessing the impact of local public libraries on the most vulnerable populations (the poor, racialized minority, elderly, isolated, recent immigrants, unhoused people, and those with poor health and addictions) can provide invaluable information on the best practices to enhance community resilience – by which we mean a community's ability to recover from disruptions, adapt, and rebuild stronger. Libraries' role for local resilience was particularly salient during the COVID-19 pandemic, an extreme example of biological vulnerability, when public libraries creatively redesigned their services to support their patrons' information needs.

Our project addresses the National Leadership Grants Program *Goal 2: to Build the capacity of libraries (…) to lead and contribute to efforts that improve community well-being (…)* and *Objective 2.3: to Establish or refine approaches that equip libraries (…) to contribute to the well-being of communities*. By focusing on libraries' contributions to local resilience to economic, climate, and health emergencies, and to disinformation campaigns, the project also advances *Goal 4: to Strengthen the ability of libraries to provide services to affected communities in the event of an emergency or disaster*. The dissemination of findings will *support the training and professional development of the (…) library workforce* (IMLS Objective 1.2)

We will advance these goals by answering the following research questions:
Across the US states and territories:

- RQ1. How do public libraries and their resources (space, staff, budget, and collections) impact local economic and social outcomes (employment rates, education levels, median income, social capital)?
- RQ2. What library programs addressing community stressors (in responses to weather extremes, economic hardships, public health crises, and disinformation campaigns) are most innovative and contribute the most to local resources and resilience?
- RQ3. What factors drive libraries to adopt and implement resilience-boosting programs, what factors hinder implementation, and how can those barriers be removed?

For each of these questions, we will assess whether the impacts of library programs and resources vary by community size and across U.S. regions, states, and territories. Once we answer those questions with reliable and generalizable information, we will disseminate the findings to our target group, i.e., libraries, librarians, LIS educators, and scholars, to improve the profession's ability to meet communities' future challenges.

Project overview: Our multidisciplinary research team, led by Dr. Iulian Vamanu at the University of Iowa School of Library and Information Science (SLIS), requests $494,444 from the National Leadership Grants Program for a three-year mixed method Applied Research project documenting and assessing public libraries' impacts on community resilience across the United States. The study focuses on the socio-economic impacts of public libraries, in particular their contributions to the resilience of the most vulnerable populations to climate extremes and natural disasters, economic recessions, public health emergencies, and disinformation campaigns. To ensure the breadth, generalizability, and depth of analysis, we employ a mixed methodology. It includes spatial and econometric analyses of national data (including IMLS data on libraries, census data, educational and public health outcomes); a survey of public library directors; interviews with frontline staff; and data mining of these libraries' social media content. This combination of high-level quantitative and fine-grained qualitative data will allow us to fully understand, describe, and

assess the role public libraries programs and practices play in supporting community resilience. We will then diffuse information about best practices to libraries and librarians nationwide.

The Libraries and Resilient Communities (LARC) interdisciplinary research team is led by Dr. Vamanu (Principal Investigator and assistant professor in the School of Library and Information Science (SLIS), specialist in heritage institutions and practices), and includes SLIS faculty (Ms. Logsden, with more than 30 years of librarianship experience), School of Planning and Public Affairs (SPPA) (Dr. Laurian, expert in urban and environmental planning, Dr. Qian, expert in urban economics, and Dr. Nguyen, expert in public finance and spatial econometrics), Sociology (Dr. Glanville, expert in social capital and social trust assessment), Business Analytics (Dr. Zhao, specialist in social media data analysis), and Social Work (Dr. Gilster, a specialist in the local determinants of community wellbeing). Since 2021, the LARC Team has collaborated on cross-cutting research looking at the many social roles of public libraries. To ensure that the project would meet the needs of our target group, i.e., practicing librarians, we refined and piloted this project's mixed methodology in 13 Midwestern states in collaboration with 16 librarians in Eastern Iowa, and with the support of a UI grant ("Public Libraries for Disaster Resilience: Assessing Libraries' Community Impacts in Times of Climate and Socio-Economic Crises," $150,000, 2021-23).

The LARC Team will be supported by a Project Manager (one half-day per week), and one graduate assistant in the first and second years and two graduate assistants in the third year. We will also rely on an Advisory Board comprised of 8-10 practicing librarians in small and mid-sized public libraries for regular feedback and guidance on librarians' information needs. The LARC Team is also supported by the University of Iowa Public Policy Center (PPC), a research center that facilitates applied and policy-relevant interdisciplinary collaborations, with dedicated professional grant, reporting, and budget management staff.

Social challenges addressed: In the U.S., disenfranchised persons (e.g., low-income, racialized minorities, people with limited literacy, recent migrants, teenagers, elderly, and isolated persons) —the beneficiary group for this project— are disproportionately vulnerable to cumulative and compounding environmental, economic, and health risks, as well as disinformation campaigns. They are also most likely to lack the social networks and social capital that facilitate access to resources. Public libraries mitigate many of those risks by providing a wide range of essential material, informational, and human services. They do so by implementing welcoming, non-judgmental, and non-bureaucratic information delivery modes, and tend to be more tolerant of neurodivergent and addicted persons than traditional social service providers (Anderson, 2018; Cho, 2018; Halvorson, 2006; Lowenstein et al., 2021). Libraries vary across the nation, but all have expanded their services over the past decades, and many have begun to serve as *de facto* resilience hubs (Featherstone et al., 2008; Veil & Bishop, 2014). In large cities, library branches act as neighborhood centers, catering to the specific needs of their community. In small towns, libraries are often the only free and open information and resource center and are thus particularly important resources for community resilience and for vulnerable residents' well-being.

During extreme climate events, libraries provide shelters from the elements to unhoused persons and to those who cannot afford to heat and cool their homes (Gazette, 2021; PG&E, 2021; Rhode Island Emergency Management Agency, 2021; Widerynski et al., 2017). Worsened by global climate change, extreme heat and cold waves are the deadliest disasters, and they are expected to worsen in frequency and intensity (Reidmiller et al., 2018). From 1999 to 2016, heat waves caused at least 10,000 deaths, more than hurricanes, tornadoes, or floods (Gawthrop, 2020). The most vulnerable to climate extremes are the most disenfranchised. For instance, due to the Urban Heat Island Effect, heat waves temperatures are the highest in American cities' poorest neighborhoods (Anderson & McMinn, 2019; Dolsak & Prakash, 2020; Flavelle, 2021). The 1995 Chicago heat wave killed 739 in a week, three times as many as Superstorm Sandy and Hurricane Harvey combined. Most victims were elderly and poor, and disproportionately African Americans (49%). Extreme cold is even deadlier, killing fifteen times more people than heat-related causes (Gasparrini et al., 2015).

