The Neighborhood Atlas:
Local Health and Social Disadvantage

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Disclosures

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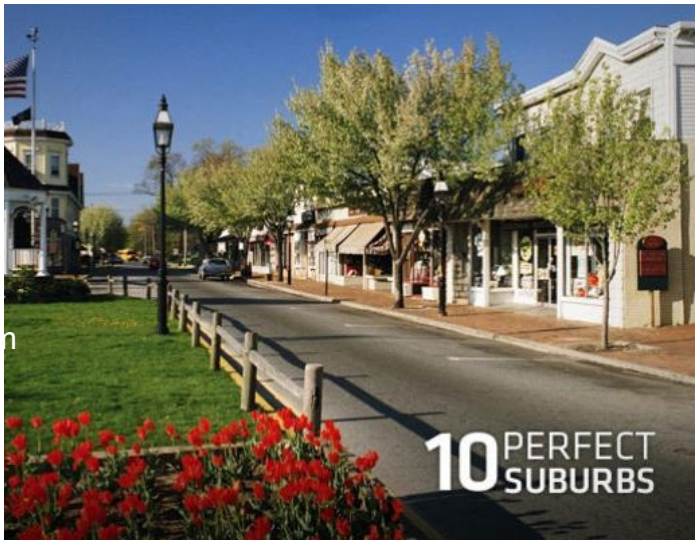
and Health Disparities
US Centers for Medicare and Medicaid Services
US Department of Veterans Affairs
Commonwealth Foundation
UK Alzheimer's Society

We Can Improve Health Here….



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….But Can We Improve Health Here?

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Background

- Alzheimer's disease and many other conditions disproportionately impact racial/ethnic minorities and the socioeconomically disadvantaged—populations often exposed to neighborhood disadvantage

  [Link & Phelan, J Health Soc Behav, 1995;]

- Neighborhood disadvantage influences many factors including health behaviors, access to food, toxic exposures and personal safety

  [Link & Phelan, J Health Soc Behav, 1995; House et al, Milban Q, 1990; Franco et al, Am J Prev Med, 2008; and others]

- Neighborhood disadvantage is a social determinant of health

- Living in a disadvantaged US neighborhood is strongly linked to increased mortality and disease

  [Kind et al, Annals of Int Med, 2014; Link & Phelan, J Health Soc Behav, 1995; House et al, Milban Q, 1990; and others]

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- Context is fundamental to almost all theoretical mechanisms of health disparities

NIMHD Minority Health and Health Disparities Research Framework
Health Disparity Populations: Race/Ethnicity, Low SES, Rural, Sexual/Gender Minority
Other Fundamental Characteristics: Sex/Gender, Disability, Geographic Region

Domains of Influence	Levels of Influence			
	Individual	Interpersonal	Community	Societal
Biological	Biological Vulnerability and Mechanisms	Caregiver-Child Interaction Family Microbiome	Community Illness Exposure Herd Immunity	Sanitation Immunization Pathogen Exposure
Behavioral	Health Behaviors Coping Strategies	Family Functioning School/Work Functioning	Community Functioning	Policies and Laws
Physical/Built Environment	Personal Environment	Household Environment School/Work Environment	Community Environment Community Resources	Societal Structure
Sociocultural Environment	Sociodemographics Limited English Cultural Identity Response to Discrimination	Social Networks Family/Peer Norms Interpersonal Discrimination	Community Norms Local Structural Discrimination	Societal Norms Societal Structural Discrimination
Healthcare System	Insurance Coverage Health Literacy Treatment Preferences	Patient-Clinician Relationship Medical Decision-Making	Availability of Health Services Safety Net Services	Quality of Care HealthCare Policies
Health Outcomes	Individual Health	Family/Organizational Health	Community Health	Population Health

Lifecourse

Source: https://www.nimhd.nih.gov/images/research-framework-slide.pdf

Background

- High-quality studies *[Ludwig, Science 2012 and others]* suggest that neighborhood-level factors impact health independently of individual-level factors
- Health interventions and policies that do not account for neighborhood disadvantage may be ineffective
- Much research in this area relies on application of geospatial analytics to quantify neighborhood disadvantage. This is a specialized field, not widely available
- Key Gap: Neighborhood-level factors are not typically incorporated into existing NIH research data and population resources

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Potential of Geospatial Metrics of Neighborhood Disadvantage

- Metrics of Neighborhood Disadvantage are Robust:
  - Generalizable to full US and Puerto Rico
  - Incorporate into predictive analytics
  - Facilitate mechanistic science across health conditions
  - Privacy-compliant
  - Strong track record of application – mostly abroad
- Translatable: Actionable at person, community, research and policy levels
  - Guide outreach, targeting- particularly through mapping
  - Influence intervention design, implementation
  - Policy-applicable: eligibility, adjustment, resources, etc
- Underutilized: Yet, despite all this potential, greatly underutilized in the US-- not easily accessible nor always in a format that allows wide applicability

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Area Deprivation Index (ADI)

- Originally created by Health Resources and Services Administration nearly three decades ago and employed at the county level
- 17 education, employment, housing-quality and poverty measures originally drawn from long-form Census
- Limitations mirror those of parent data
- Required updates for modern use
- UW team:
  - Updated to more recent and relevant data sources (American Community Survey, 2009-13)
  - Refined down to census block-group level (i.e. “neighborhood” ~ 1,500 persons) which is critical to more precisely measure exposure
  - NIH R01 to validated these changes with users across US

