

HEAT WAVES

Designing a Heat Action Plan to Mitigate Disproportionate Impacts of Urban Heat Island Effect in Underserved Communities in Omaha, NE

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Heat Waves: Designing a Heat Action Plan to Mitigate Disproportionate Impacts of Urban Heat Island Effect in Underserved Communities in Omaha, NE

Submission Format

1. Cover Page
 - a. Project title: Heat Waves: Designing a Heat Action Plan to Mitigate Disproportionate Impacts of Urban Heat Island Effect in Underserved Communities in Omaha, NE
 - b. Researchers:
 - i. (PI): Salvador Lindquist, Assistant Professor, University of Nebraska - Lincoln, slindquist@unl.edu, (402) 450-6460
 - ii. (co-PI): Abigail Cochran, PhD, Assistant Professor of Community and Regional Planning, University of Nebraska–Lincoln, acochran@unl.edu, (402) 472-9212
2. Detailed Budget Page
3. Main Proposal Text
 - a. Abstract
 - b. Research Problem Statement
 - c. Background and Significance
 - d. Objectives of Study
 - e. Work Plan including schedule of activities
 - f. References
4. Deliverables
5. Summary CV

Detailed Budget

	Budget Item	Amount	Subtotal
a.	Supplies		
	Teledyne FLIR - Thermal Imaging Camera (\$650)	\$650	
	Community Workshops (\$1,000 x3)	\$3,000	
	Presentation Prints	\$500	
	Total Supplies Expenses		\$4,100
b.	Travel		
	Student Case Study Fieldwork/Research (\$1000 x 5)	\$5,000	
	Total Travel Expenses		\$5,000
c.	Personnel		
	Questionnaire Development - Research Assistant (\$2,000)	\$2,000	
	1-month PI Summer Salary	\$7,817	
	Total Personnel Expenses		\$9,817
d.	Institutional Indirect Costs		
	University Indirect Cost (12%)	\$3,000	
	Total Indirect Cost Expenses		\$3,000
e.	Other		
	Survey Incentive (120 x \$25 gift cards)	\$3,000	
	Total Other Expenses		\$3,000
	Total Expenses		\$24,967

Abstract

This study builds on a transdisciplinary collaboration between the City of Omaha, University of Nebraska Medical Center, University of Nebraska - Lincoln College of Architecture, and Community-based Organizations to develop a Heat Action Plan to mitigate the disproportionate impacts of urban heat island effect in underserved communities in Omaha, NE.

Research Problem Statement

Extreme heat kills more people in the United States than any other natural disaster. These effects are more pronounced in urban environments, where buildings, roads, and other infrastructure absorb and re-emit the sun's heat, otherwise known as urban heat island effect. The increasing intensity, duration, and frequency of heat waves disproportionately impact underserved populations in a heightened state of precarity. There is a significant gap in the research on applied approaches to integrating mitigation and adaptation strategies for addressing extreme heat, particularly in underserved communities. Omaha, NE, a 'hypersegregated' city, would benefit from a transdisciplinary heat action plan.

Background and Significance

Urban heat resilience is a growing issue as extreme heat kills more people in the United States than any other natural disaster (Berko, 2014). The earth consistently faces increased heat waves, in which 15 of the 16 warmest years on record have occurred during this century. This year, 2022, is expected to rank among the 10 hottest years in annual global temperature readings (NOAA, 2022). Rising temperatures contribute to the intensification of environmental threats, such as drought and rising sea levels. Higher average temperatures also raise health risks by leading to increased energy use and subsequently pollution. According to the Intergovernmental Panel on Climate Change (IPCC), we face longer continuous stretches of higher temperatures that pose greater health risks than isolated extreme heat events. Heat-related illnesses, such as heat stress, asthma, and malaria, are expected to claim an additional 250,000 lives between 2030 and 2050 (Neira, 2016). These effects are more pronounced in urban environments, where buildings, roads, and other infrastructure absorb and re-emit the sun's heat—a phenomenon known as urban heat island effect (EPA, 2022).

