Community Connector

AHRQ's Visualization of Community-Level Social Determinants of Health Challenge (SDoH)

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AHRQ Visualization Resources of Community-Level SDoH Challenge

Agency for Healthcare Research and Quality's (AHRQ's) Goal

"AHRQ seeks tools that support visualizing [SDoH and community service digital data sets] to enhance our research and analysis of community-level health services."[1]

Mathematica's Goal

We sought to build a common definition of local SDoH and a way to identify communities with similar needs and demographics, particularly those that have had success in addressing social needs and improving health and well-being.

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1 https://www.ahrq.gov/sdoh-challenge/about.html

Community Connector Prototype

Geography

- Focus on Colorado

Health Outcomes

- Focus on obesity, diabetes, and kidney disease
  - Similar risk factors and preventive strategies[2]
  - Associated with higher health care costs/utilization[3]
  - CDC[4] and Colorado Department of Public Heath and Environment (DPHE)[5] "Winnable Battles"

Functionality

- Outcome-agnostic county-level scores for six domains of SDoH[6]
- Identifies county matches with similar demographic and SDoH characteristics relevant to the health outcomes
- Displays distribution of health outcomes for all Colorado counties

AHRQ Visualization Resources of Community-Level (SDOH) Challenge Winner

2 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3539140/
3 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5119873/
4 https://www.cdc.gov/winnablebattles/index.html
5 https://www.healthcoloradorae.com/community/10-winnable-battles/
6 https://www.kff.org/disparities-policy/issue-brief/beyond-health-care-the-role-of-social-determinants-in-promoting-health-and-health-equity/

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Target Audience

- Local government and public health officials
- State and federal regulators and policymakers
- Individual researchers
- Health care payers, care delivery organizations, and community-based organizations

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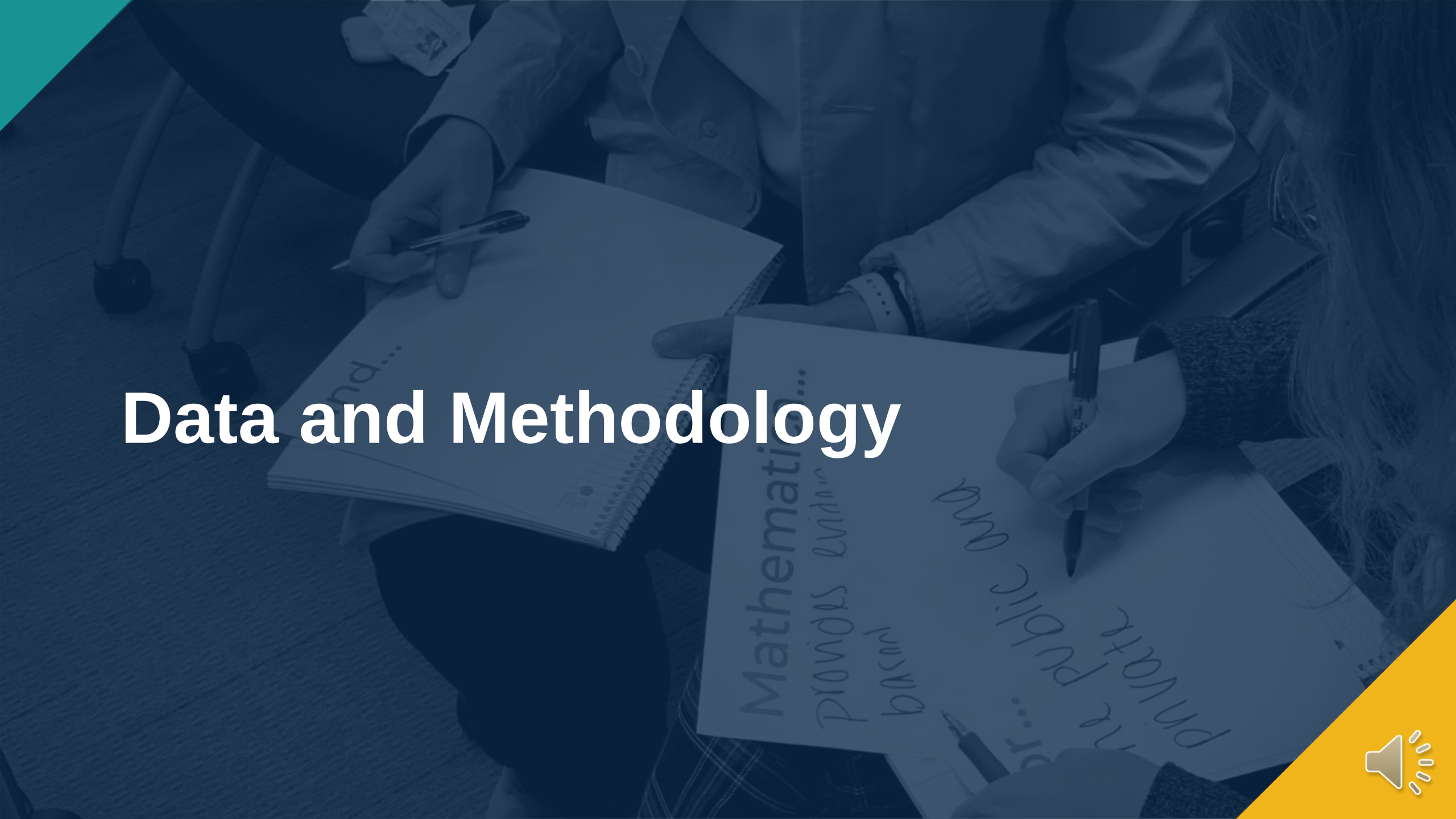
Data and Methodology