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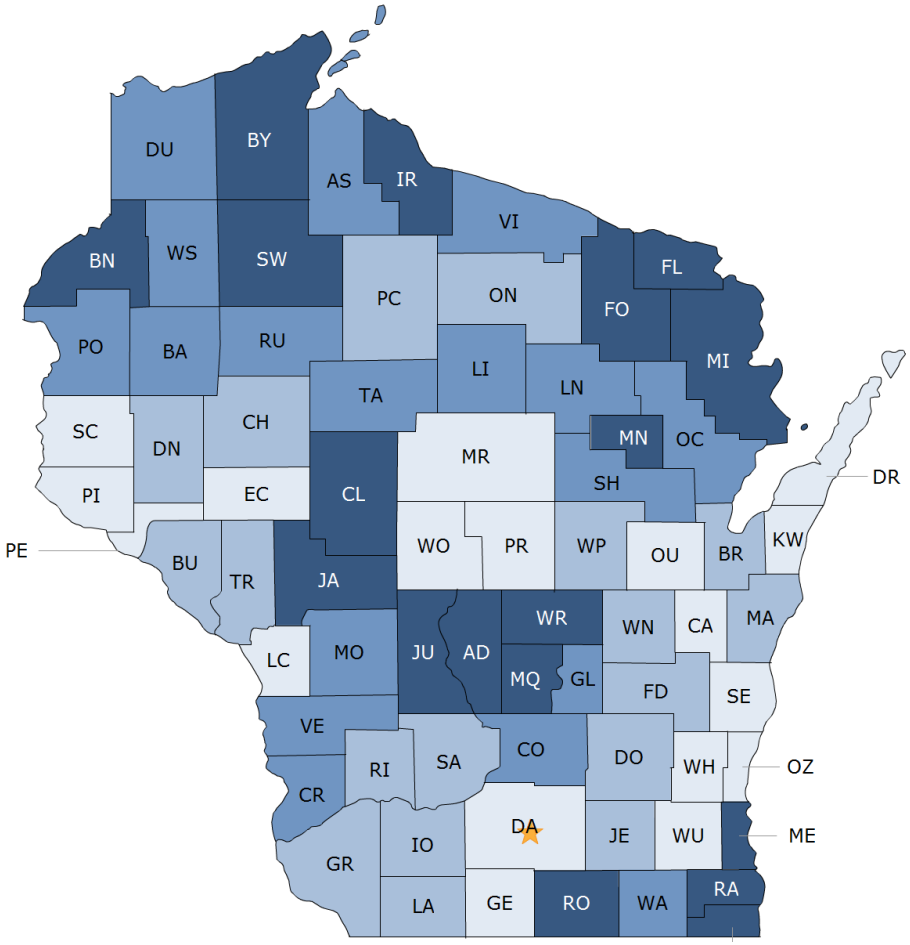
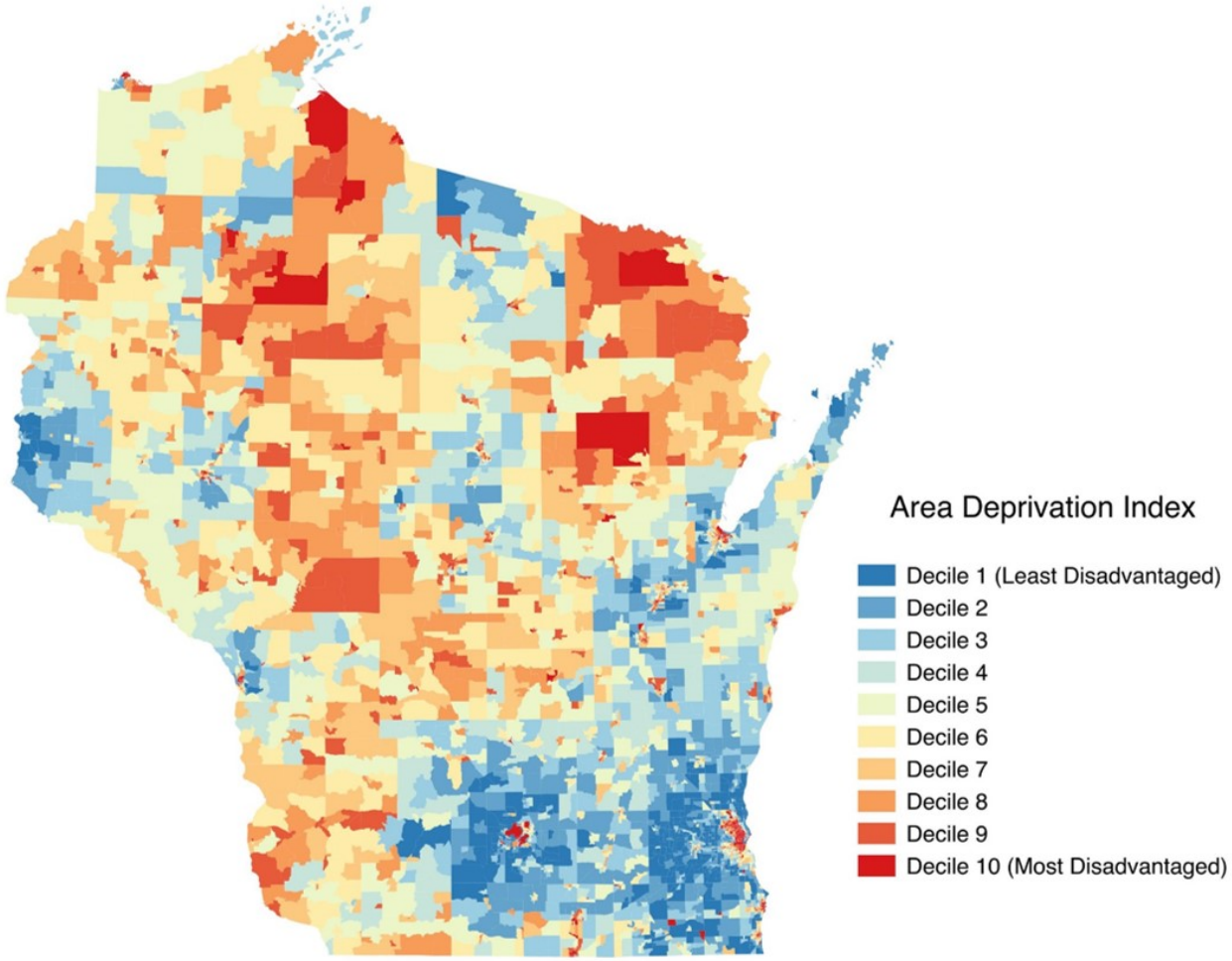
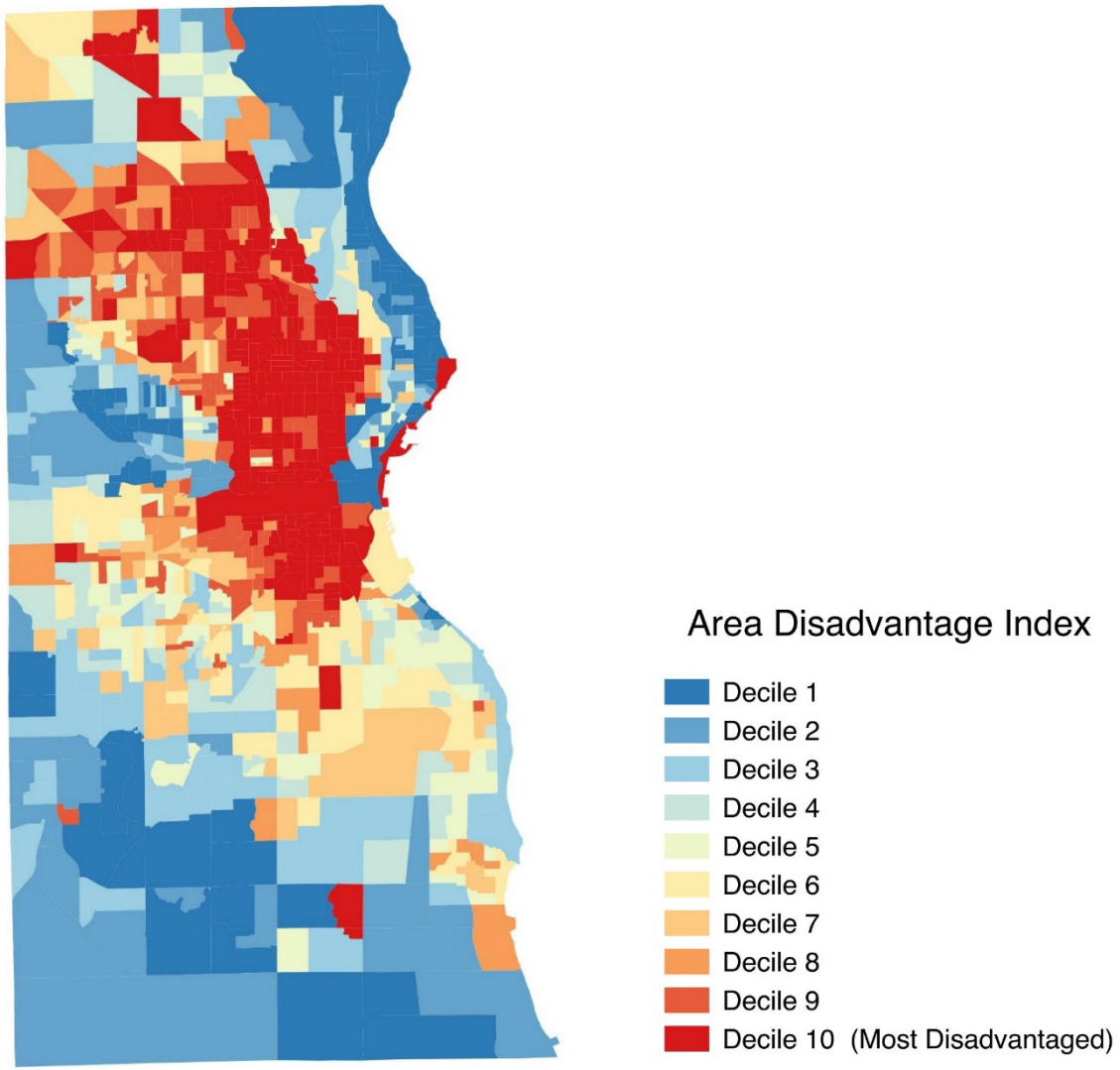
Typical Geo-Political Boundaries Employed in Identification of Contextual Disadvantage

