

# Energy Insecurity and the Local Dimensions Impacting Access to Energy Assistance

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# Outline

- Energy insecurity
- Energy assistance
- Local energy assistance framework
- Policy implications



# Energy Insecurity

**Energy insecurity (EI):** inability to meet household energy needs (Hernández, 2016)

**Economic:** financial challenges

**Physical:** deficiencies in the infrastructure of a home

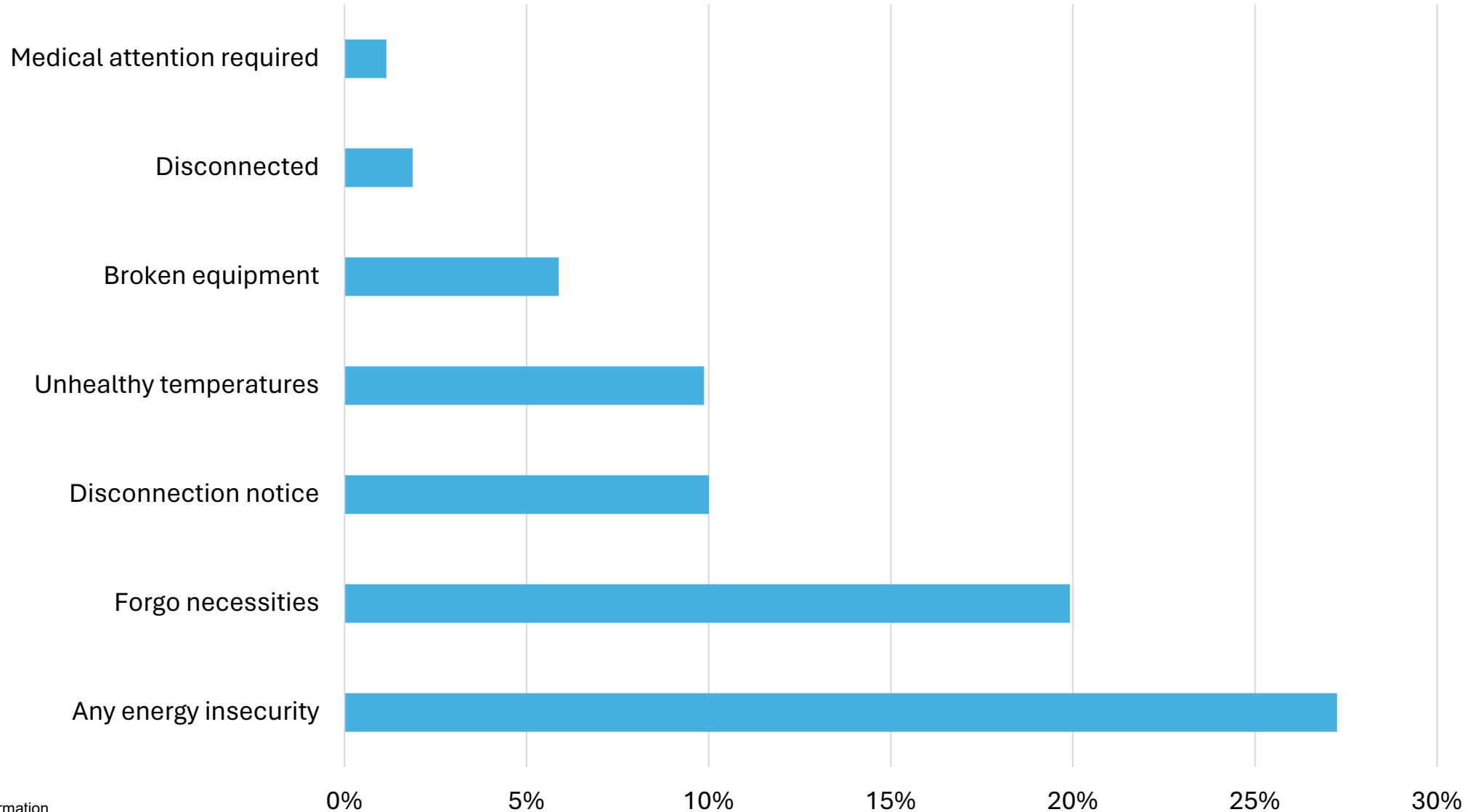
**Behavioral:** coping strategies to alleviate economic and physical EI