Today, researchers think of the heat island as more of an archipelago, where hot spots are heterogeneously distributed throughout a city in locations with higher concentrations of concrete and asphalt, whereas cooler temperatures can be found around trees, parks, or other open space (Borunda, 2021). The increasing intensity, duration, and frequency of heat waves have been found to disproportionately impact underserved populations in a heightened state of precarity. In a study of 108 urban areas nationwide, the formerly redlined neighborhoods of nearly every city studied were hotter than the non-redlined neighborhoods, some by nearly 13 degrees Fahrenheit (Hoffman, 2020). Redlining is the historical discriminatory practice of refusing home loans or insurance to whole neighborhoods based on a racially-motivated perception of safety for investment.

Omaha, NE is one such example of a city that suffers from the lingering impacts of redlining, consistently rated among the top 50 most segregated cities in the US (UC Berkeley, 2020). The Omaha metropolitan area has been categorized as a 'hypersegregated' city, which is a term used to describe metropolitan areas in which African Americans were highly segregated in at least four of five dimensions of segregation: unevenness, isolation, clustering, concentration, and centralization (Massey, 2015). An ongoing study of extreme heat in Omaha has found a 10 degree difference in historically redlined neighborhoods (Abdoulaye, 2022). Along with disproportionate heat intensity, redlined neighborhoods in Omaha are also faced with increased levels of lead and coal contamination. In 1999, the EPA found that residential yards in eastern Omaha, including the historically redlined and segregated Black community of North Omaha, had high concentrations of lead due to

historic industrial air emissions; as a result, this area was designated as a Lead Superfund Site (EPA, 2017).

These environmental injustices have not gone without notice. The EPA has since remediated more than 13,000 residential properties at the superfund site between 1999 and 2015 (EPA, 2017) and recently, the City of Omaha has announced plans to develop a climate action plan to be completed by June 2024. According to Omaha Mayor, Jean Stothert, tackling extreme heat is among the goals of the plan. Heat action plans have been gaining traction as a process for identifying both mitigative and adaptive strategies for countering heat intensity, especially as a form of addressing environmental injustices (TNC, 2019)(Guardaro, 2020). Mitigating the inequitable distribution of intense surface temperatures requires a multifaceted approach incorporating policy, public health, urban planning, and landscape strategies. Designing resilient cities requires an understanding of how they can “persist, adapt, and transform in the face of stress, while maintaining their function and identity” (Meerow & Newell, 2016).

This study aims to build upon a collaborative partnership between the City of Omaha Planning Department, University of Nebraska Medical Center, and the University of Nebraska - Lincoln College of Architecture to develop a Heat Action Plan. There are a myriad of potential solutions to extreme heat, but there is no one-size-fits-all approach. It is crucial to recognize that impactful collaborations require the “collective capacity of academic, health, and environmental leaders, along with the communities themselves” to develop a coordinated plan that transcends silo-based actions and limited nature-based solutions (NbS) (Kabisch, 2016)(Guardaro, 2020).

Developing a heat action plan through a participatory process will contribute to the development of mitigation and adaptation strategies that work for a particular context. Urban heat solutions generally fall into two categories, mitigation and adaptation (TNC, 2019). Mitigation involves reducing the heat of the urban environment through a variety of nature-based and architectural interventions, including increasing shade through tree planting, using high albedo surfaces, and reducing greenhouse gas emissions. Adaptation is the adjustment to environmental conditions by changing behavior to deal with the increased intensity of extreme heat. These can include strategies such as taking alternative forms of transportation, providing free public drinking water, and opening a cooling center. Equitable access to shade and sensible microclimates are often perceived as an amenity, but should be considered a public health concern (Bloch, 2019). As deadly heat waves become commonplace, we must consider it as a civic resource shared by all.

Objectives of Study

The primary goal of this study is to design a heat action plan for the City of Omaha in collaboration with the municipal planning department, University of Nebraska Medical Center (UNMC), and the University of Nebraska - Lincoln College of Architecture (UNL). Three objectives are embedded within this process, 1) Incorporate service learning in addressing issues of environmental justice in design pedagogy, 2) Build community around the collective process of consensus building in the development of mitigative and adaptive strategies, and 3) Collect qualitative data to supplement ongoing quantitative measures of heat disparity in historically redlined communities

Service Learning

Service-learning is a “pedagogical method wherein students apply what they learn in the classroom and work with community groups to address real-life problems” (definition adapted from Learn and Serve America). When implemented according to standards of best practice, service-learning can enhance academic learning, promote civic responsiveness, and strengthen communities (Ellenburg, 2018). Public health and landscape architecture students from UNMC and UNL, respectively, will collaborate on contributing to the design and development of Omaha’s heat action plan.