When natural disasters hit, people of color and low-income community are disproportionally impacted (Zanocco et al. 2022). For instance, people of color and residents of mobile home parks are disproportionately impacted by floods, African Americans and low-income households are more likely to suffer great tornado damages, and the ever-increasing number and impact of natural disasters worsens existing wealth inequalities (Howell and Elliott, 2019, Tate et al., 2021, Kashian et al., 2022). During disasters, libraries become particularly important resource centers. They are often the place where broadband access is restored first, enabling residents to access the internet, apply for FEMA aid,

and receive support for insurance claims. Libraries, as points of trusted information dissemination, act as Disaster Recovery Centers (Young, 2018; U.S. Department of Homeland Security, 2018). Two recent IMLS-funded projects examine the links between public libraries and resilience in the face of natural disasters. Dr. Patin's project titled "Interconnected: How Public Libraries as Essential Information Infrastructures Enhance Community Resilience" (2021-2024) shows that in the aftermath of disasters, libraries enhance their communities' economic resources (e.g., helping residents and business owners fill out government forms, filling and submitting insurance claims). Libraries also engage in inter-institutional collaborations, and provide the space needed for rebuilding a sense of community (Patin, 2020). Dr. Strover and Dr. Mardis' project titled "Rural Libraries and Disasters: Investigating Resiliency in the Digital Environment and Beyond" (2018-2020) used qualitative research methods focusing on small and rural libraries. They demonstrate how libraries use information and communication technologies to interact with other organizations assisting communities. Mardis et al. (2021) also found that in addition to providing critical information, communication technologies, and workspaces, libraries build a sense of community with storytelling and art-based programming.

With regards to economic recessions: libraries support patrons with resume writing, job search, and accessing social services. Economic hardships hit poor communities and racial minorities the hardest. African Americans experience higher unemployment rates than whites (11 v. 7%, U.S. Bureau of Labor Statistics 2020) and significantly lower median household income ($48,000 v. $78,000, U.S. Census Bureau 2021). For the 10 million unemployed (U.S. Labor Department 2021), and the more than 580,000 unhoused people, identifying and securing life-supporting services such as jobs, shelter, food, health, and social services increasingly requires internet access. Yet, the digital divide severely limits access to basic services for those who need them the most. About 15 million Americans lack access to fixed broadband service and this includes up to 25% of rural populations (Federal Communications Commission, 2020). Furthermore, about 21% of American adults (about 43 million) are illiterate or functionally illiterate (National Center for Education Statistics, 2020) and need individualized support to access lifeline services. In the last twenty years, public libraries have expanded their scope beyond traditional collections and programs, adding many patron services. This shift has positioned libraries to support the most vulnerable, those with the least financial and social capital (resources available through social connections) with accessing vital resources and social services. They also provide free computer and internet access, personalized help with identifying job postings, preparing resumes and job applications, finding food, homes, and temporary shelter, filing tax forms, understanding and using e-government websites, and hosting drivers' license renewal kiosks (Hoffman et al., 2011; Young, 2018).

With regards to disinformation campaign threats, the COVID-19 pandemic revealed how politicized public health messages can impact behaviors (masking, vaccination, etc.) and health outcomes (Allcott et al., 2020; WHO, 2020). Ongoing disinformation campaigns are also impacting communication and information sharing related to gender and non-binary/non-conforming gender roles and behaviors. Libraries' responses to COVID were not unlike other organizations (dematerializing services, opening/closing decisions, providing sanitizer, mask mandates, serving as mask distribution and vaccination centers, etc.). Public libraries serve another related vital community function: they provide access to accurate and verified information. The public trust they generally enjoy also makes them essential resources in the current "post-truth" climate (Alvarez, 2016; Geiger, 2017; LaPierre & Kitzie, 2019; Paris, Carmien, & Marshall, 2022; Walker, 2021).

Beyond reducing vulnerability to disinformation, libraries are community-building institutions that contribute to "social sustainability" (Engström & Rivano Eckerdal, 2019) and reduce social polarization (Demas & Sherer, 2002). They facilitate and nurture social networking (Aabø et al., 2010; Chen & Ke, 2017; Hapel, 2020; Khoir et al., 2017; Vårheim, 2014) and individual learning (Hassinger-Das et al., 2020; Yoshida, 2013). Libraries support a positive public sphere, social connections, a sense of community, democratic discussions and debates (Klinenberg, 2018), and provide opportunities for checking and balancing government powers (Mehra, 2017; Oliphant, 2019). In small towns, the higher levels of social connections and cohesion that libraries create reduce population decline (Flora, 1998). Finally, in the recent post-truth climate of "fake news," librarians provide curated collections and information evaluation and literacy (LaPierre & Kitzie, 2019; Sosulski & Tyckoson, 2018).

Finally, libraries are *physical* gathering spaces that support placemaking and serve as local civic centers. As places, they are endowed with "powerful properties" and "mythic" functions, embodying "transcendent and transportive" social values symbolized through architecture and interior design (Osburn, 2006; Buschman & Leckie, 2007). As such, libraries are "third places" (Antener, 2019; Bhabha, 2006; Elmborg, 2011; Harris, 2007; Soja, 2006), neither home nor