Data Overview

Demographics
Age
Race
Income
Gender
Population density
Language
Family life
Education
Employment
Medicare population

Social Determinants of Health*	
Spending 50%+ on housing	Annual job growth
Air quality/pollution	Household income
State gov't budget allocations	% free/reduced-price lunch
% households with limited plumbing	% unemployed
% driving deaths due to alcohol	Median rent-to-income ratio
% long commute, lone drivers	% overcrowded housing
% food insecure	Teen birth rate
Walkability	Violent crime rate
Violent crime rate	% high school education
% physically inactive	% low literacy
Rate of social club membership	High school graduation rate
Teen birth rate	GINI inequality index
# hospitals, mental health providers, and physicians per capita	Self-reported mental health
% uninsured	Preventable hospital admission rate

Outcomes
% overweight adults
Obesity prevalence
5-year change in obesity
Diabetes prevalence
Diabetes incidence
5-year change in diabetes prevalence
5-year change in diabetes incidence
% diabetes in Medicare
Diabetes hospitalization rate
Medicare diabetes spending
% chronic kidney disease (CKD) in Medicare
Medicare CKD spending

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Methodology Overview

- **SDoH scores**
  - Domains of SDoH
  - Variable selection across the domains
- **County similarity selection**
- **Health outcomes variability**