Community Building

Beyond building a community Heat Action Plan and completing demonstration projects, a participatory process will be designed to develop awareness, agency, and social cohesion in underrepresented communities. A collaborative process will serve as a model for critically engaging in heat resilience efforts to create a local, contextual, and culturally appropriate vision of a safer, healthier future. The iterative participatory process will produce an outline for context-specific mitigation and adaptation strategies.

Collection of Qualitative Data

As part of a past study, quantitative data was collected in Omaha through surface temperature sensor readings to compare heat intensity between historically redlined areas in Omaha to non-redlined areas. The development of predictive models to identify priority zones to focus funding and implementation projects additionally requires a qualitative understanding. This study will develop a survey to be distributed as part of the community workshops to contribute to better understanding key perspectives in disproportionately affected communities.

Work Plan

The development of the heat action plan hinges on the collective effort of a transdisciplinary team consisting of municipal decision makers, community-based organizations, and technical advisors. The City of Omaha Planning Department will serve as the primary voice for considering and implementing mitigation and adaptation strategies developed as part of the Heat Action Plan. The community voice will consist of groups currently participating in ongoing efforts in heat action planning in Omaha. The technical team consists of the PI and Co-PI's on the grant along with representatives from the Architectural Engineering firm, Smithgroup.

The work plan for this study is structured into five phases: 1) Case Study Research and Fieldwork, 2) Workshops, 3) Post-workshops, 4) Neighborhood Selection, and 5) Pilot Project Prototypes.

Case Study Research and Fieldwork

In beginning the research on developing the heat action plan, landscape architecture students from UNL and students in public health from UNMC will conduct case study research to identify prevailing mitigation and adaptation strategies in addressing extreme heat. The landscape architecture students will research Nature-based Solutions (NbS) and their consequential landscape performance benefits, while students in public health from UNMC will identify typologies of adaptive solutions. As part of the case study research on NbS, students will travel to visit with designers, planners, and policy makers that have participated in the implementation of landscape projects focused on heat mitigation. Following the case study research, the landscape architecture studio will then map Omaha to better understand existing conditions, including the inventory and analysis of the distribution of surface temperature, demographics, open space, transportation, among other spatial factors.

Workshops

Through three participatory planning workshops, qualitative data will be collected to better understand how Omaha residents cope with rising temperatures. This will be accomplished through storytelling from residents, the core team, and advisors. Workshop I will focus on the discovery of major concerns and potential actions, workshop II will invite designers and decision-makers to hear concerns and determine feasible actions, and workshop III will focus on making decisions about priorities for implementation.

Post-workshops

Workshop materials will be reviewed and analyzed to co-develop a community Heat Action Planning framework. The draft will be circulated within communities to gain momentum and agreement on heat action priorities and solutions. Community-based organizations, along with self-selected resident leaders and the core team, will present their Heat Action Plans to city officials and county planners in 2023. The goal for these plans is that their components be implemented as pilot projects for mitigating urban heat and that they become part of the larger heat mitigation efforts currently underway. The qualitative data will then subsequently be analyzed to contribute to the development of predictive models that will assist in the identification of priority sites and neighborhoods in Omaha.

Neighborhood Selection

The Heat Action Planning core team will examine a variety of potential criteria to select neighborhoods to develop pilot projects. The team will weigh each criterion based on importance and use the top five criteria for selecting neighborhoods. By consensus, the core team will select three neighborhoods with challenges and opportunities for growth. The criteria for neighborhood and pilot project selection are adapted from The Nature Conservancy (2019) including heat, usage, history and opportunity, community cohesion, and health and vulnerability (figure 1).