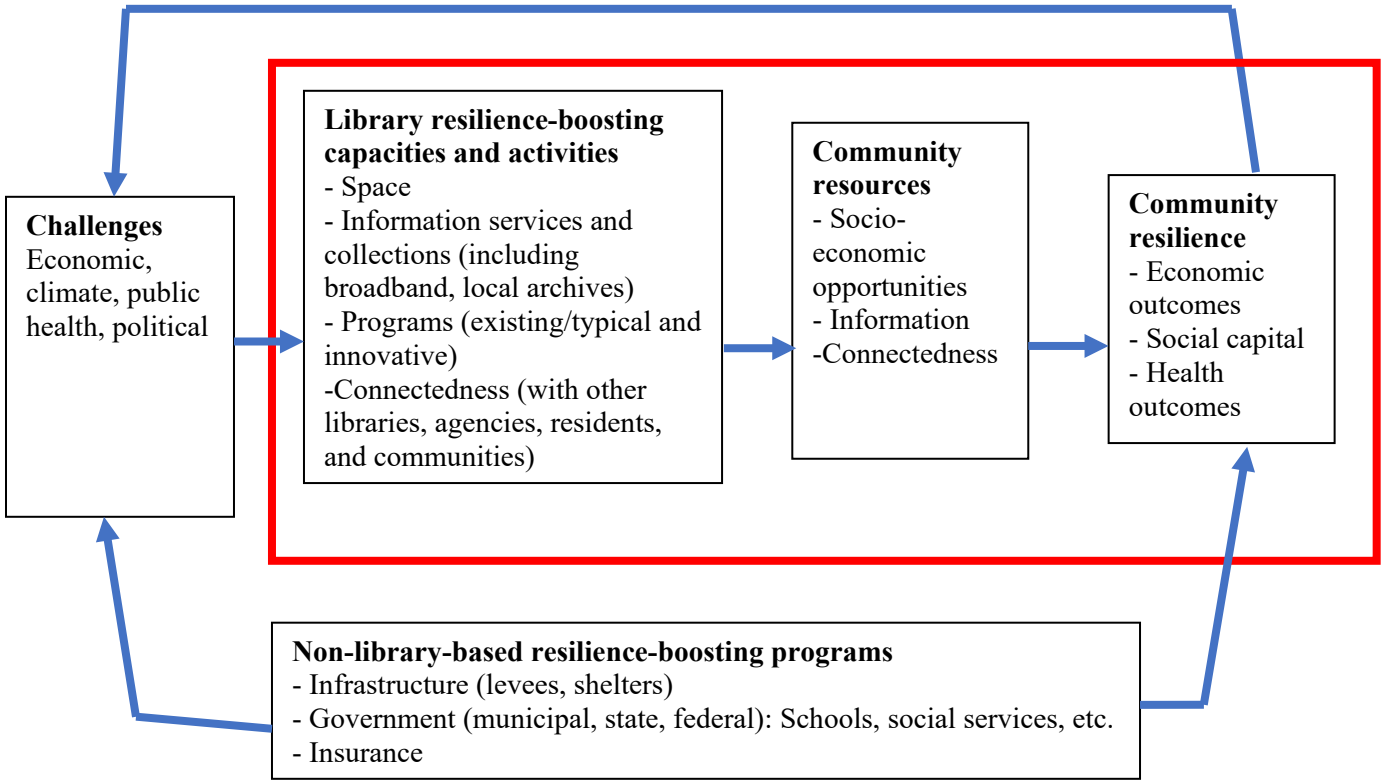
workplace, bridging across social groups and cultures, clearly structured by zone, but also supporting free social interactions and individual exploration and learning. Unlike other social spaces and institutions, public libraries thus have the social capital, ethos, values, the ability to provide open and sheltering spaces, to serve the most disenfranchised in times of crises.

Libraries and community resilience: a conceptual framework

Community resilience can be understood as a community's ability to recover from disruptions, adapt, and rebuild stronger. The literature shows that resilience is positively associated with local capacity, social support and resources, and negatively associated with miscommunication, risks, and trauma (Patel et al., 2017; Cutter et al., 2014). Resource robustness, i.e., economic resources, social capital and connectedness, access to needed space and information, are particularly important determinants of resilience (Longstaff et al., 2010; Norris et al., 2008; Veil & Bishop, 2014). Based on the literature, we posit that libraries enhance resilience by providing community resources. Physical infrastructure and other institutions, such as local, state, and federal government agencies and insurance companies that also impact community resilience are not part of this analysis. See Figure 1.

Figure 1. Libraries and resilience: Conceptual framework

The red frame indicates the research focus area.



Knowledge gap and research questions: While some library-based resilience-boosting programs mentioned above are innovative, most are common practice. Yet, they are poorly documented, quantified, and thus are underestimated and underfunded. We thus seek to quantify the socio-economic impacts of libraries on local communities (e.g., to what extent library programs reduce unemployment, increase income and social capital, protect the most disenfranchised, and increase communities' overall resources), and to disseminate information about the most innovative and successful programs to the librarianship community, library funders, and LIS educators, so that those target groups may advance best practices that support community well-being and resilience, especially for the most disenfranchised and vulnerable beneficiaries. This project complements existing scholarship by answering the following research questions.

1. **How do public libraries and their resources impact local community resilience, well-being, and economic and social outcomes?** More specifically, since social vulnerability and resilience are closely tied to socio-economic factors, and since libraries vary across the nation and by size, we answer the following questions:
   1.a. How do library closures, library openings, and changes in library resources (space, staff, budget, collections) impact local socio-economic outcomes (economic, educational, social capital, and health outcomes)?
   1.b. Are those impacts similar across the nation, or do they vary across regions, states, and territories, or based on the size of libraries and their communities?

2. **What library programs addressing community stressors (responses to weather extremes, natural disasters economic hardships, public health crises, and disinformation campaigns) are most innovative and contribute the most to local resource robustness?** In particular:
   2.a. Which programs are most common, most innovative (i.e., recently adopted) and most utilized?
   2.b. How do libraries fund, support, and track the impacts of those programs?
   2.c. Do programs vary significantly based on local risk factors, across regions, states, and territories, based on library resources and funding mechanisms, or based on community socio-economic characteristics?

3. **Why and how do libraries adopt, implement, and communicate about resilience-boosting programs?** In particular:
   3.a. What library and community-level factors support and hinder the adoption and implementation of resilience-boosting programs?
   3.b. Do those factors supporting or hindering adoption vary across regions, states, and territories, based on library resources and funding mechanisms or based on the practices of nearby libraries?
   3.c. How do library directors and libraries communicate about their resilience-boosting programs to their patrons, communities, and other librarians?

We answer those questions by focusing on the impacts of library programs that respond to economic hardships, weather extremes, the COVID-19 pandemic, and disinformation campaigns (see Appendix 1, Figure 2). Those are not the only possible community challenges, but they are those most often discussed by library partners and are understudied in scholarly literature.

2. Project Work Plan

Mixed-methods Applied Research approach: We document, analyze, and quantify the impacts of public libraries on their local communities' wellbeing and resilience nationwide, identify the most innovative and effective resilience-boosting practices, as well as the factors that impact libraries' ability to deliver those essential services. Those are dynamic processes that evolve over time, result from multiple capabilities and decisions, which themselves build on many quantitative and qualitative factors. Thus, we rely on a mixed methods research design, including spatial, economic, and statistical methods, and qualitative analyses. This approach provides the breadth and depth needed to answer the complex research questions: it allows us to identify *causal* links between library resources and local socio-economic outcomes using control groups and statistical controls (RQ1), to make *generalizable inferences* about library practices across the US states and territories, and across large cities and small towns (RQ2), and to build on a *deep understanding* of library programming and decision-making processes through qualitative interviews with librarians (RQ3). We refined the methodology with input from a group of 16 public librarians –our target group— with whom we met regularly in 2021-22. We then tested the methodology in 13 midwestern states with UI pilot seed funding (*Public Libraries for Disaster Resilience: Assessing Libraries' Community Impact in Times of Climate and Socio-Economic Crises*; $150,000; 2021-22). The project completion timeline indicates the leading team members for each task. As the timeline shows, parts of the project are conducted by different team members simultaneously.