**Recurring** material hardship (Konisky et al., 2022)

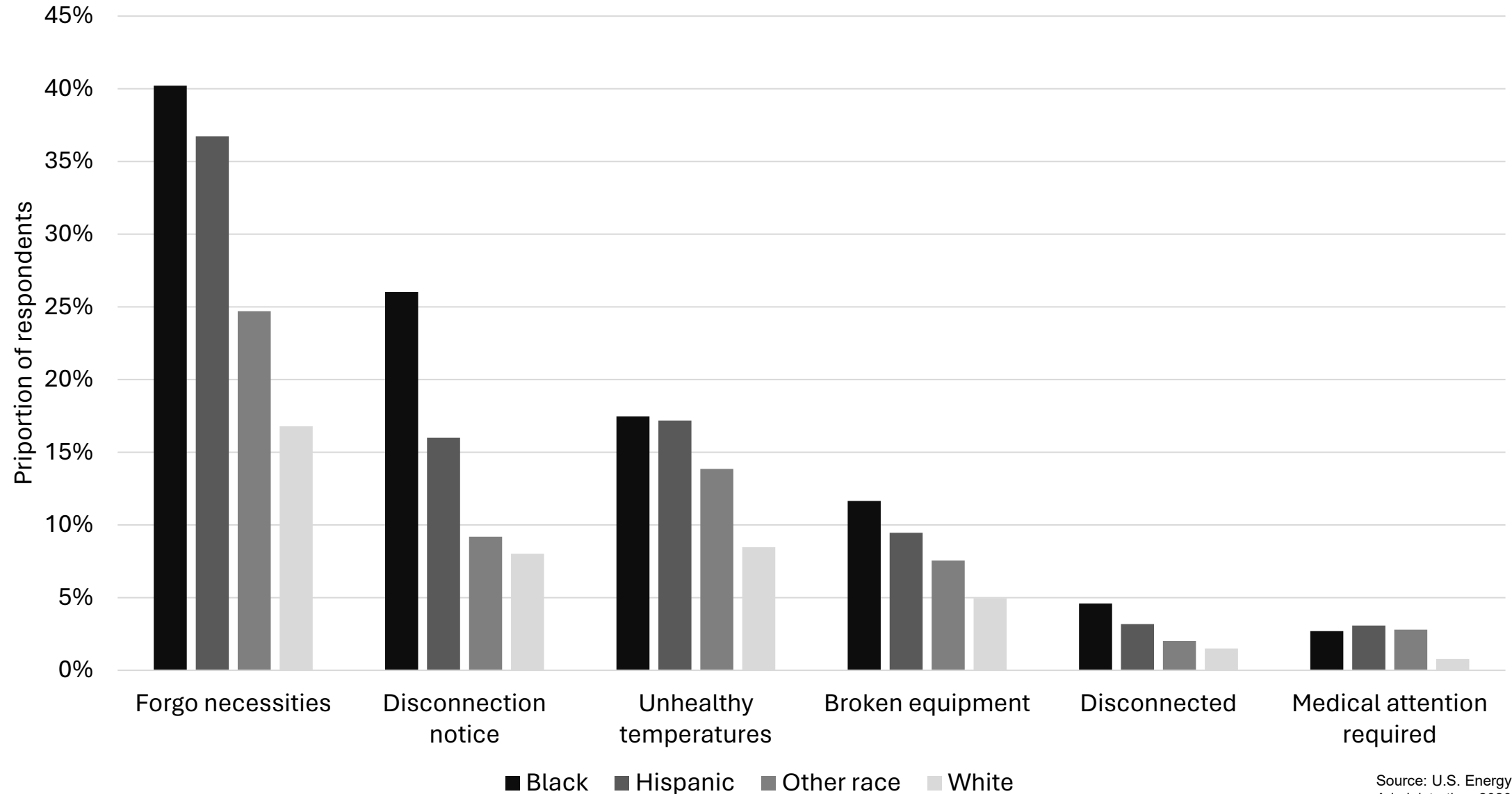


**Without Power...**

# Household energy insecurity measures



# Household energy insecurity measures, by race



# What factors correlate with energy insecurity?

Deficient/inefficient **housing conditions** (Graff et al., 2021)