Categories	Potential Criteria
Heat	Vegetation coverage Vegetation index Surface temperature
Usage	Use of public spaces Transit usage
History and Opportunity	Land vacancy Community presence Slated housing, renovation, or capital improvement projects
Community	Sense of community identity Potential for mutual learning History of engagement
Health and Vulnerability	Rate of heat deaths/heat-related illnesses Household income Rates of self-reported heat concerns Availability of heat-related infrastructure

Figure 1. Adapted from The Nature Conservancy's "Heat Action Planning Guide."

Pilot Project Prototypes

A goal of the heat action plan is to produce impact by identifying potential pilot projects for implementation. The case study research and fieldwork, participatory process, and neighborhood selection will provide the impetus for undergoing a prototypical design process which integrates both mitigation and adaptation strategies in the built environment. This process will take place in the landscape architecture design studio. Students will participate throughout the process to synthesize crucial input and context to develop designs to assist in the visualization of potential implementation projects. The visualization of the potential built solutions will assist in obtaining consensus, funding, and building excitement in envisioning a more just and equitable urbanity.

References

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Environmental Protection Agency. (2022, July 21). *What You Can Do to Reduce Heat Islands*. EPA. Retrieved September 20, 2022, from <https://www.epa.gov/heatislands/what-you-can-do-reduce-heat-islands>

Environmental Protection Agency. (2022, April 18). *Heat Islands and Equity*. EPA. Retrieved September 20, 2022, from <https://www.epa.gov/heatislands/heat-islands-and-equity>

Guardaro, M., Messerschmidt, M., Hondula, D. M., Grimm, N. B., & Redman, C. L. (2020). Building Community Heat Action Plans Story by story: A three neighborhood case study. *Cities*, 107, 102886. <https://doi.org/10.1016/j.cities.2020.102886>

Hoffman, J. S., Shandas, V., & Pendleton, N. (2020). The effects of historical housing policies on resident exposure to intra-urban heat: A study of 108 US urban areas. *Climate*, 8(1), 12. <https://doi.org/10.3390/cli8010012>

Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M. K., Artmann, M., Haase, D., Knapp, S., Korn, H., Stadler, J., Zaunberger, K., & Bonn, A. (2016). Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action. *Ecology and Society*, 21(2). <https://doi.org/10.5751/es-08373-210239>

Massey, D. S., & Tannen, J. (2015). A research note on trends in black hypersegregation. *Demography*, 52(3), 1025–1034. <https://doi.org/10.1007/s13524-015-0381-6>

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Neira, M., & Prüss-Ustün, A. (2016). Preventing disease through Healthy Environments: A global assessment of the environmental burden of disease. *Toxicology Letters*, 259. <https://doi.org/10.1016/j.toxlet.2016.07.028>

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Deliverables

Heat Action Plan Report

- a. Case Study Research
 - i. Catalog of existing Nature-based Solutions to mitigative landscape architecture and planning
 - ii. Catalog of policy-based adaptive solutions
- b. Field Work
 - i. Inventory and analysis of Omaha, NE
 - 1. Potential Maps
 - a. Demographics
 - b. Surface Temperature
 - c. Transportation
 - d. Community-based Organizations
 - e. Open Space
 - f. Vegetation Cover and Index
 - g. Land Vacancy
- c. Qualitative Analysis
 - i. Community Input Executive Summary
 - ii. Survey Results and Analysis
 - iii. Integrative qualitative and quantitative predictive model
- d. Priorities and Opportunities Map
- e. (4) Speculative Design Prototypes

Salvador Lindquist

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1. EDUCATION

- 2018 - 2019 **University of Michigan - Taubman College**
2000 Bonisteel Blvd, Ann Arbor, MI 48109
Master of Urban Design with High Distinction
Thesis: Incinerator Incorporated: Designing Just Communities in Detroit, MI
Advisor: María Arquero de Alarcón
- 2009 - 2014 **University of Nebraska - Lincoln**
1400 R St, Lincoln, NE 68588
Major: Landscape Architecture
Minor: Community and Regional Planning