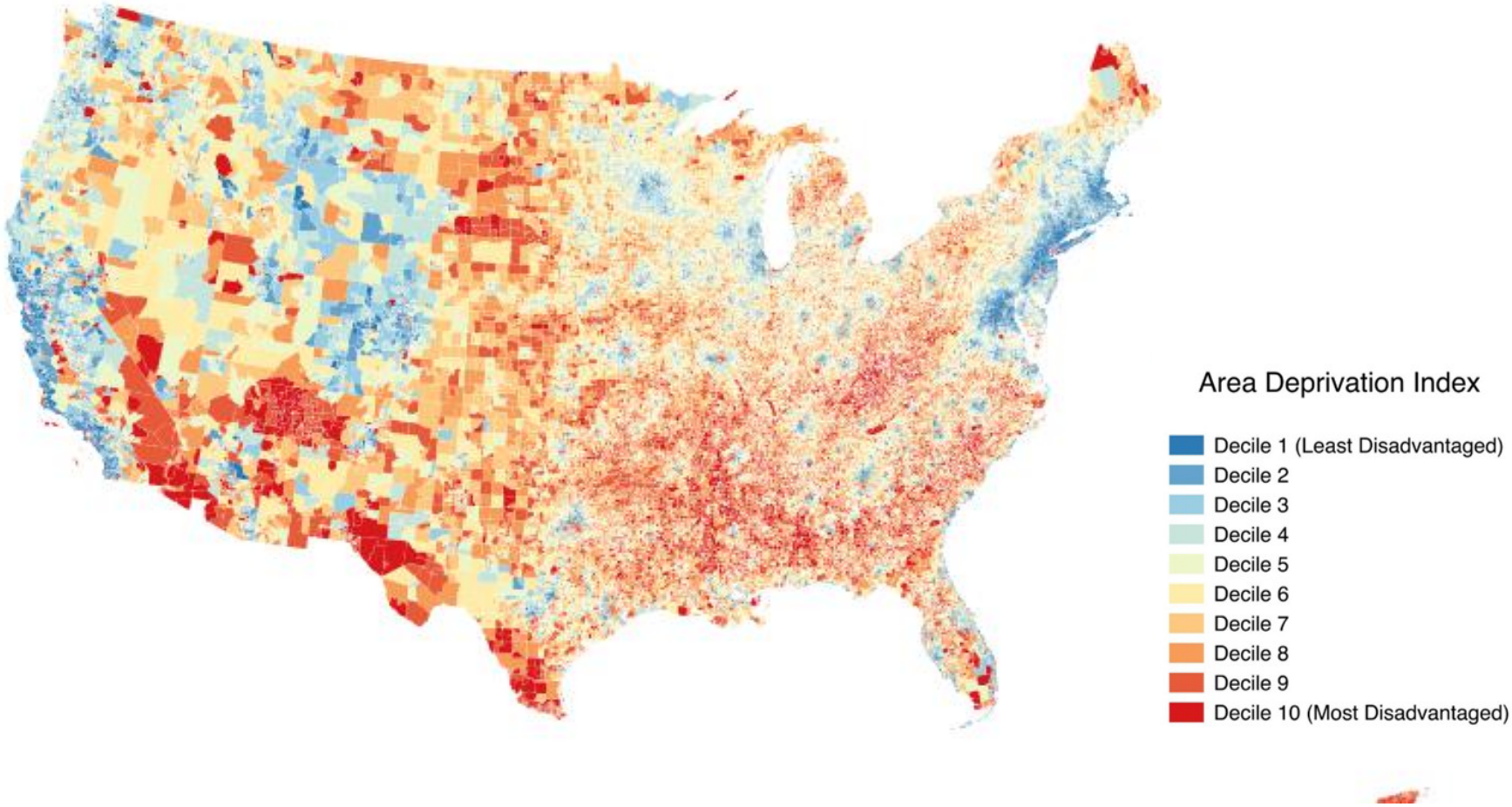


Neighborhood Disadvantage by ADI



Milwaukee County




Area Deprivation Index
Decile 1 (Least Disadvantaged)
Decile 2
Decile 3
Decile 4
Decile 5
Decile 6
Decile 7
Decile 8
Decile 9
Decile 10 (Most Disadvantaged)

Examples: Neighborhood Disadvantage by ADI and Health

- Research---Living in a highly disadvantaged neighborhood:
  - Rehospitalization and cost
    [Kind et al, Annals, 2014; Hu et al, AJMQ, 2018]
  - AD-specific CSF biomarkers, cognitive loss; hippocampal volumes
    [Kind et al, Alz Assoc Annual Meeting, 2017; Hunt et al, Alz Assoc Annual Meeting, 2018]
  - CMV seroprevalence in pregnancy
    [Lantos et al, J Racial and Ethnic Health Disparities, 2018]
  - Skin infection and deafness in childhood
    [Lantos et al, manuscripts in submission, 2018]
  - Medicare Advantage plan performance on cholesterol and BP quality measures
    [Durfey et al, Health Affairs, 2018]
  - Functional loss, many others…
    [Jung et al, JAGS, 2018]
- Delivery -- CMS Everyone with Diabetes Counts Program
  - Outreach, targeting to disadvantaged neighborhoods
- Policy– Multiple state-based health organizations
  - Catalyze new partnerships among communities, health systems and governments to advocate for policies addressing social factors that influence health

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Data Democratization

- Making complex data easily available to wide-reaching expert and non-expert audiences to massively broaden uptake and use of critical concepts and tools

- Extremely challenging to practically achieve due to technical challenges of big data