At-home **electronic medical devices** (Memmott et al., 2021)

**Demographics** (Hernández and Laird, 2022)

- Low-income
- Young children
- Households of color

# Implications of energy insecurity?

**Evictions** — energy burden is positively associated with eviction filing rates (Hatch and Graff, under review)

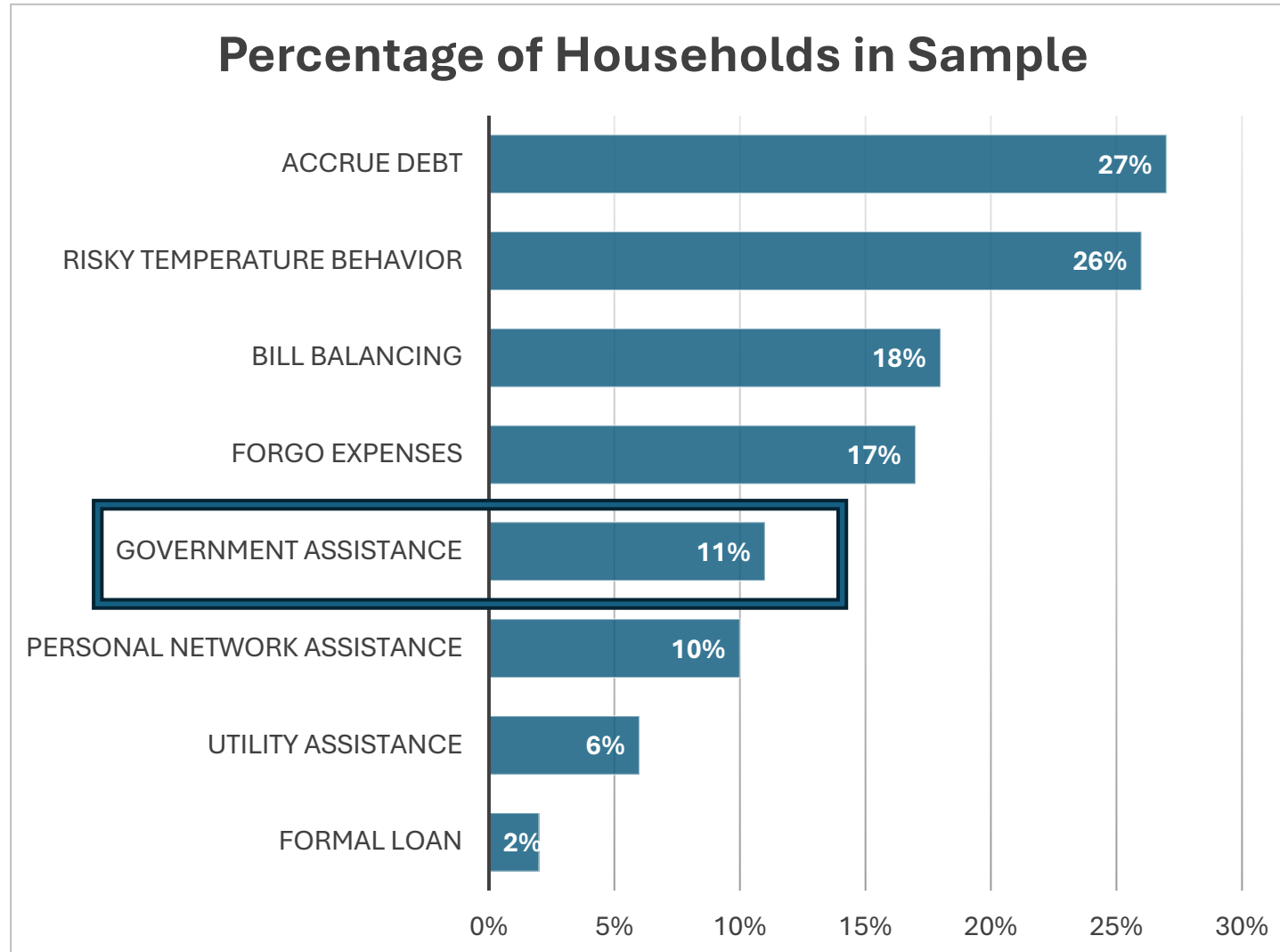
**Acute and chronic health conditions** — respiratory, mental health, and cardiovascular conditions (Liddell and Morris, 2020; Hernández and Siegel, 2019; Siegel et al., 2024; Reames et al., 2021)