Methodology: Six SDoH Domains

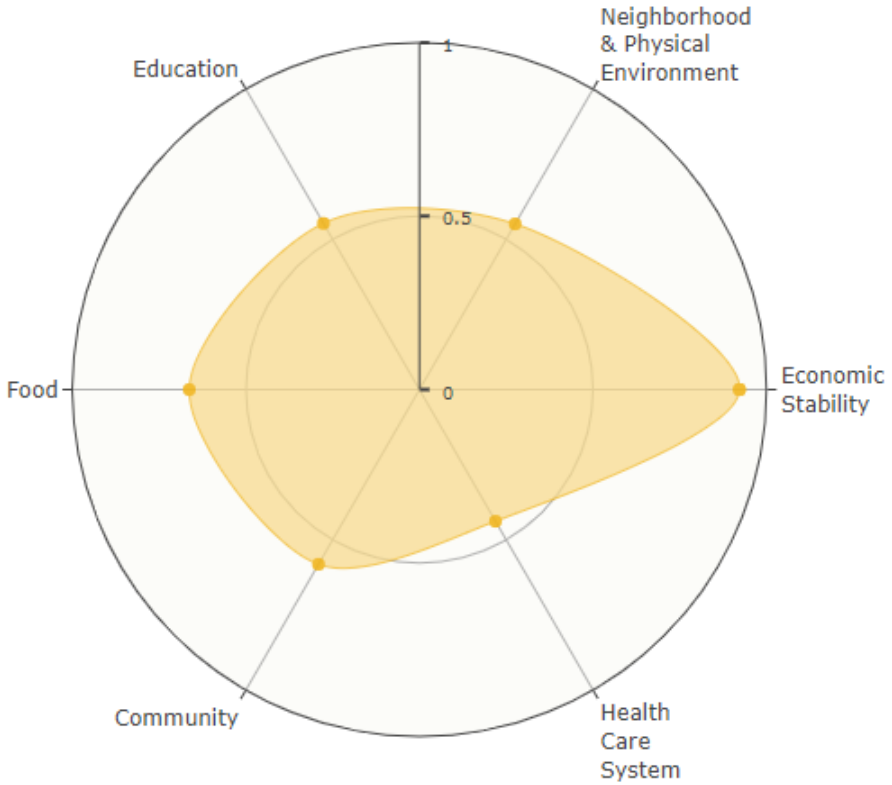
Economic Stability	Neighborhood and Physical Environment	Education	Food	Community and Social Context	Health Care System
Employment	Housing	Literacy	Hunger	Social integration	Health coverage
Income	Transportation	Language	Access to healthy options	Support systems	Provider availability
Expenses	Safety	Early childhood education		Community engagement	Provider linguistic and cultural competency
Debt	Parks	Vocational training		Discrimination	Quality of care
Medical bills	Playgrounds	Higher education		Stress	
Support	Walkability				
	Zip code / geography				

Health Outcomes
Mortality, Morbidity, Life Expectancy, Health Care Expenditures, Health Status, Functional Limitations

https://www.kff.org/disparities-policy/issue-brief/beyond-health-care-the-role-of-social-determinants-in-promoting-health-and-health-equity/

Methodology: SDoH Scores

- **Variable selection**
  - Sparse Principal Component Analysis[7]
  - Research and literature
  - Examining variables' correlations with the health outcomes
- **Assigned a direction of association to each of the selected variables to health outcomes**
- **Scores are a weighted average of normalized variables**
- **SDoH scores in other categories adjusted by Economic Stability score to account for strong covariance**
- **SDoH score on zero (worst) to one (best) scale**