2. RESEARCH + TEACHING APPOINTMENTS

- 2020 - Current **Assistant Professor - Landscape Architecture**
University of Nebraska-Lincoln, Lincoln, NE
- 2020 **Lecturer - Landscape Architecture**
University of Nebraska-Lincoln, Lincoln, NE
- 2019 **Graduate Student Instructor (GSI)**
University of Michigan, Ann Arbor, MI
- 2019 **Research Assistant**
RVTR, Ann Arbor, MI
- 2019 **Research Assistant**
EXTENTS, Ann Arbor, MI
- 2014 **Research Assistant**
University of Nebraska - Lincoln, Lincoln, NE
- 2013 **International Service-Based Learning**
University of Nebraska - Lincoln, Puerto Ayora, Galapagos
- 2013 **Teaching Assistant**
University of Nebraska - Lincoln, Lincoln, NE

3. GRANTS/FUNDING

- Agency/Title of Grant:** UNL Internal Seed Grant / Beyond Compliance: Accessibility in Greenway Planning and Design
- Duration of Funding:** July 14, 2022 - July 14, 2022
- Funding Amount:** \$10,000
- Role:** Primary Investigator
- Responsibility:** 100%

Agency/Title of Grant: Enright Professorship
Duration of Funding: May 10, 2022 - May 10, 2024
Funding Amount: \$20,000
Role: Primary Investigator
Responsibility: 100%

Agency/Title of Grant: Landscape Architecture Foundation (LAF) Case Study Investigation (CSI) /
“Dequindre Cut”
Duration of Funding: February 2, 2022 - August 3, 2022
Funding Amount: \$5,600
Role: Primary Investigator
Responsibility: 100%

Agency/Title of Grant: Center for Transformative Teaching Grant / “Artsapes in Marginalia”
Duration of Funding: August 1, 2021 - August 1, 2022
Funding Amount: \$1,000
Role: Primary Investigator
Responsibility: 100%

Agency/Title of Grant: Emergency Research Gap Funding Program
Funding Amount: \$2,000

4. PUBLICATIONS + CONFERENCES

a. BOOK CONTRIBUTIONS

Fritz, D., Muzika, R.M., Anania, K., Buller, R., **Lindquist, S.** (2023). *Field Guide to a Hybrid Landscape*. University of Nebraska Press.

Lindquist, S. (2022). Spatial Justice: Design Agency in the Production of Space. In E. Cain, R. A. Filback, & J. Crawford (Eds.), *Cases on Academic Program Redesign for Greater Racial and Social Justice* (pp. 41–64). essay, Information Science Reference.

b. REFEREED ARTICLES

Lindquist, S. (2019). Bustees to Blots: The Bangladeshi Pursuit of Community. *Agora Journal of Urban Planning and Design*, 76–83.

Lindquist, S., & Eric, M. (2019). Power Plant Power. *Scenario Journal 07: Power*.
<https://doi.org/https://scenariojournal.com/article/power-plant-power/>

Lindquist, S., & Sutton, R. K. (2015). Storing Carbon in Green Roofs: Above- and Below-Ground Biomass of Blue Grama and White Stonecrop. *RURALS: Review of Undergraduate Research in Agricultural and Life Sciences*, 9(1).
<https://doi.org/http://digitalcommons.unl.edu/rurals/vol9/iss1/1>

c. REFEREED CONFERENCE ABSTRACTS AND PRESENTATIONS

Essink, J., **Lindquist, S.** (2022). *Omaha Lead Pollution: Proactive and Restorative Strategies for Environmental Justice in Landscape Architecture*. Environmental Design Research Association (EDRA 53) Greenville, SC.

Lindquist, S. (2022). *Spatial Justice: Design Agency in the Production of Space*. Council of Educators in Landscape Architecture (CELA) National Conference Proceedings. Santa Ana Pueblo, NM.

Lindquist, S. (2022). *Artsclapes in Marginalia*. Council of Educators in Landscape Architecture (CELA) National Conference Proceedings. Santa Ana Pueblo, NM.

Lindquist, S., & Onwenu, S. (2021). *Artsclapes in Marginalia - Gamechanger Presentation*. American Society of Landscape Architecture (ASLA) National Conference Proceedings. Nashville, TN.