Step 1. The first research question addresses how public libraries and their resources impact local community resilience, well-being, and social-economic outcomes. For Step 1, in Year 1, we will assess the impacts of public libraries on local community socio-economic outcomes (RQ1), focusing on economic outcomes (Dr. Qian), educational and health outcomes (Dr. Nguyen), and social capital (Dr. Glanville) using quantitative spatial and econometric analyses. Since libraries can be rural, urban, or suburban, we use the census place designation as the most appropriate spatial scale for this analysis (it includes cities, townships, villages, and unincorporated communities). First, Ms. Logsden and Dr. Glanville will merge, clean, and code Institute of Museum and Library Services Public Libraries Surveys data on all 9,000 library systems in the U.S., including 17,000 main libraries, library branches, and

Bookmobiles, for all years between 2010 and 2020, including the library type (single library vs. branch) and library resources (annual budget, staff size, building age and size, size of collections and digital services). Second, Dr. Nguyen will link each library's data to its community's socio-economic characteristics. Those include (1) economic outcomes, assessed using 2010 and 2020 census data associated with social vulnerability: median household income and housing values, unemployment and homeownership rates (Cutter et al., 2014); (2) educational outcomes assessed through the Early Childhood Longitudinal studies, which includes, for all communities in the US, youth literacy rates and measures of library usage; (3) health outcomes of interest assessed through county-level COVID-19 mortality rates retrieved from the Center for Systems Science and Engineering at Johns Hopkins University, and (4) social capital assessed through the number of nonprofit organizations per capita, voter turnout, and Census response rates (Paxton et al., 2016; Rupasingha et al., 2006; Ressler et al., 2021).

The SPPA research assistant will also create maps overlaying library presence, library per capita, and library resources per capita with local socio-economic characteristics using Geographic Information Systems (GIS) software to visualize library distributions and identify potential spatial trends. The maps will reveal *spatial correlations*, e.g., areas of the country that are underserved in terms of library resources, whether libraries are disproportionately located in high or low-income communities, or in communities with high or low risks of natural disasters. For instance, the pilot study maps show fewer libraries per capita in Western South Dakota and Missouri compared to Kansas, Nebraska, or Iowa, and reveal that rural areas and urban centers with low to moderate median income levels tend to have more libraries per capita than suburban and wealthier areas (see Appendix 2).

To identify the *causal* relationships between library presence and resources and socio-economic outcomes, we assess potential changes in socio-economic outcomes (1) when libraries close permanently, (2) when new libraries open, and (3) when library resource levels (budgets, staff) change. We examine the relationships between library resources and socio-economic characteristics by examining (1) differences between communities with and without libraries, and (2) whether and how changes in library resources impact each type of community outcomes. This analysis will be led by Dr. Qian and Dr. Nguyen, with input from Dr. Vamanu and Ms. Logsden, using spatial and longitudinal statistics and difference-in-difference regression models to identify possible spatial patterns, regional, and nationwide trends. These regression models have the advantage of statistically "controlling" for other factors that may impact relevant outcomes, including for instance median income, property values, literacy rates, etc. In those models, changes in library presence and resources explain changes in community characteristics (e.g., change in median income, in literacy rates, in social capital, etc.). Unlike economic multipliers, which calculate the direct and indirect impacts of investments on local economies (wages, contributions to the local economy, tax revenues), our analysis focuses on correlations and causal linkages between libraries (their presence and resource levels) and the socio-economic outcomes related to community wellbeing and resilience. In the pilot study, this analysis showed, for instance, that library closures lead to significant declines in local median household incomes one, three, and four years after the closure (by 2.3%, 5.3% and 8.6% respectively), even after controlling for local economic trends prior to the closure (see Appendix 2). After analyzing our data, we will present our findings to the Advisory Board for input and feedback and submit papers to the 87th Annual Meeting of the Association for Information Science and Technology Fall of 2024, the American Library Association Annual Conference, the Public Library Association Annual Conference, and other appropriate conferences.

Step. 2. The second research question focuses on identifying library programs that address community stressors (responses to weather extremes, natural disasters, economic hardships, the COVID pandemic, and disinformation campaigns) and which programs are most innovative (meaning that they are adopted in the last 3 years) and impactful for community resilience. It will be answered using a national survey of library directors. The survey work will span Years 1 and 2 and run concurrent with Step 1. In the Fall of Year 1, Dr. Laurian will adapt the survey and interview questionnaires based on our pilot study results, with input from Dr. Vamanu, Ms. Logsden, Dr. Gilster, and our Advisory Board. For instance, we will explore librarians' responses to disinformation campaigns and probe in more depth the budgetary factors that support program adoption and implementation. Those topics emerged as important in the pilot study. Dr. Laurian will prepare the survey in Qualtrics, ensuring that it is desktop, tablet, and cell phone compatible. Dr. Vamanu will obtain IRB approval for the survey, as we did in the pilot study, in the Spring of Year 1.

The web-based 13-to-15-minute survey includes mostly closed–ended questions, with a few strategic open-ended questions to probe innovative programs, concerns, and assessment mechanisms we may not have envisioned. Survey questions cover the following topics: library directors' visions about their libraries' priorities, library services,

programs, and policies (1) in response to heat and cold waves, recent natural disasters (if any) and plans in the eventuality of a disaster, (2) for patrons who struggle economically and with limited literacy (help with job search, training, filling forms, etc.), (3) in response to the COVID-19 pandemic, and (4) in response to disinformation campaigns and political pressures for and against certain collection materials. We also ask how many people come into the library and use each type of service and program, which we conceptualize as outcomes. We ask how libraries fund those programs, and whether and how they track their impacts. We also ask for background information, such as funding mechanism, and an assessment of the respondents' and staff job satisfaction and morale. Finally, we ask for the library location (state, city/county, and name) so that we may link the survey data to community and IMLS library information (in the pilot study, only 4.7% of respondents declined to provide this information, presumably to protect their anonymity). Respondents are also invited to provide their emails if they wish to receive study results and invitations to workshops and webinars. The pilot survey (see questionnaire in Appendix 5) revealed, for instance, that Midwestern libraries offer *individualized, on-demand* support for resume writing (44%), job search/applications (54%), accessing social services (50%), finding housing (27%), and filing taxes (22%). We found that library directors think libraries can (58%) and should (48%) act as cooling and warming shelters. During the COVID-19 pandemic, libraries provided curbside pickup (89%), new online services (52%), and added Wi-Fi internet access points outside their buildings (51%). We also found that librarians can identify approximately how many patrons they serve with those services.