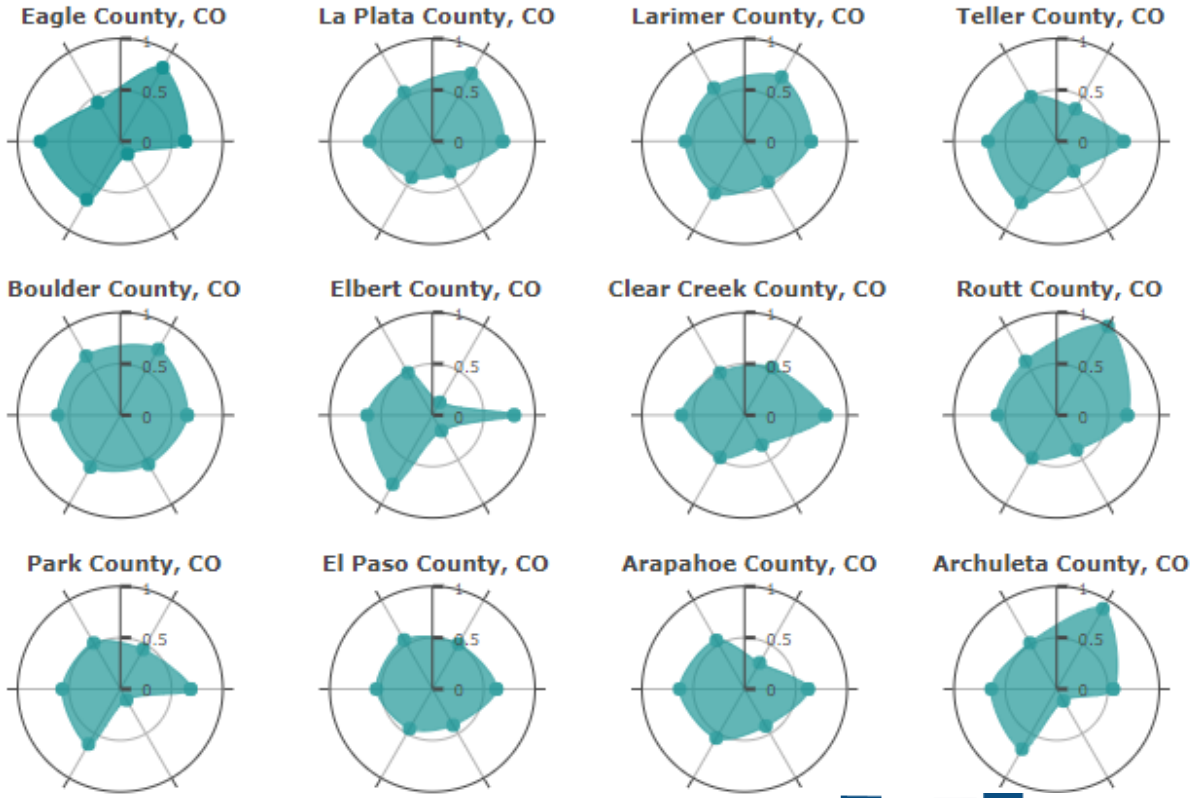


7 https://doi.org/10.1198/106186006X113430

Methodology: Identifying Similar Counties

Identify modifiable versus non-modifiable SDoH variables

- Based on literature and intervention feasibility
- Example modifiable variables: county budget, percent spent on health
- Example non-modifiable variables: population, percent rural



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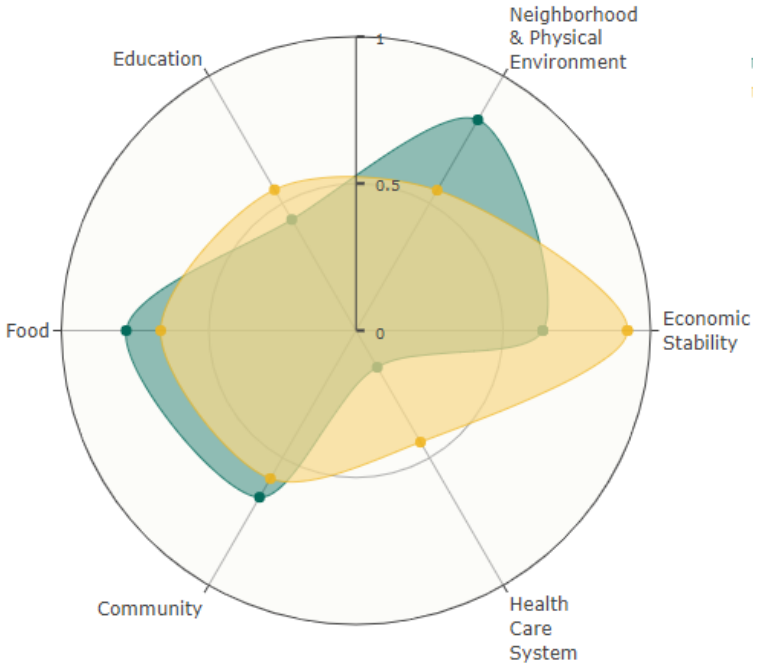
Methodology: Identifying Similar Counties

Lasso regression model:

$$y_i = \alpha + \beta * X_i + \gamma * nonmodifiableSDoH_i + \theta * modifiableSDoH_i + \epsilon_i$$

where y_i is a health outcome for county i and X_i are their demographic characteristics