Lindquist, S. (2021). *Incinerator Incorporated: Entangling Land Tenure, Governance, Service Provision, and Urban Morphology*. Environmental Design Research Association (EDRA 52) Detroit: Just Environments - Transdisciplinary Border Crossings. National Conference Proceedings. Detroit, MI.

Lindquist, S. (2020). *Give a Park, Get a Park*. DETROIT DESIGN 139 Pecha Kucha, Inclusive Futures: Housing, Public Spaces, Economy, Neighborhoods and City Systems. Detroit, MI.

Education

- 2020 **University of California, Berkeley**
Ph.D., City and Regional Planning
Dissertation, *The travel behavior of people with disabilities in the era of ridehailing*
Advised by Drs. Daniel Chatman (Chair), Karen Chapple, and Karen Trapenberg Frick
- 2016 **University of California, Berkeley**
M.C.P. with specialization in Transportation Policy and Planning
Client Report, *Is ignorance bliss? Impact of real-time information on commuter perceptions of transit network usability*; Advised by Drs. Paul Waddell (Chair) and Karen Trapenberg Frick
- 2014 **University of Arizona**
B.S. with honors, Ecology and Evolutionary Biology; Summa Cum Laude
Honors Thesis, *The urban ecology of Gila Topminnow: A case study of population health in built environments*; Advised by Drs. Peter Reinthal (Chair) and Philip Rosen

Academic Positions

- 2022–Present **University of Nebraska–Lincoln**
Assistant Professor of Community and Regional Planning
- 2020–Present **University of North Carolina at Chapel Hill**
Postdoctoral Research Associate, Department of City and Regional Planning

Peer-Reviewed Publications (Selected)

- Cochran, Abigail L., Noreen C. McDonald, Lauren Prunkl, Emma Vinella-Brusher, Jueyu Wang, Lindsay Oluyede, and Mary Wolfe. 2022. “Transportation Barriers to Care among Frequent Health Care Users during the COVID Pandemic.” *BMC Public Health* 22 (1): 1783. <https://doi.org/10.1186/s12889-022-14149-x>.
- Vinella-Brusher, Emma, **Abigail L. Cochran**, Evan Iacobucci, Jueyu Wang, Mary Wolfe, Lindsay Oluyede, Lauren Prunkl, and Noreen C. McDonald. “Potential of Telehealth to Mitigate Transport Barriers: Evidence from the COVID-19 Pandemic.” *Findings* (July): 37060. <https://doi.org/10.32866/001c.37060>
- Oluyede, Lindsay, **Abigail L. Cochran**, Mary Wolfe, Lauren Prunkl, and Noreen McDonald. 2022. “Addressing Transportation Barriers to Health Care during the COVID-19 Pandemic: Perspectives of Care Coordinators.” *Transportation Research Part A: Policy and Practice* 159 (May): 157–68. <https://doi.org/10.1016/j.tra.2022.03.010>.
- Oluyede, Lindsay, **Abigail L. Cochran**, Lauren Prunkl, Jueyu Wang, Mary Wolfe, and Noreen C. McDonald. 2022. “Unpacking Transportation Barriers and Facilitators to Accessing Health Care: Interviews with Care Coordinators.” *Transportation Research Interdisciplinary Perspectives* 13 (March): 100565. <https://doi.org/10.1016/j.trip.2022.100565>.
- Wang, Jueyu, Noreen McDonald, and **Abigail L. Cochran**. 2021. “Health Care Visits During the COVID-19 Pandemic: A Spatial and Temporal Analysis of Mobile Device Data.” *Health & Place*, September, 102679. <https://doi.org/10.1016/j.healthplace.2021.102679>.
- Cochran, Abigail L., Jueyu Wang, Lauren Prunkl, Lindsay Oluyede, Mary Wolfe, and Noreen McDonald. 2021. “Access to the COVID-19 Vaccine in Centralized and Dispersed Distribution Scenarios.” *Findings*, May, 23555. <https://doi.org/10.32866/001c.23555>.
- Cochran, Abigail L., and Daniel G. Chatman. 2021. “Use of App-Based Ridehailing Services and Conventional Taxicabs by Adults with Disabilities.” *Travel Behaviour and Society* 24 (July): 124–31. <https://doi.org/10.1016/j.tbs.2021.02.004>.
- Cochran, Abigail L. 2020. “Impacts of COVID-19 on Access to Transportation for People with Disabilities.” *Transportation Research Interdisciplinary Perspectives* 8 (November): 100263. <https://doi.org/10.1016/j.trip.2020.100263>.
- Cochran, Abigail L. 2020. “Understanding the role of transportation-related social interaction in travel behavior and health: A qualitative study of adults with disabilities.” *Journal of Transport & Health* 19 (December). <https://doi.org/10.1016/j.jth.2020.100948>.