**Children** — face hospitalization, lower health ratings, and developmental delays (Cook et al., 2008)

- Consume fewer calories (Nord and Kantor, 2006; Bhattacharya et al., 2002)
- Face social stigmatization and struggle in school (Hernández, 2016)



# How do households cope with energy insecurity?



Source: Carley, Graff, Konisky, Memmott. 2022. Behavioral and financial coping strategies among energy insecure households. *Proceedings of the National Academy of Sciences*.

# Energy Assistance

**Energy assistance:** programs or policies designed to help households manage and pay their energy bills

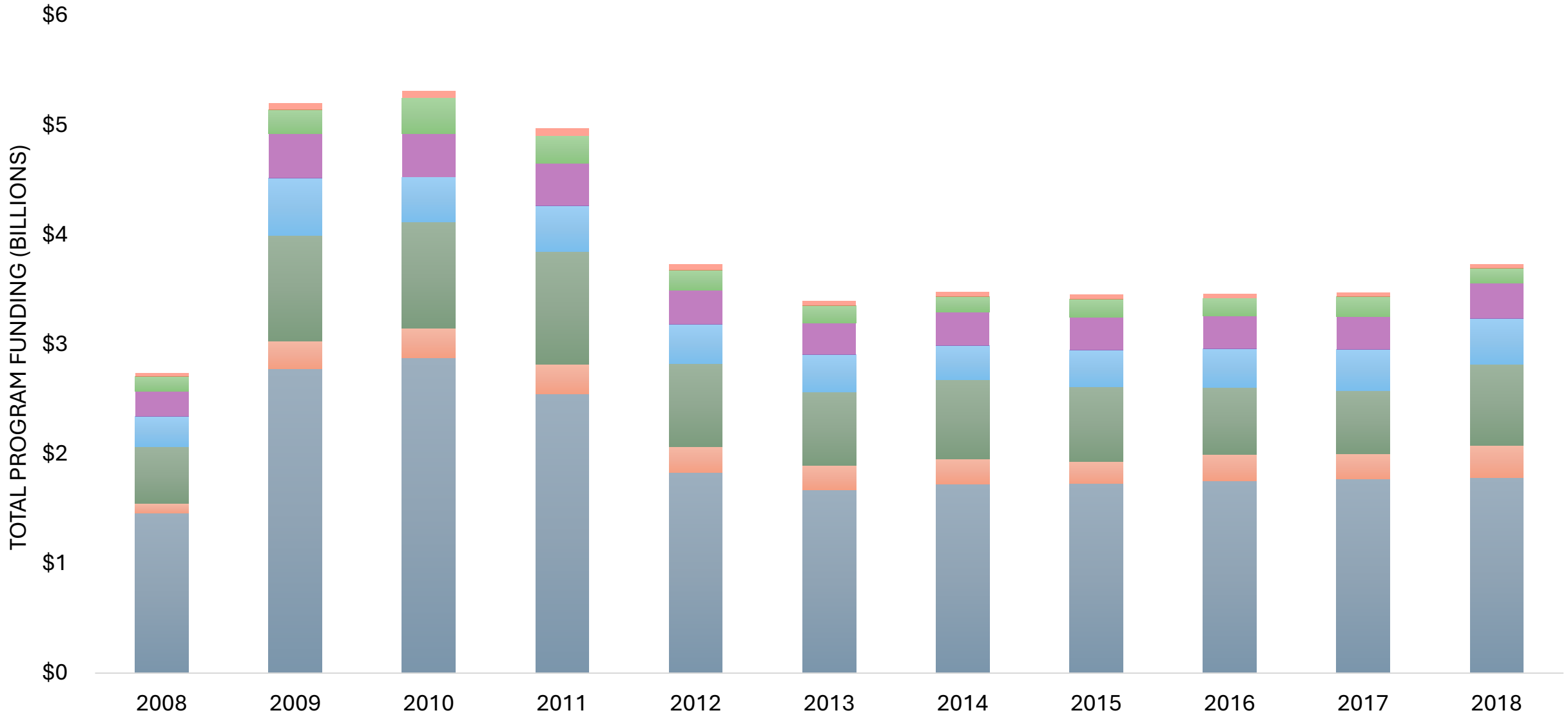