For Step 2, in the Spring of Year 1, Ms. Logsden and a SLIS Research Assistant will distribute the survey to the 9,000 directors representing 17,000 outlets through the state library or professional organizations, e.g., state library associations, in each state and territory, with one announcement about the survey and its purpose, and three follow-up reminders. Using the same survey distribution system, the pilot study collected 505 responses from libraries across 13 Midwestern states. We thus expect a sample of about 1500 responses when including all U.S. states and territories. Since the survey will not build on a random sample selection, once the data is collected, Dr. Laurian will examine whether respondents' libraries are representative in terms of distribution across all US states and territories. If any region, state, or territory is under-represented, we will follow up with two additional reminders to librarians in this area.

In Year 2, Dr. Laurian will clean and de-identify the survey data (see Data Management plan), code qualitative answers, and analyze the data. The data analysis will involve creating new variables, such as distinct indicators of library resources, outputs, and outcomes, e.g., indicators measuring the breadth of library programs, innovation (i.e., programs adopted in the last three years), and utilization, i.e., the number of patrons helped by each kind of program, as a percentage of the community population size. The survey data analysis, led by Dr. Laurian, will begin with descriptive results (programs, factors of adoption, libraries' communication and connectedness, patrons served, etc.). Next, the analysis will explore linkages between library characteristics and their programs and usage using correlations and regression analyses. Finally, where respondents provide their library's city and name (based on the pilot we expect about 95% of respondents to do so), we will link the survey data to community characteristics (census data, social capital data, education and public health outcomes etc.) and to the IMLS library data (see above). We will then be able to analyze the linkages between libraries' resilience-boosting programs, program utilization, and community resilience outcomes. Multiple regression analyses will be run to identify which kinds of library programs have the greatest impact on each dimension of resilience. For instance, the pilot study showed causal links between library usage and elements of social capital: mutual trust and openness to different ideas. Finally, we will complete the survey analysis, write up the results, present them to the Advisory Board for input and feedback, and present the findings to our target groups at the 88th Annual Meeting of the Association for Information Science and Technology, the American Library Association Annual Conference, the Public Library Association Annual Conference, and other relevant conferences in the Fall of Year 2.

Step 3. Next, Dr. Vamanu and Ms. Logsden will focus on identifying the factors that drive the adoption of resilience-boosting programs (Question # 3) using qualitative in-depth interviews with frontline librarians. The interviews will reveal the reasons for developing and adopting resilience-boosting programs, the resources they rely on to support those programs, the supporting factors and barriers library leaders and frontline librarians face in implementation those programs, the factors that drive innovation adoption, evidence of successes or failures, and potential outcome assessment mechanisms, and the measurable and perceived impacts of library programs on local communities. The interviews will also provide essential qualitative information to assess the impacts of library programs and activities in response to disinformation campaigns, a topic not captured by direct measures of community resilience, and thus only

evaluated through qualitative data. Finally, we will also explore how the institutional role of libraries may be reconceptualized to match those resilience-boosting functions.

For Step 3, in Year 1, Dr. Vamanu and Ms. Logsden will refine the interview semi-structured questionnaire with support from the rest of the team and of the Advisory Board. Dr. Vamanu will then obtain Institutional Review Board approval for the interviews, as he did for the pilot study. In the Fall of Year 2, we will strategically select 15 libraries in each of the four census regions (West, Midwest, Northeast, and South) based on survey responses to learn from librarians who implement a variety of innovative programs.
We will select, in each of the four census regions:

1. the four libraries with the widest variety of resilience-boosting programs they offer(ed) in response to climate extremes, natural disasters, patrons' economic needs, the COVID-19 pandemic, disinformation campaigns and book bans (e.g., services to the unhoused people and immigrants, food pantries, health promoting activities, showcasing historically banned books, etc.);
2. the four most innovative libraries, i.e., libraries that have adopted new programs in the past three years; and
3. the four libraries that are in areas at highest risk of natural disasters and/or in communities that have experienced a natural disaster in the last 5 years.

We will interview frontline librarians who have a good overview of all library programs, services, and usage, and have direct experience serving the people in need in their communities. Once the libraries are selected, we will identify their staff on their website. If the website doesn't have personnel information, we will use email lists from the American Library Association and the Association for Rural and Small Libraries. If the information is neither on the website nor in either of those lists, we will move down to the next library in our database. In small libraries with only one librarian, this person may be the staff as well as the director. In larger libraries with several staff, we will randomly pick one staff member using a random number generator. This randomization will prevent biases that could occur if we asked the director to nominate an interviewee. We will then contact that librarian by email to ask if they would agree to be interviewed. Their answer will be recorded as their consent to be interviewed.

In the Spring and Summer of Year 2 we will conduct all 48 interviews. The semi-structured interviews will be conducted over Zoom based on interviewees' preference and recorded with interviewees' consent. Zoom-based interaction will allow us to download the transcript of the conversation, which we will then use for data analysis. In the pilot study, interviews lasted from 20 to 50 minutes. The interviews will each be conducted by one faculty researcher and one Library and Information Science Graduate Research Assistant (6-8 interviews per faculty on average). While this is more time consuming than having the Research Assistants conduct the interviews, the pilot study showed Research Assistants do not always follow up with important clarifications or questions. They will set up the interviews, learn from the interview process and contents, and lead the analysis of interview contents. We will then write up interview summaries and share them with the interviewees for their review. Once this step is complete, we will proceed with the interview data analysis. The interview qualitative data will be analyzed as a corpus in the Spring of 2026. We piloted the interview protocol with 14 interviews. We found, for instance, that many libraries have started using social media platforms to not only keep in touch with their patrons, but also to share best practices with other libraries and to deliver services. In addition, they have become hubs for technology training and services, as well as for health-related activities.

In Year 3, Dr. Vamanu and Dr. Gilster will analyze the content of the interview data using NVivo, a qualitative research analysis software. We want to understand in more depth the reasons why and the ways in which public libraries adopt and implement resilience-boosting programs. We want to learn about the library and community-level factors that support and hinder the adoption and implementation of resilience-boosting programs; about the extent to which those factors supporting or hindering adoption vary across regions, states, and territories, based on library resources and funding mechanisms or based on the practices of nearby libraries; and about the ways in which library directors and libraries communicate about their resilience-boosting programs to their patrons, communities, and other librarians.