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Data Democratization

- **The Neighborhood Atlas**
  - https://www.neighborhoodatlas.medicine.wisc.edu/
  - A free research tool which makes neighborhood disadvantage metrics for the full US and Puerto Rico accessible through real-time customized mapping and easily linkable data downloads
  - No geoanalytics or other advanced degree is required to use the Atlas
  - Anyone can map areas of interest or look up specific addresses
  - Data downloads include a crosswalk of approximately 70 million nine-digit zip codes which enables linkage to most NIH research resources

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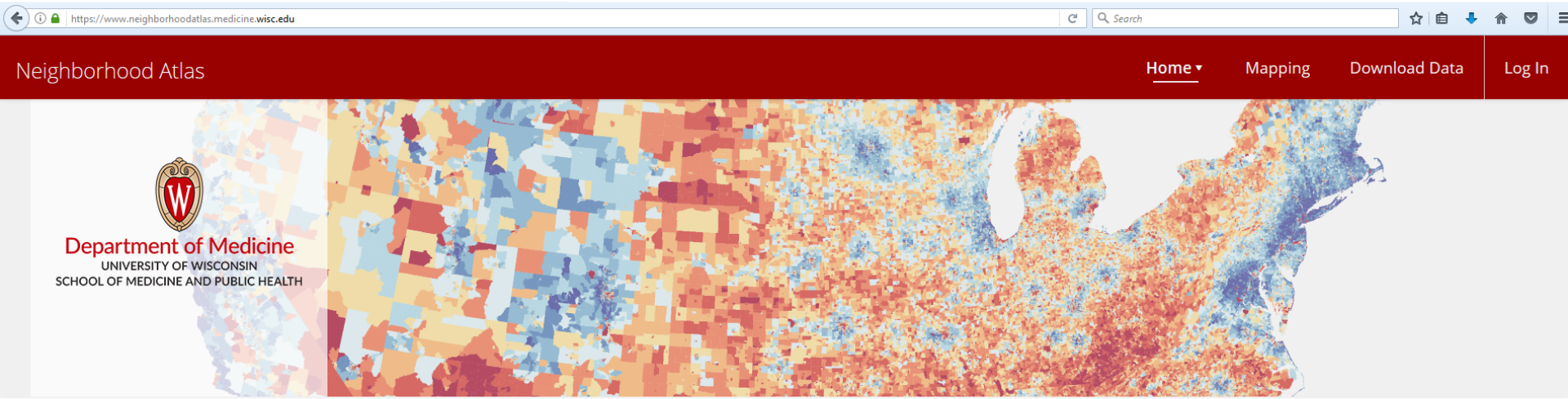
Neighborhood Atlas



About the 2013 Area Deprivation Index (ADI)

The Area Deprivation Index (ADI) is based on a measure created by the Health Resources & Services Administration (HRSA) over two decades ago for primarily county-level use, but refined, adapted, and validated to the Census block group/neighborhood level by Amy Kind, MD, PhD and her research team at the University of Wisconsin-Madison. It allows for rankings of neighborhoods by socioeconomic status disadvantage in a region of interest (e.g. at the state or national level). It includes factors for the theoretical domains of income, education, employment, and housing quality. It can be used to inform health delivery and policy, especially for the most disadvantaged neighborhood groups.

Considerations for Use

The ADI is limited insofar as it uses 2013 American Community Survey Five Year Estimates in its construction. All limitations of the source data will persist throughout the ADI. The choice of geographic units will also influence the ADI value. In the case of the 2013 ADI the Census block group is the geographic unit of construction and all results are subject to the accuracy and errors contained within the 2013 American Community Survey data release.

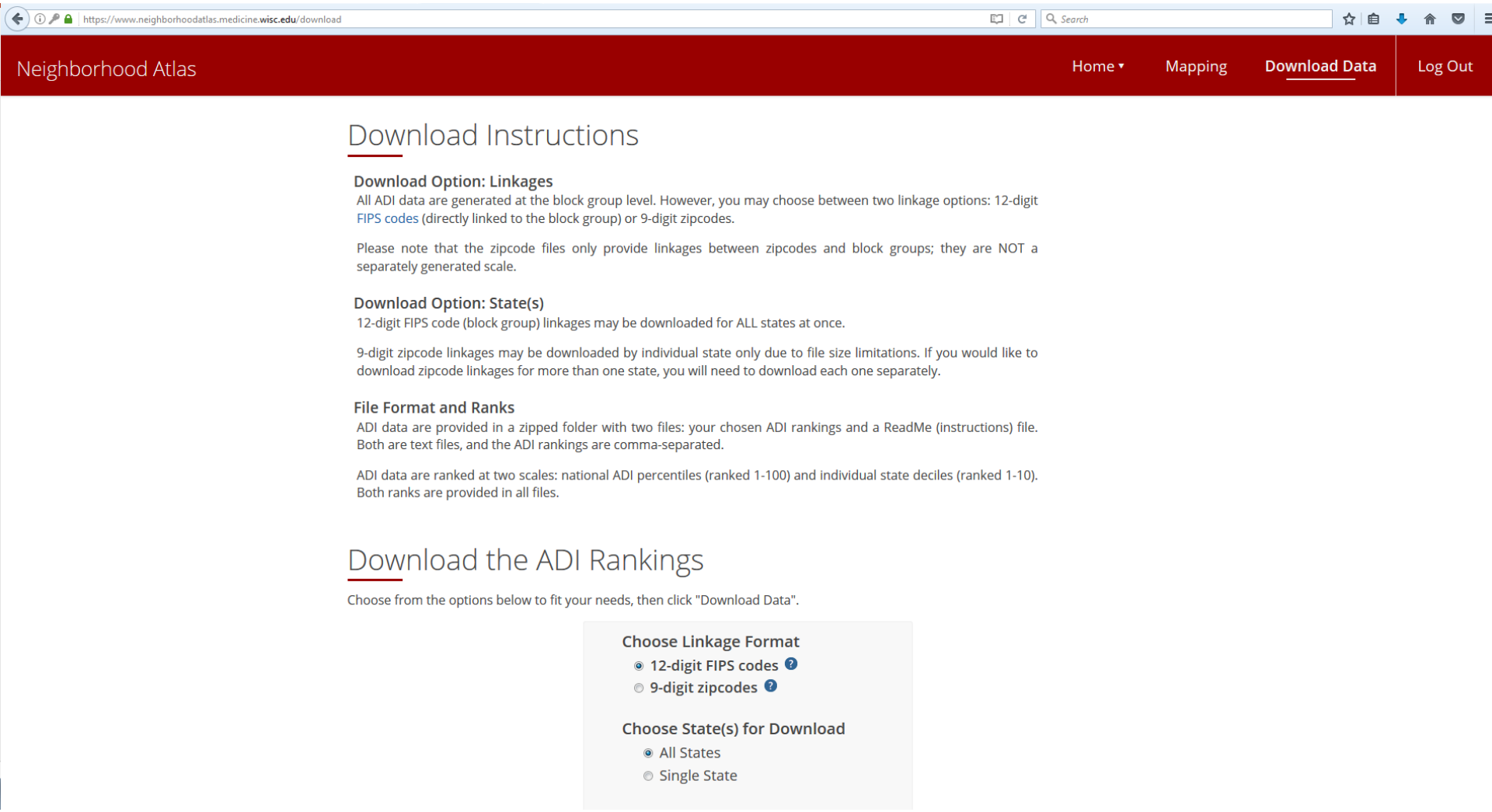
How to Use This Site

This site offers several different ways to use the Area Deprivation Index (ADI).