Patents

Caywood, Matthew, **Abigail Cochran**, Ryan Croft, and Diego Canales Salas. Apparatus and Method for Quantifying Multimodal Transportation Resources at a Geographic Location. U.S. Patent 10,380,891, issued August 13, 2019.

Research Grants

North Carolina Department of Transportation, “Impacts of Medicaid Transformation on North Carolina Public Transit Systems: Lessons Learned and Best Practices” (Co-PI with Dr. Noreen McDonald), \$162,607, 2022–2023.

Recent Conference Papers & Presentations (Selected)

Abigail L. Cochran and Noreen McDonald. 2021. “Transportation barriers to health care access during the COVID-19 pandemic among North Carolina residents” Paper accepted for presentation at the 2021 NCDOT Research & Innovation Summit, October 2021 ([virtual](#), start 43:10); and the ACSP Annual Conference, Miami, FL, October 2021 (virtual).

“Transportation’s Critical Role in the COVID-19 Vaccine Rollout” Southeastern Transportation Research, Innovation, Development and Education (STRIDE) Center Webinar, June 2021([virtual](#)).

“Transportation to Health Care and COVID-19: Exploring Pandemic-Era Travel Trends and Post-Pandemic Challenges and Opportunities” STRIDE Center Webinar, June 2021([virtual](#)).

Zhang, Xiaojian, Yu Yang, **Abigail L. Cochran**, Noreen McDonald, and Xilei Zhao. 2021. “Optimizing Demand-Responsive Paratransit Operations: A Mixed Integer Programming Approach.” In *2021 55th Annual Conference on Information Sciences and Systems (CISS)*, 1–6.

<https://doi.org/10.1109/CISS50987.2021.9400283>.

Teaching & Curriculum Development**University of California, Berkeley**

Spring 2019 CY PLAN 101 Introduction to Urban Data Analytics (lecture/lab), Created course and taught as Co-Instructor with Dr. Karen Chapple

Fall/Spring 2017–2019 CY PLAN 280C Doctoral Colloquium in City & Regional Planning (lecture/speaker series), Co-Organizer and Co-Instructor

Summer 2018 CY PLAN 114 Introduction to Urban and Regional Transportation (lecture), Instructor

Fall/Spring 2015–2017 ESPM 175 A/B Senior Thesis Research in Environmental Sciences (lecture/lab), Graduate Student Instructor

University of Arizona

Spring 2014 SBE 201 Sustainable Design & Planning, Assistant Instructor

Summer 2013 PLG 301 Introduction to Regional Planning (online), Assistant Instructor

Membership & Service (Selected)**Affiliations and College/Departmental Service**

Association of Collegiate Schools of Planning; WTS San Francisco Bay Chapter

UC Berkeley CED Graduate Student Council; UC Berkeley DCRP Ph.D. Committee

Community Service

California SB 1376 TNC Access for All Act Working Group Member

Metropolitan Transportation Commission Policy Advisory Council Member, Representing the Disabled Community of Alameda County

LightHouse for the Blind and Visually Impaired (LightHouse Volunteer of the Year 2019)

Fellowships & Awards (Selected)

2020 Eno Center for Transportation Future Leaders Development Conference Fellow

2020 WTS Maggie Walsh Leadership Legacy Scholarship, San Francisco Bay Chapter Award

2016–2019 USDOT FHWA Dwight David Eisenhower Graduate Fellow

2017 UC Berkeley Data Science for the 21st Century (DS421) NSF Fellow

2016–2021 Eugene Cota-Robles Fellow

2014 University of California Center on Economic Competitiveness in Transportation Fellow

2013 Phi Beta Kappa