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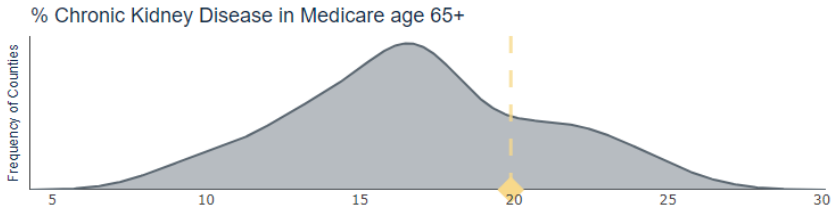
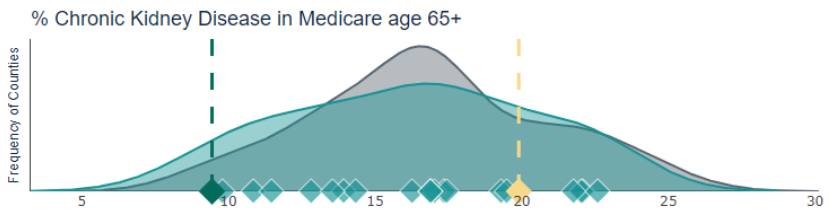
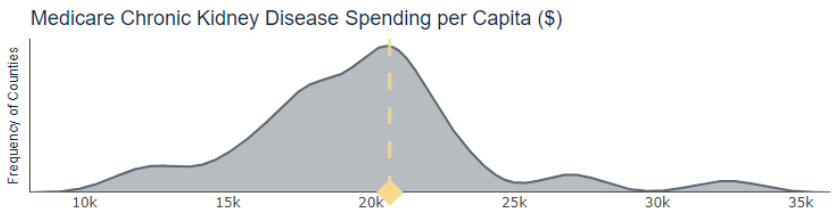
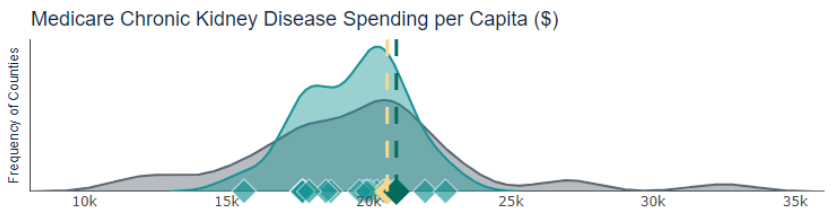
Methodology: Outcomes Variability

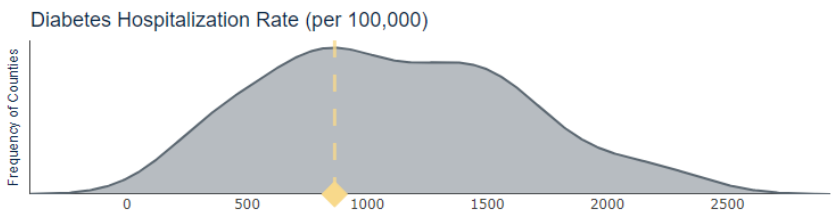
Present outcomes data from matched counties as distribution

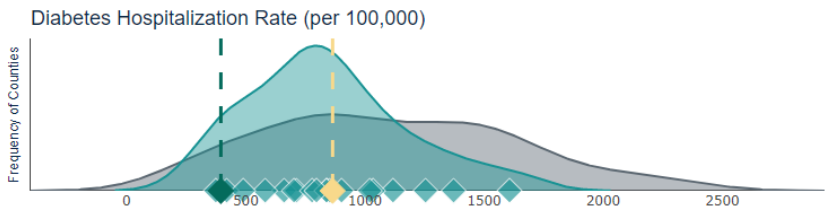












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The Community Connector Tool:

https://communityconnector.mathematica.org/

Goals Achieved and Future Uses

- Vast heterogeneity across community needs and outcomes
- Assessed usability of the Community Connector and incorporated feedback from a variety of stakeholders into the prototype
- Prototype scalability
- User experience and interactivity