Step 4. Finally, in the second half of Year 2, we will identify how libraries communicate about their resilience-boosting programs to their patrons, communities, and other libraries (Question 3c). This is important for two reasons: for programs to be impactful, the need to be known and utilized (see Figure 2), and connectedness is --in and of itself-- an important factor of resilience. To assess communications between public libraries and their community, we focus on libraries' social media engagement. Among the libraries included in the survey, we will randomly select 6 libraries per

state and territory (336 total). Since Twitter leadership and management are in flux, we may use Facebook data instead. The Research Assistant will identify the twitter handles for the sampled libraries. Dr. Zhao will extract (or "scrape") their tweets since June 2019 (to include the pre-COVID period) using a text mining package called "tm" in R, a programming language for statistical computing and graphics. He will then analyze the thematic contents of those tweets using Semantic Network Analysis method (SNA). We will then map this twitter activity against the dates of the COVID-19 pandemic, natural disasters, heat and cold waves in their region, and other locally important events. This large-scale analysis of social media data will allow us to assess how libraries respond to heat/cold waves, patrons' economic needs, the COVID-19 pandemic, and disinformation campaigns, as well as how they communicate their response to their communities. Analysis of the interviews with library directors conducted within our "Public Libraries for Disaster Resilience" project has shown that public libraries in the Midwest use social media extensively to communicate news with patrons and best practices with other libraries, as well as to deliver services. This increased presence of public libraries in social media justifies the special attention we will pay to this environment as a source of data for our project. We will also assess public libraries' Twitter presence, the "buzz" generated by these services, and public sentiments expressed online. Our pilot analysis shows that public libraries engage differently with their communities via social media based on library size, with smaller libraries engaging far less on Twitter than larger ones, and that large libraries post often about their programs.

Dissemination of findings: At the end of each year, Dr. Vamanu and Ms. Logsden will share the results with our target groups, i.e., the Advisory Board, library professionals, and LIS educators, highlighting the most impactful library practices. We will publicize results from the spatial analysis by Fall of Year 2, findings from the survey by Spring of Year 2, and findings from the interviews and integrated comprehensive findings by Summer of Year 3. Results will be shared throughout the funding period through presentations and workshops at librarian and LIS educators' conferences: the American Library Association, the Public Library Association, the Association for Library and Information Science Education, and the Association for Information Science and Technology. We will also distribute short reports and one comprehensive report, 4 to 5 open-access papers, a webinar produced and hosted by OCLC's WebJunction (see Appendix 3), and podcasts through IMLS newsletter, state library and LIS educator listservs, and the PUBLIB Electronic Discussion List, and to major public and philanthropic library donors. We will also share our findings via op-eds and media outlets, e.g., the *New York Times* and *National Public Radio,* with the support of the UI's Office of Strategic Communications.

3. Diversity Plan

Since we study public libraries and their impact on the community resilience across the entire U.S., we are committed to understanding how these institutions serve the diverse communities that make up the population of this country. While we acknowledge that all communities face different types and levels of risks, we are aware that vulnerability is unequally distributed: across the U.S., certain groups are consistently more vulnerable than others (along the various axes of age, gender, income, as well as race and ethnicity, but also from an intersectional perspective); moreover, within the same local community, such goods as wealth, education, health, and opportunities for professional advancement are not uniformly distributed. Our research design takes these differentials into account: we ensure that our samples of libraries reflect differences in terms of population size, geographic area, etc. In addition, the questions we include both in the survey and the interview instruments are designed to elicit our participants' insights into these differentials.

To conduct this research, our team espouses a diversity of disciplinary and methodological perspectives and practices: we are a multidisciplinary team (Library and Information Science, Planning and Public Affairs, Sociology, and Business Analytics) and we approach our topic from both quantitative and qualitative research methodological perspectives. We engage in our research a practitioner and a mix of four US, two racialized minority, and one international faculty, as well as students. SLIS typically has 10% racialized minority graduate students and 25% first generation graduate students, and SPPA typically has 20% racialized minority and 32% first generation graduate students. We have already identified graduate students from underrepresented groups in the newly admitted student cohorts in the SLIS and SPPA programs, whom we will hire as research assistants. These assistants will be actively engaged in all aspects of the project. We will seek to involve undergraduate students from underrepresented groups in the Summers of 2024 and 2025 through the UI's Summer Research Opportunities Program, a program that brings undergraduate students from underrepresented groups to campus for an intensive research experience in preparation for graduate school.

In addition, to ensure that both the methodology and study results meet the needs of our target group, i.e., librarians across the country, we will form an advisory board. The Board will include 8-10 library practitioners (as we did for our pilot study to gather practitioners' input and feedback), 2-3 social work experts (in the pilot study, discussions with practitioners revealed the importance of social work-adjacent programs in libraries, e.g., referral services), and a representative of OCLC's WebJunction who will ensure that findings are useful to all US librarians. We will invite the East Central Iowa librarians who guided our pilot study (a racially diverse group) to continue to participate in our advisory board because they serve a wide range of libraries, showed great commitment to the project, and have provided invaluable guidance. As we invite other members, we will aim for 50% racialized minority board members in total. We have already identified potential members. We will meet with our advisory board in person (with Zoom options if needed) twice per year, early September and early January. The board will review our research instruments (survey and interview questions), provide input on preliminary results, and they review our dissemination materials to make sure that what we produce is directly useful to librarians.

The project itself (the survey, results, and dissemination of findings), will strengthen the library field's commitment to diversity, equity, and inclusion practices by elevating the importance of libraries' role for community resilience, especially as they function as hubs that provide vital services for the most disadvantaged community members at times of greatest need.

4. Project Results

At the conclusion of the project, we will know what programs and practices libraries across the US implement in response to local economic, climate, health, and disinformation threats, what factors facilitate and hinder adoption of those programs, how libraries communicate those programs to their communities, and how communities become more resilient as a result, in terms of economic, social, health, and information resources.

The results will advance knowledge about libraries as they function as community resilience hubs. It will advance knowledge about the place of local libraries as core institutions of resilience for disciplines such as sociology, public policy or urban planning that typically do not consider libraries' contributions. It will benefit libraries and librarians who be in a better position to compare their practices to others', to better understand the position of libraries vis-a-vis resilience, and it will provide them useful evidence to advocate for more support for the vital services they provide. Finally, it will benefit local, state, and federal agencies, as well as philanthropic organizations who support libraries by highlighting which programs most effectively support community resources, wellbeing, and resilience, especially for the most vulnerable community members, the beneficiaries of this study.

The deliverables will be readily and freely available, generalizable to all US states and territories, and directly useful to libraries librarians, as well as to institutions interested in resilience (e.g., FEMA, Economic Development agencies).

We take multiple approaches to sustain the benefit(s) of our project beyond the project period. We will share our findings with target groups (library staff, directors, managers and educators) at practitioner, educator, and academic library conferences throughout the funding period, including the American Library Association, Public Library Association, Association for Rural and Small Libraries, Association for Library and Information Science Education. We will also provide training and education materials such as workshops and open-access resources that will be available to all librarians nationwide. They will also be available in partnership with Region 6 of the Network of the National Library of Medicine (NNLM) and in conjunction with OCLC's WebJunction continuing education program, drawing on their proven networks of delivering education and training to frontline library staff (see Appendix 3 for documentation of support).