- The Mapping function allows you to view a state or the entire country mapped by ADI. This will show areas of relatively high disadvantage as well as areas of moderate to less disadvantage. Neighborhoods may be ranked

https://www.neighborhoodatlas.medicine.wisc.edu/

Neighborhood Atlas: Download Data



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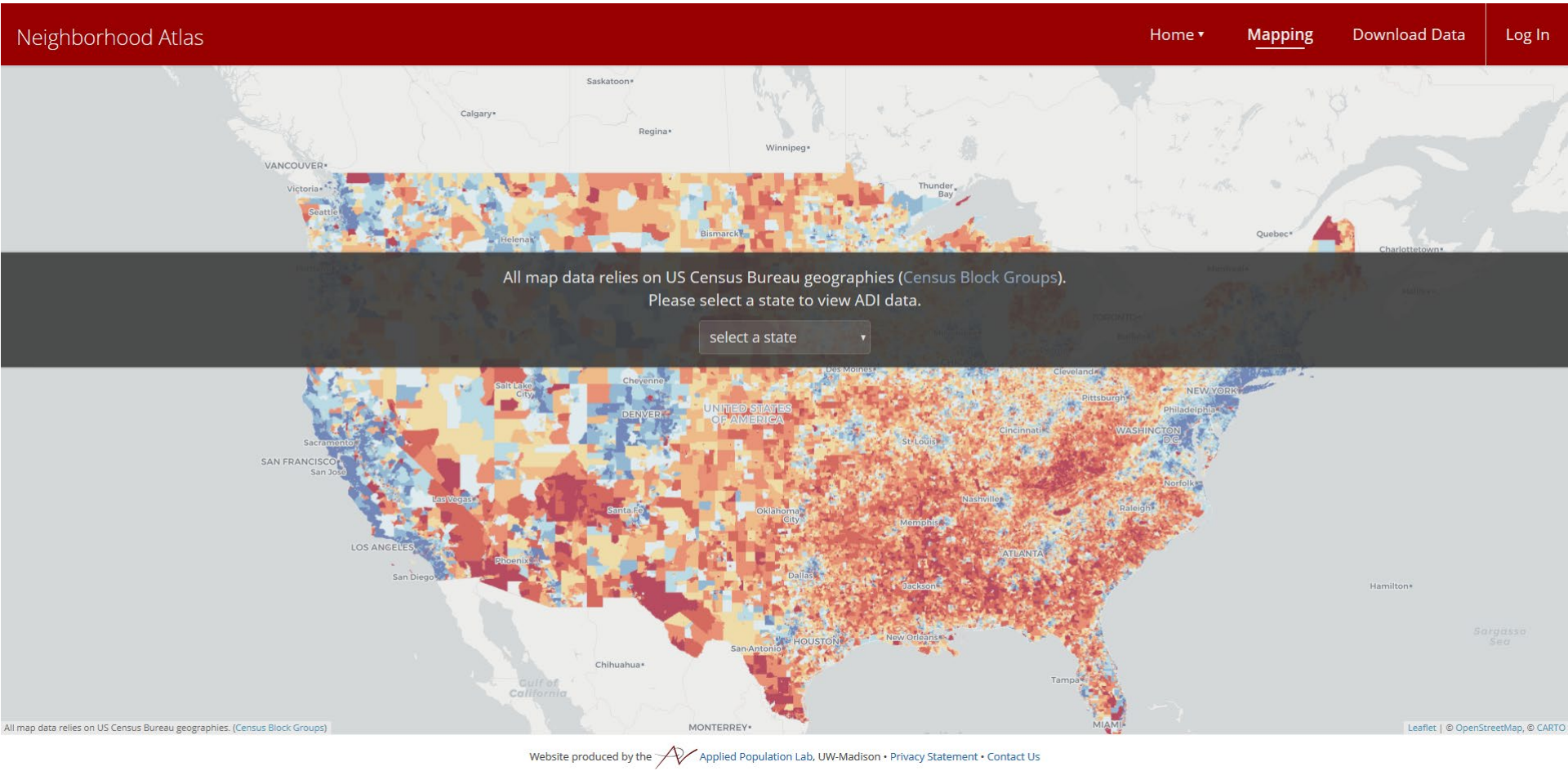
Neighborhood Atlas: Mapping



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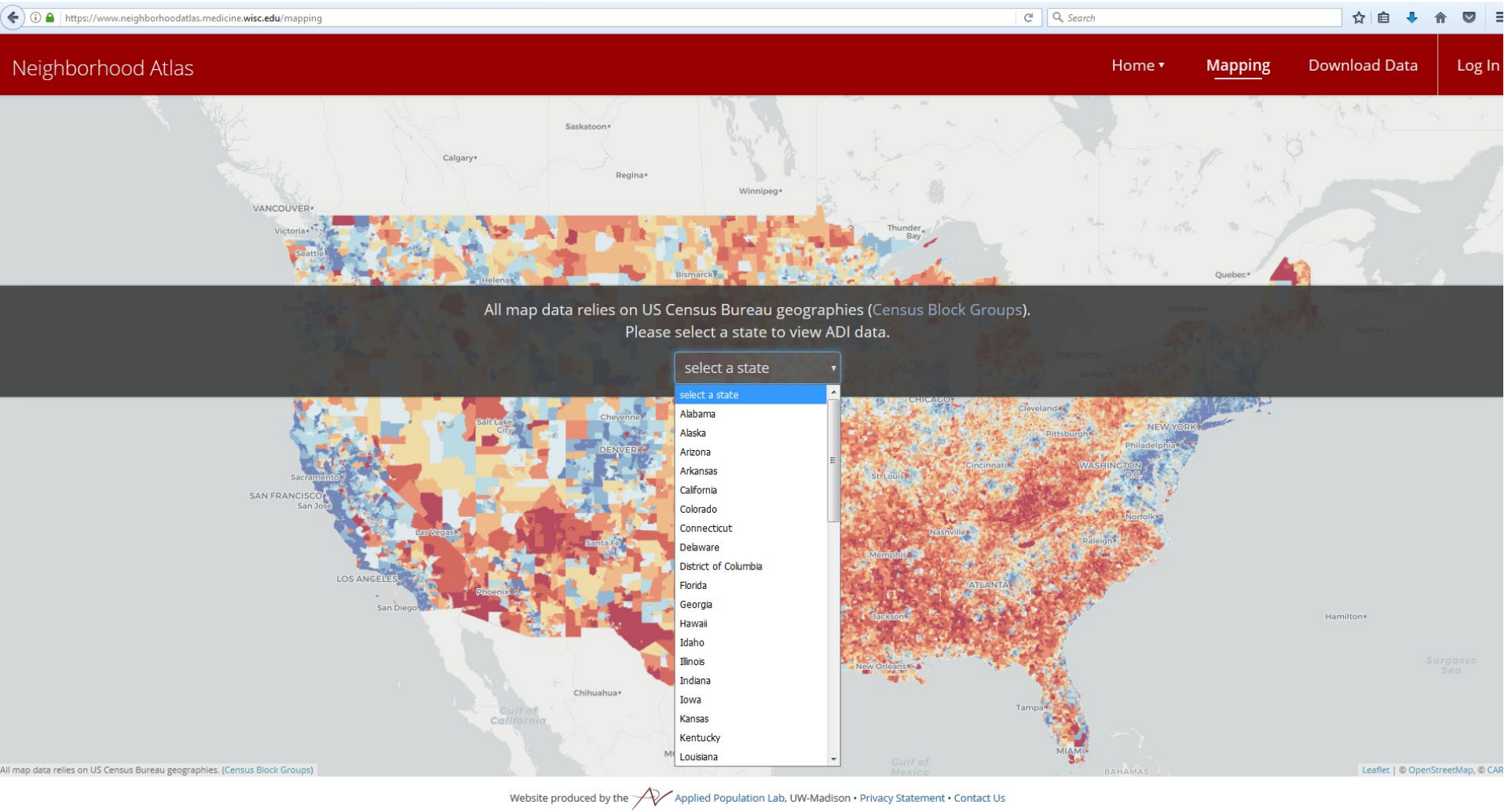
Neighborhood Atlas: Mapping