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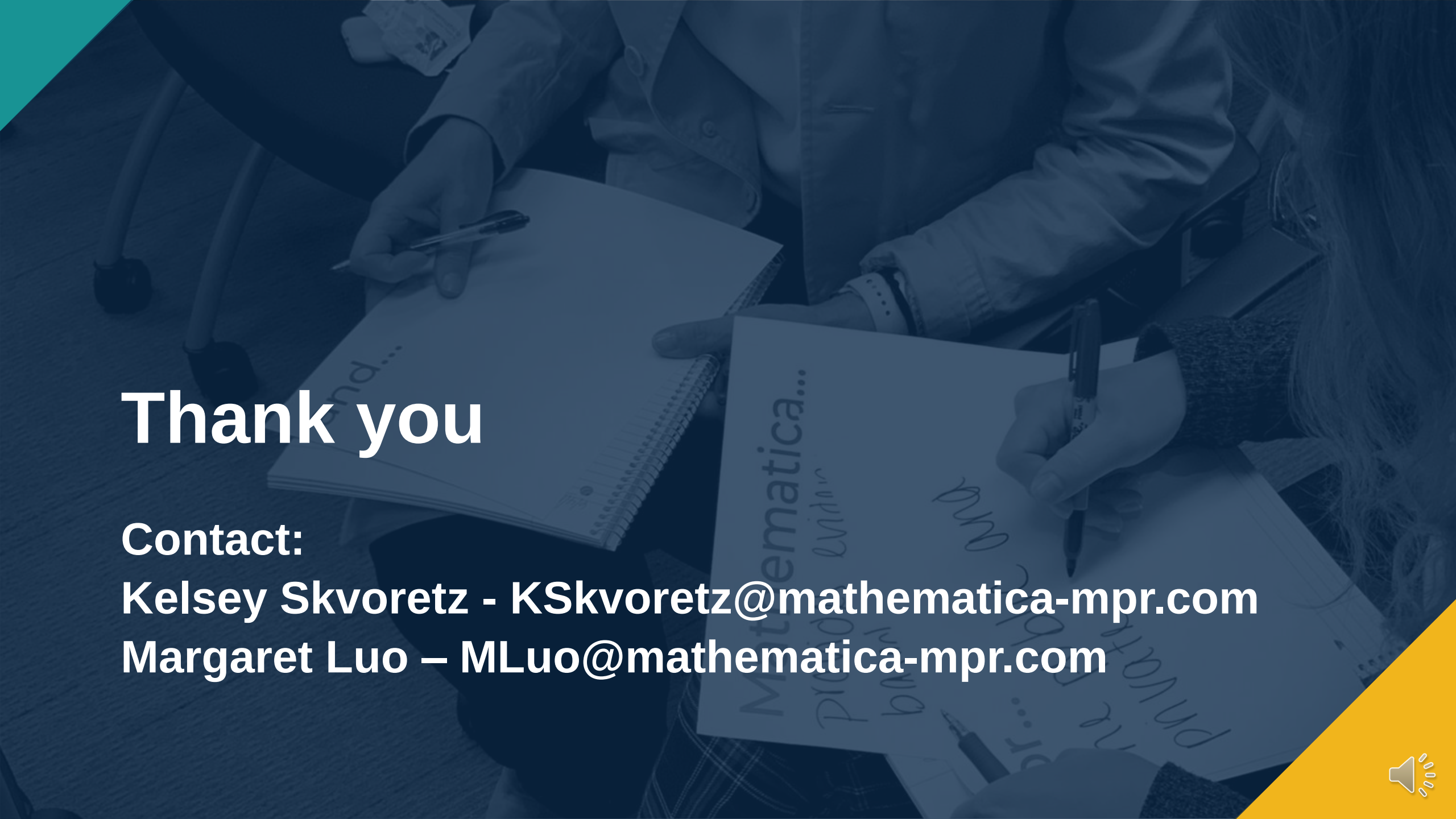

Thank you

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