Finally, we will publish a full report distributed to all U.S. libraries through available state library listservs and the PUBLIB Electronic Discussion List, and to funding agencies – IMLS and philanthropic organization, e.g., the Bill and Melinda Gates Foundation, the Laura Bush Foundation, the Roy J. Carver Trust, and the H.W. Wilson Foundation. We will also publish two to three open access articles in LIS practitioner magazines (American Libraries; Public Libraries), and four to five open access articles in scholarly journals (*Library Quarterly*; *Library & Information Science Research*; *Information Research*; *Public Library Quarterly*; *Evidence-Based Library & Information Practice*). We will also create media products: new podcasts and contributions to Public Library Association's "FYI" and American Libraries' "Dewey Decibel" podcasts, as well as webinars linked to training sessions and podcasts.

Project timeline and lead personnel

Research Question	Tasks and lead researcher	Prior to project start	Year 1 (2023-24)			Year 2 (2024-25)			Year 3 (2025-26)		
			Fall	Spr.	Sum.	Fall	Spr.	Sum.	Fall	Spr.	Sum.
	Hire Graduate Research Assistants (GRAs) (Vamanu, Laurian)	X			X			X			
Question 1. Impact of public libraries on socio-economic outcomes	Merge, clean, and code IMLS data (Logsden, Glanville); census data (Nguyen); social capital data (Glanville); and link data (Nguyen, GRAs)		X								
	Mapping and spatial econometric analysis (Qian, Nguyen)		X	X							
	Write findings of spatial socio-economic analyses (led by Qian, all team members)			X	X						
	Disseminate results (Logsden, Vamanu)					X					
Question 2. Library programs addressing community stressors	Finalize survey and interview questionnaires (Vamanu, Laurian, Logsden, Gilster)		X								
	Obtain IRB approval for survey and interviews (Vamanu)			X							
	Implement survey (Logsden)				X						
	Analyze and write up survey results (led by Laurian, all team members)				X	X					
	Collect and analyze social media communication of libraries in the survey (Kao)										
	Disseminate results (Logsden, Vamanu)						X				
Question 3a-3b. Factors that drive the adoption of resilience-boosting programs	Select interviewees (Vamanu)					X					
	Conduct interviews (Vamanu, with GRAs and all team members)						X	X			
	Analyze interviews (Vamanu, Logsden, Gilster, GRAs)							X	X		
Question 3c. How libraries communicate	Social media data collection and analysis (Khao)						X	X	X		
Dissemination of findings and lessons learnt	Conference presentations, workshops, webinars, blogs, papers (Vamanu, Logsden, all team members)								X	X	X

DIGITAL PRODUCT PLAN

SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS

A.1 What will be the intellectual property status of the digital products (i.e., digital content, resources, or assets; software; research data) you intend to create? What ownership rights will your organization assert over the files you intend to create, and what conditions will you impose on their access and use? Who will hold the copyright(s)? Explain and justify your licensing selections. Identify and explain the license under which you will release the files (e.g., a non-restrictive license such as BSD, GNU, MIT, Creative Commons licenses; RightsStatements.org statements). Explain and justify any prohibitive terms or conditions of use or access, and detail how you will notify potential users about relevant terms and conditions.

We will generate three types of digital products: *dissemination documents; data products*; and *scholarship.*

Dissemination documents are evidential materials by means of which we plan to share our findings and evidence-based suggestions outside scholarly contexts. They include (a) four reports (three short and one comprehensive); (b) one webinar; and (c) two podcasts.

> (a) All four reports will be owned by the team; hosted by the Iowa Research Online (IRO), a University of Iowa (UI) repository of digital documents; and published under a Creative Commons Attribution 4.0 license. This arrangement allows the project's various audiences (e.g., public librarians, social workers, researchers) to access, publish, share, and readapt documents to their own goals and contexts. These reports will include attribution to the PI and all relevant stakeholders (advisory board, team members, and participants) and IMLS for supporting the project. The PI will provide a clear overview of the license details including attribution and how the reports can be re-purposed.
>
> (b) The webinar will be produced in collaboration with WebJunction, a program of OCLC Research, and will be owned by OCLC. However, they will make the webinar freely available through their website.
>
> (c) The two podcasts will be produced in collaboration with the Public Library Association (the "FYI" series) and American Libraries Association (the "Dewey Decibel" series) and will be owned by these two entities. However, they will make the webinar freely available through their website.

Data products include deidentified raw survey data, interview data, digital maps, and tweet data. If participants in the interviews consent, the PI will make the interview data available to facilitate reuse. In those instances where participants do not consent, the PI will make clear what data is not available. The PI will add the data products to IRO and make it available pending access protocols from UI's IRB office to protect participant confidentiality.

Scholarship includes journal articles and conference presentations. The articles will be published in open access venues (e.g., in the *Information Research* journal) and in at least one venue which provide this option for a fee (e.g., *Library Quarterly*; *Library and Information Science Research; Public Library Quarterly;* and/or *Evidence-Based Library & Practice*). A copy of each open access publication will be added to the UI's IRO repository. Whenever open access is not available, we will attempt to negotiate agreements to publish pre-print versions of these scholarly documents.

A.2 What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

We will have ownership of the *reports*, *data products*, and *scholarship documents*. We will have the UI's IRB approval for all the aspects of this project. In particular, the data we collect will be de-identified. The *reports* will be open access on IRO and published under a Creative Commons Attribution 4.0 license. *Data products* which participants consent to being accessible will be subject to access protocols developed by UI's IRB office. Ownership of the *scholarship documents* will vary depending on agreements with publishers; however, we will promote wide access to them through various channels (conferences, social media platforms, etc.).

A.3 If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

All team members involved in data collection will have an IRB-approved information sheet. In addition, the PI will limit access to data products and require confidentiality agreement from re-users. Dissemination documents and scholarship will contain no sensitive information.

SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS

A.1 Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and the format(s) you will use.

Asset	Description	Quantity	Format
Research Reports	Research findings; recommendations	3 short reports 1 comprehensive report	PDF
Maps	Spatial distributions of libraries and social-economic indicators	10-20	TIFF
Tweet data	Tweets published by public libraries. The number of followers for each public library account.	2000-2500 tweets per each of the 100 Twitter accounts	JSON

DATA MANAGEMENT

1. Data Overview: data that will be generated and data collection methods.

We will collect existing secondary data including IMLS Public Libraries Surveys data on all 9,000 library systems in the U.S. for all years between 2010 and 2020, including the library type (single library vs. branch) and library resources (annual budget, staff size, building age and size, size of collections and digital services); as well as community-level census, civic engagement, electoral data (e.g., voter turnout), education, and health data (Step 1).