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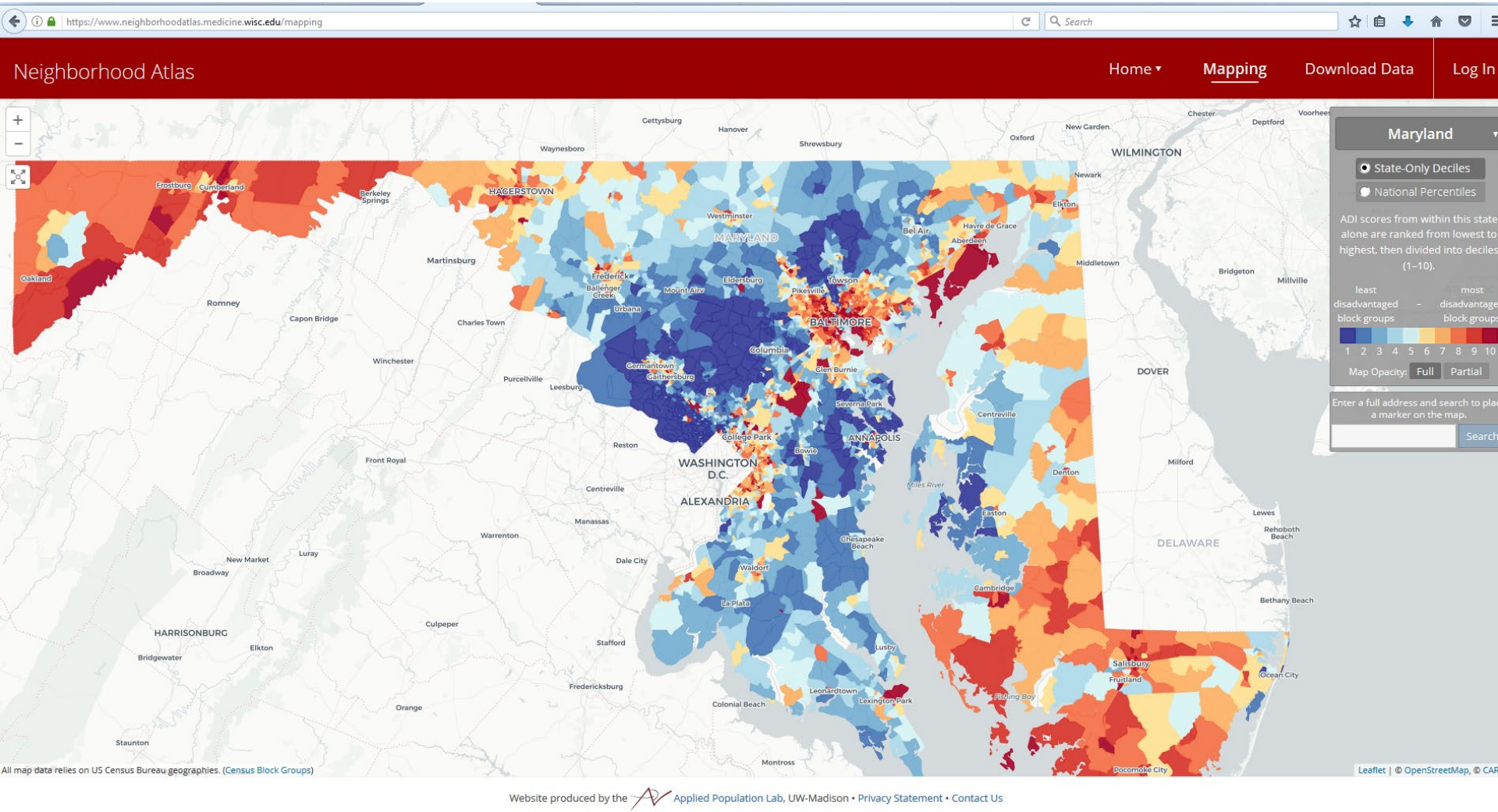

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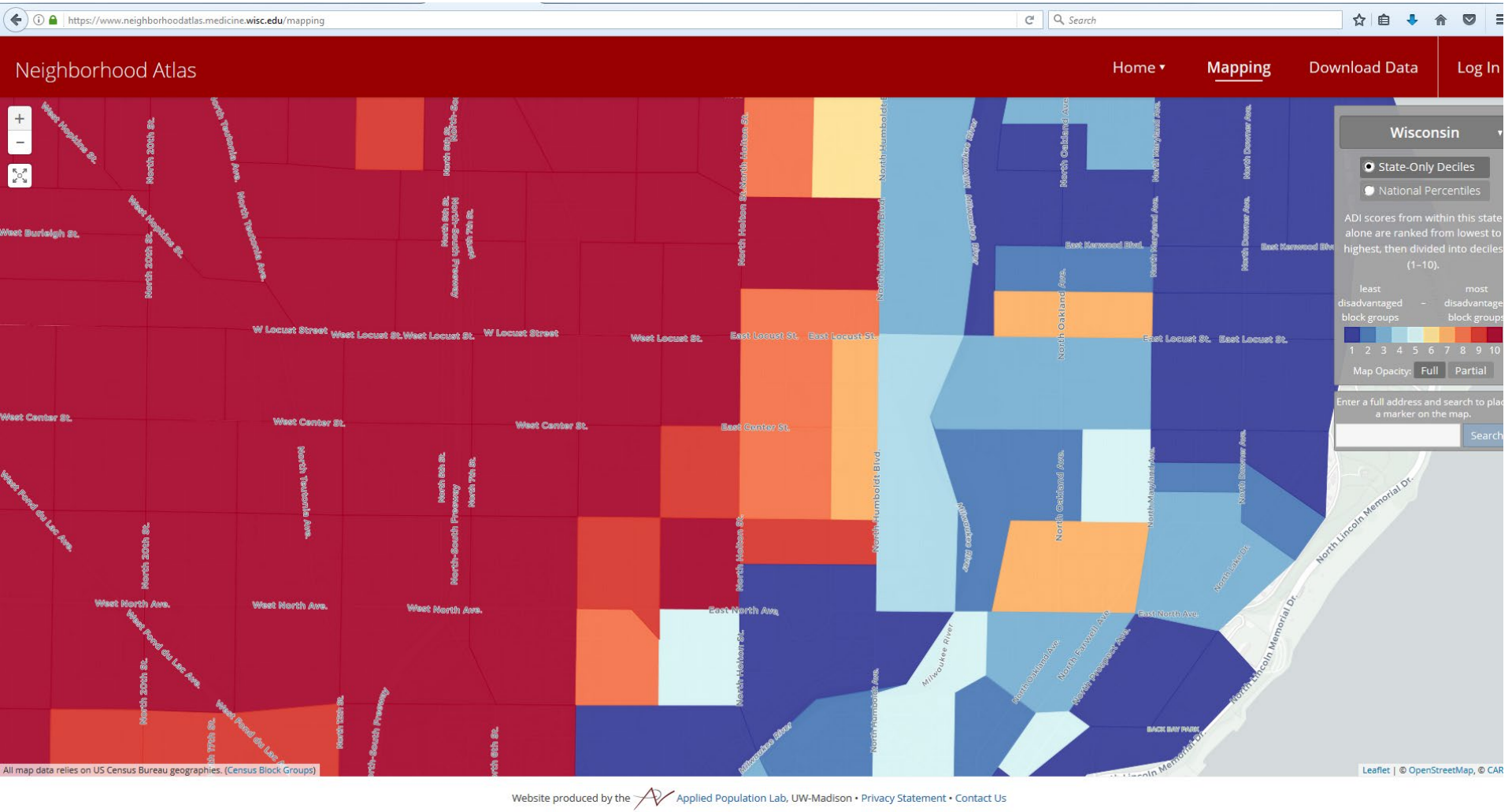