We will generate primary data, including approximately 1500 survey responses from public library directors (Step 2), and 48 interviews with frontline librarians (Step 3), as well as the content and engagement metrics (e.g., the number of likes and retweets) for 2,000-2,500 tweets of public libraries' official Twitter accounts.

2. Sensitive Information and protections of participants' privacy, rights, and confidentiality

We will collect information from library directors, including the name and location of their library so we can link it to community census data. Thus, we will need to deidentify the data to maintain confidentiality. Survey responses will be de-identified by Dr. Laurian and interview data will be de-identified by Dr. Vamanu to protect respondents' anonymity by assigning participants identification numbers. Participant names and ID numbers will be stored in a locked filing cabinet in Dr. Vamanu's locked office in the University of Iowa Main Library, Room 3068.

All the data shared will be entirely deidentified. None of the materials we produce, including reports, publications, presentations and training materials, will include any reference to any specific person or library, or any information that could identify participant name or information (e.g., we would not say "the Greenville library implements program X," but rather "a library in a town of 5000 implements program X").

3. Requirements and Dependencies

Data collected or generated at Step 1 will be saved and made available for reuse in commercially available software like Stata, ArcGIS, and Microsoft Product Suites (Word, Excel and PowerPoint); data collected or generated at Step 2 will be saved in Excel, SPSS, and STATA formats and will be made available for use via any spreadsheet or word processing application. Data collected or generated at Step 3 will be saved as .mp3 sound files and .txt files extracted from the Zoom saved meetings and will be made available in the form of summary notes without any indication of the interviewee or their library, so that interviewees cannot be identified. The file will only indicate the state in which the library is located. In addition, Twitter data will be made available as .csv files.

In addition to the data, we will provide the associated metadata: the survey questionnaire and a "read me" codebook to indicate how variables are coded and how new variables and indicators are created. Within the dataset, we will include (in each spreadsheet) column headers (variable explanation) and row data (observation number). Similarly, we will provide the interview questionnaire along with the interview notes.

4. Documentation

Participants' consent for survey and interviews will be confirmed by the first questions confirming informed and voluntary participation. No other consent agreements will be collected.

Dr. Vamanu and Ms. Logsden will archive all data, associated metadata, and study instruments on the IRO server (in standard .txt, .tiff, .json, .doc, .xls, .csv, and .pdf formats and can be accessed using any spreadsheet and word processing application). The associated metadata will include: the survey questionnaire and a "read me" codebook to indicate how variables are coded and how new variables and indicators are created. Within the dataset, we will include (in each spreadsheet) column headers (variable explanation) and row data (observation number). Similarly, we will provide the interview questionnaire along with the interview notes. Analytical information will be captured with saved programming code (e.g., STATA codes).

We will make the data and metadata available on the IRO website with a permanent URL, and accessible through the University of Iowa Libraries. The unique URL linking to this data will be made available through citations and data availability statements in publications and on the SLIS website. Dr. Vamanu and Ms. Logsden will also save all papers, reports, and training materials with unique and permanent DOIs, so that other researchers or practitioners can use and cite our team's work and data.

5. Post-Project Data Management: Data Preservation and Access

All deidentified raw data, cleaned data, data including the new indicators and variables we will create, and data linked with secondary data (e.g., census data) will be preserved on, and shared through the University of Iowa's open digital repository, Iowa Research Online (IRO) under a Creative Commons License. The data will become available to other users upon the time of the associated publications and digital products, or within two years of the end of the project (whichever comes first), with no time limit on data availability. Access to scientific data will not be controlled.

Dr. Vamanu will make all data, metadata, and study instruments available to all researchers on the Iowa Research Online (IRO) under a Creative Commons License, and include all papers, reports, and training materials with unique and permanent Digital Object Identifiers (DOIs), so that other researchers or practitioners can use and cite our team's work and data in their studies and training sessions with permanent URLs. The unique URL linking to this data will be made available through citations and data availability statements in all publications and digital products.

If Twitter's future data agreement permits (currently it does but this may change), we plan to share the IDs of tweets we collect after the project as open data on GitHub, so that it can be accessed via any web browser. This will help to promote other research on public libraries and facilitate reproduction of our research.

6. Review and Monitoring

The Principal Investigator of the project (Dr. Vamanu) is the custodian of the original data and will also be responsible for monitoring the storage of data on the file server and for sharing scientific data and metadata in compliance with this plan.

The PI will review the data management plan every June to ensure that the above-laid protocol is followed and will modify it if the circumstances require it. The PI will monitor the implementation with the support of Mr. Mark Anderson, the University of Iowa Digital Scholarship and Collections Librarian, who oversees digital publications across UI campus.

ORGANIZATION PROFILE

The **University of Iowa** (UI) is a research-intensive university with the infrastructure and resources expected at such an institution and has been a member of the Association of American Universities since 1909. As a research-intensive university, the libraries at Iowa contain over five million volumes and provide online access to an extensive list of academic journals. Iowa faculty and students have access to substantial computing facilities, technical expertise, and research facilities. Iowa is also a member of the Inter-University Consortium for Political and Social Research (ICPSR) at the University of Michigan and has full access to many services and resources available within ICPSR. In fiscal year 2021, UI collected over $589 million in grant and contract funds and has a robust research infrastructure in place to assist with the administration of federally funded projects including, the Division of Sponsored Programs, Human Subjects Office, and Grant Accounting Office. In addition, the departments employ full-time administrators and secretaries who will provide necessary support for grant administration, communications support, or materials support that the PI might need.

The multi-disciplinary **Libraries and Resilient Communities** (LARC) faculty research team consists of nine UI faculty and practitioners in **Library and Information Sciences, Planning and Public Affairs, Social Work, Sociology and Criminology,** and **Business**. We have been collaborating on cross-cutting research about the many roles and impacts of public libraries since 2021. The School of Planning and Public Affairs (SPPA), founded in 1964, trains public and nonprofit leaders and serves the state directly with more than 300 community-based projects implemented through the Iowa Initiative for Sustainable Communities since 2009. Founded in 1965, the School of Library and Information Sciences (SLIS) trains librarians, archivists, and information specialists. The School of Social Work dates to the late 1920s and engages in outreach across the state. The Tippie College of Business and Department of Sociology and Criminology are, similarly, well established. The team is also supported by the Public Policy Center (PPC), an independent research center whose mission is to facilitate applied and policy-relevant interdisciplinary collaborations.