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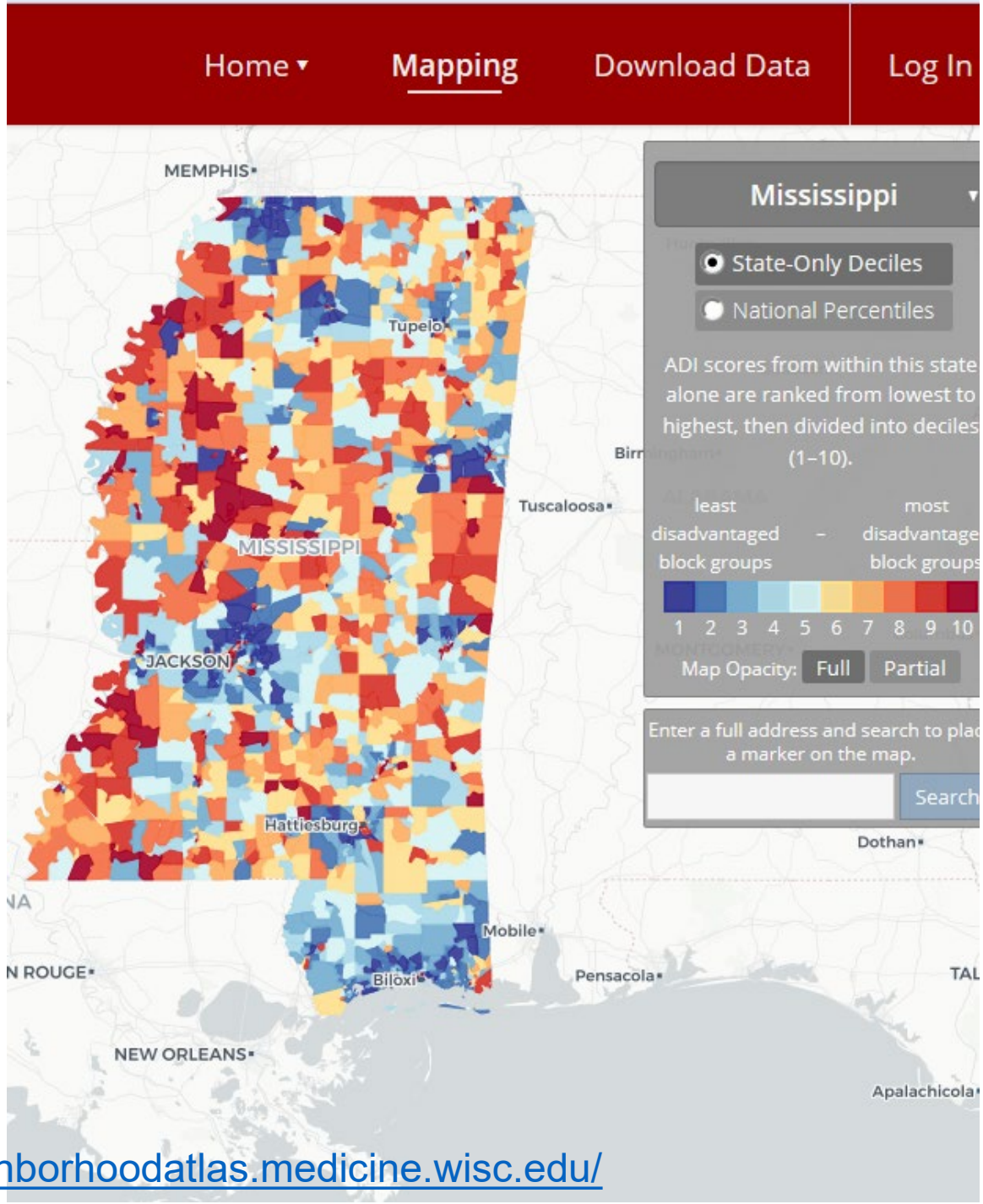

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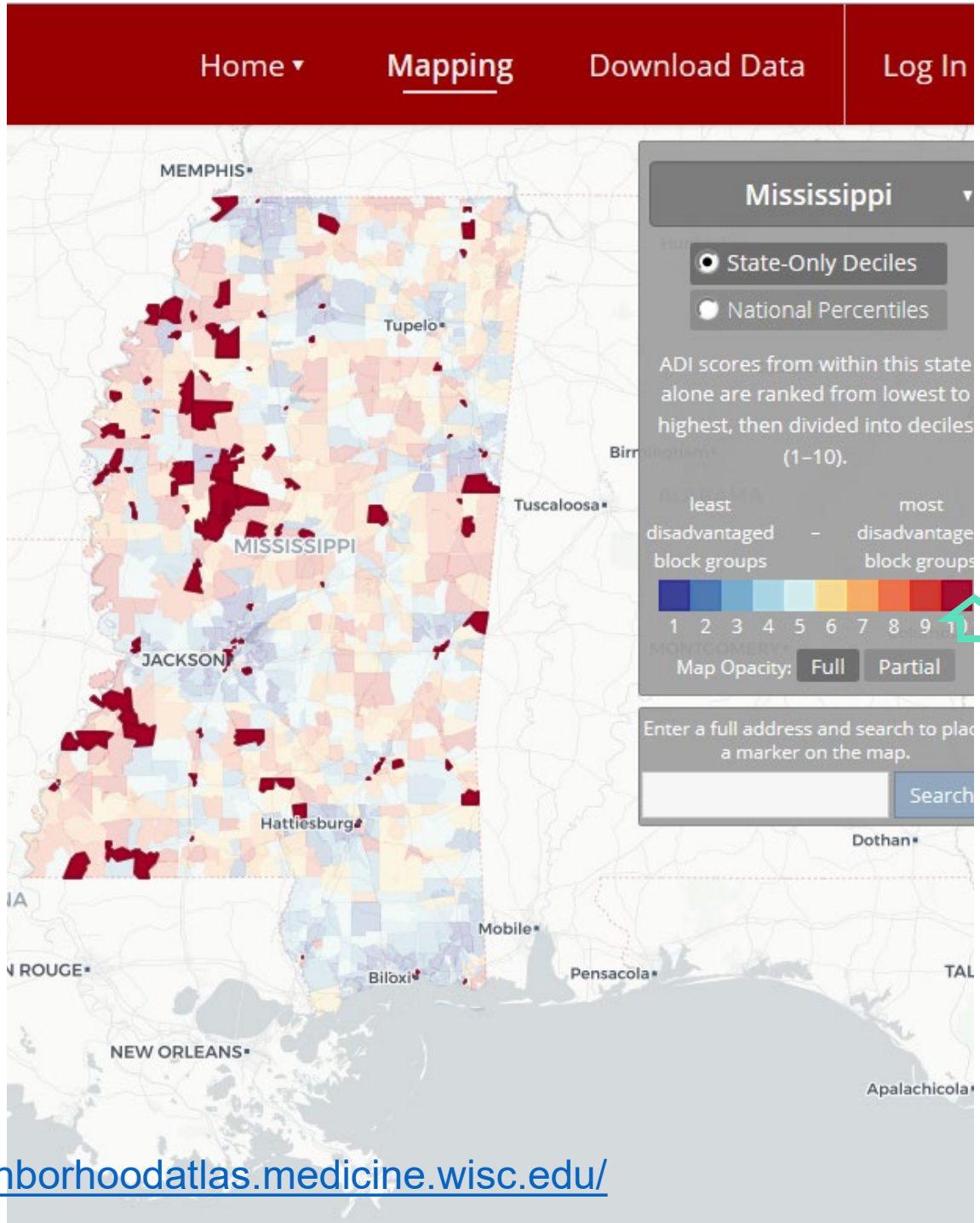

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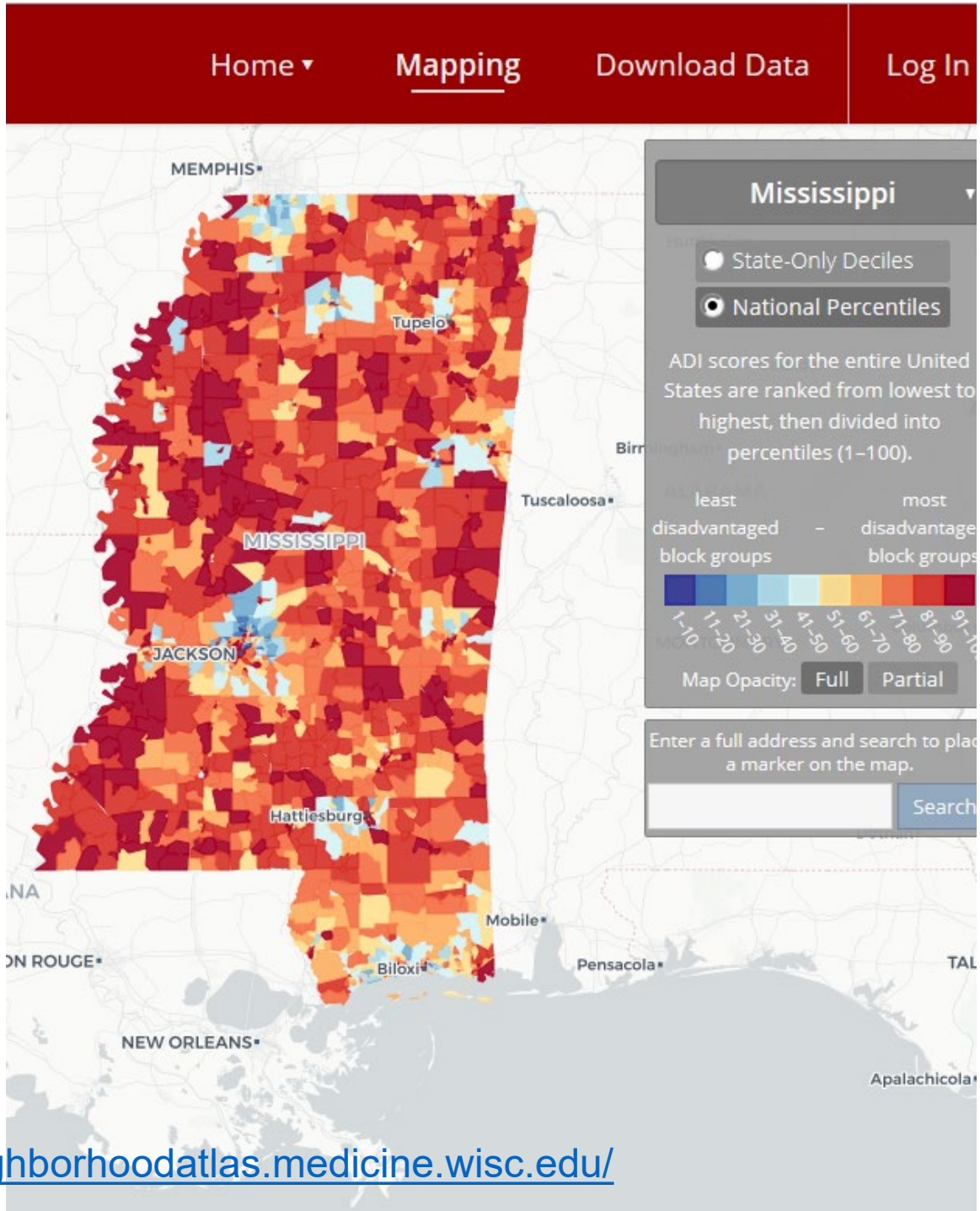

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Kind AJH, Buckingham W. Making Neighborhood Disadvantage Metrics Accessible: The Neighborhood Atlas. *New England Journal of Medicine*, 378: 2456-2458; (2018)

Neighborhood Atlas Use

(3 months after NEJM publication)

- ~60,000 views, vast majority focused on mapping
- Over 4,000 data downloads
  - US House of Representatives
  - Social Security Administration
  - NIH, CDC, VA, DOD, HHS
  - AARP
  - Directors of global pharmaceutical companies, health systems and other industry leaders, as well as many others
- More than 600 registered academic users, representing 300 unique universities in 47 of the 50 US states, France, Netherlands, England and Nigeria
- Feedback = Positive and overwhelmingly thankful

Potential Next Steps

- Update ADI at least every 5 years; Update annually if resources allow
- Explore offering additional measures on Atlas
- Catalyze, inform translational research:
  - Multi-stakeholder community intervention research to improve health
  - Clinical trial and cohort recruitment, retention, analysis
  - Epigenomics
  - Social-biological mechanisms of disease

- Goal: Bring together new partnerships to catalyze the kinds of policy initiatives, research studies, resource alignment and clinical interventions that are needed to improve health equity in the US

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Co-author

William Buckingham, PhD

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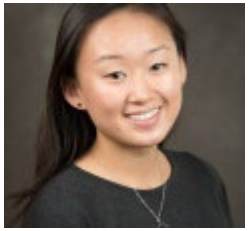

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