**Determinants?**

**Pathways?**

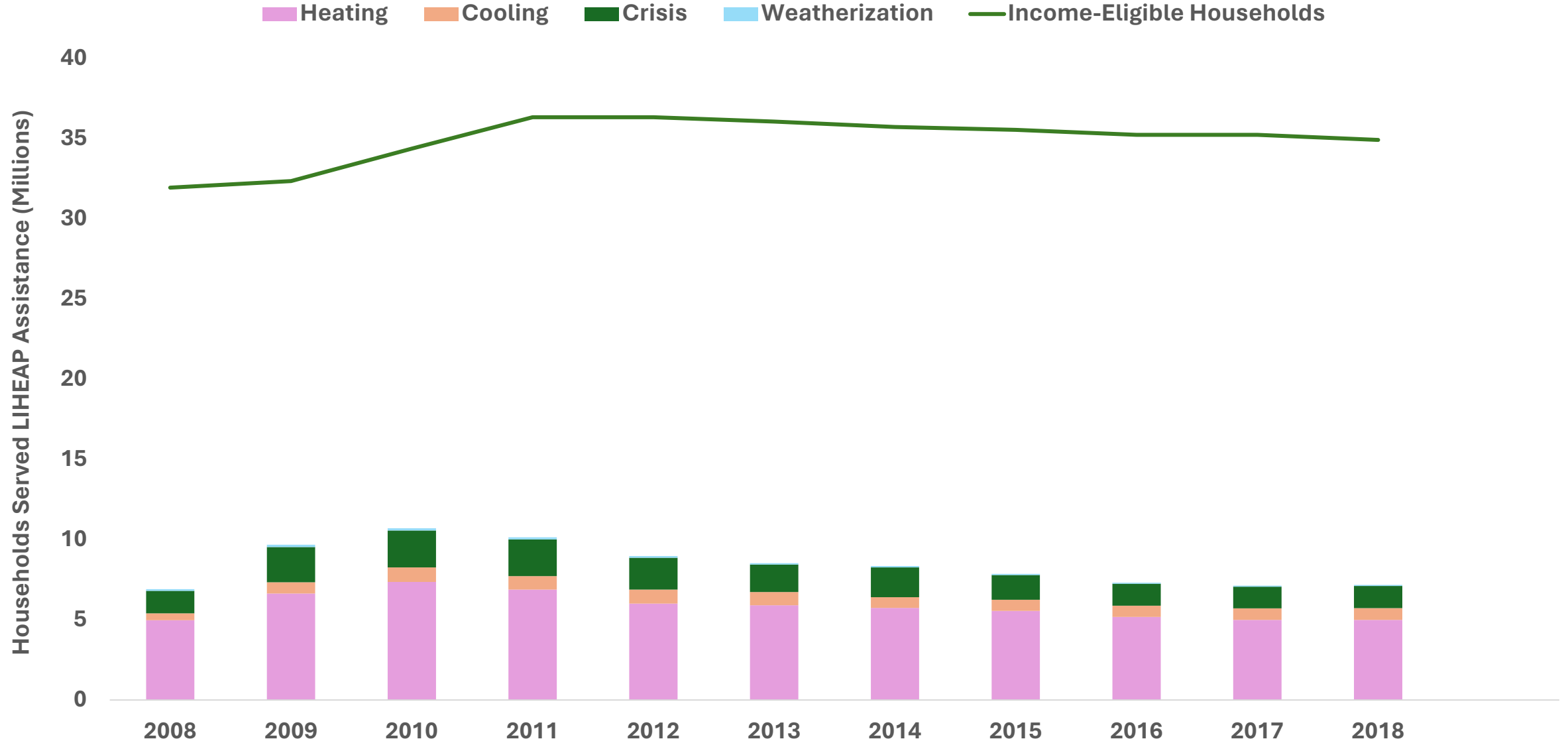
**Challenges?**

# Low Income Home Energy Assistance Program

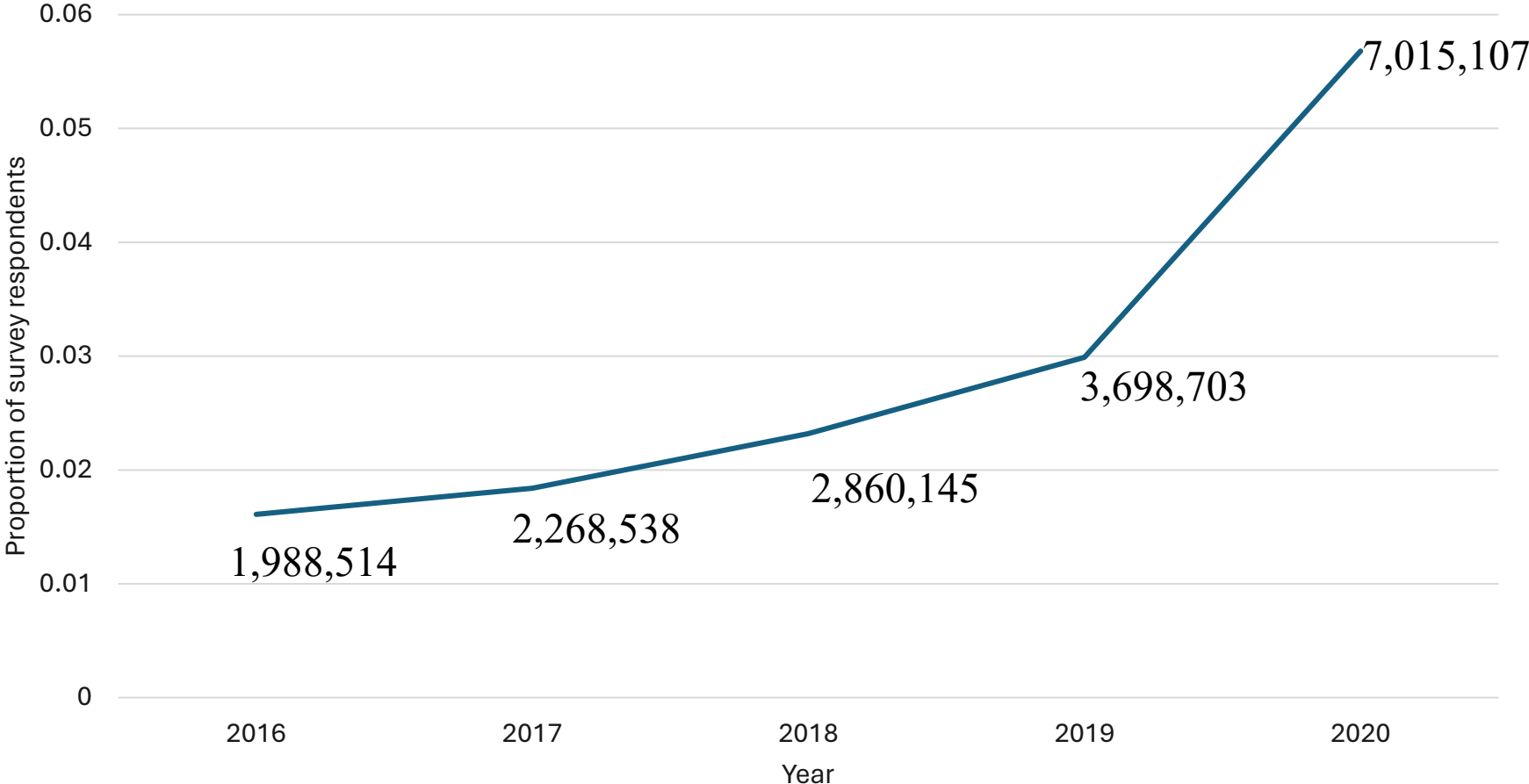
■ Heating ■ Cooling ■ Crisis ■ Weatherization ■ Administration ■ Carryover ■ Other



# Low Income Home Energy Assistance Program

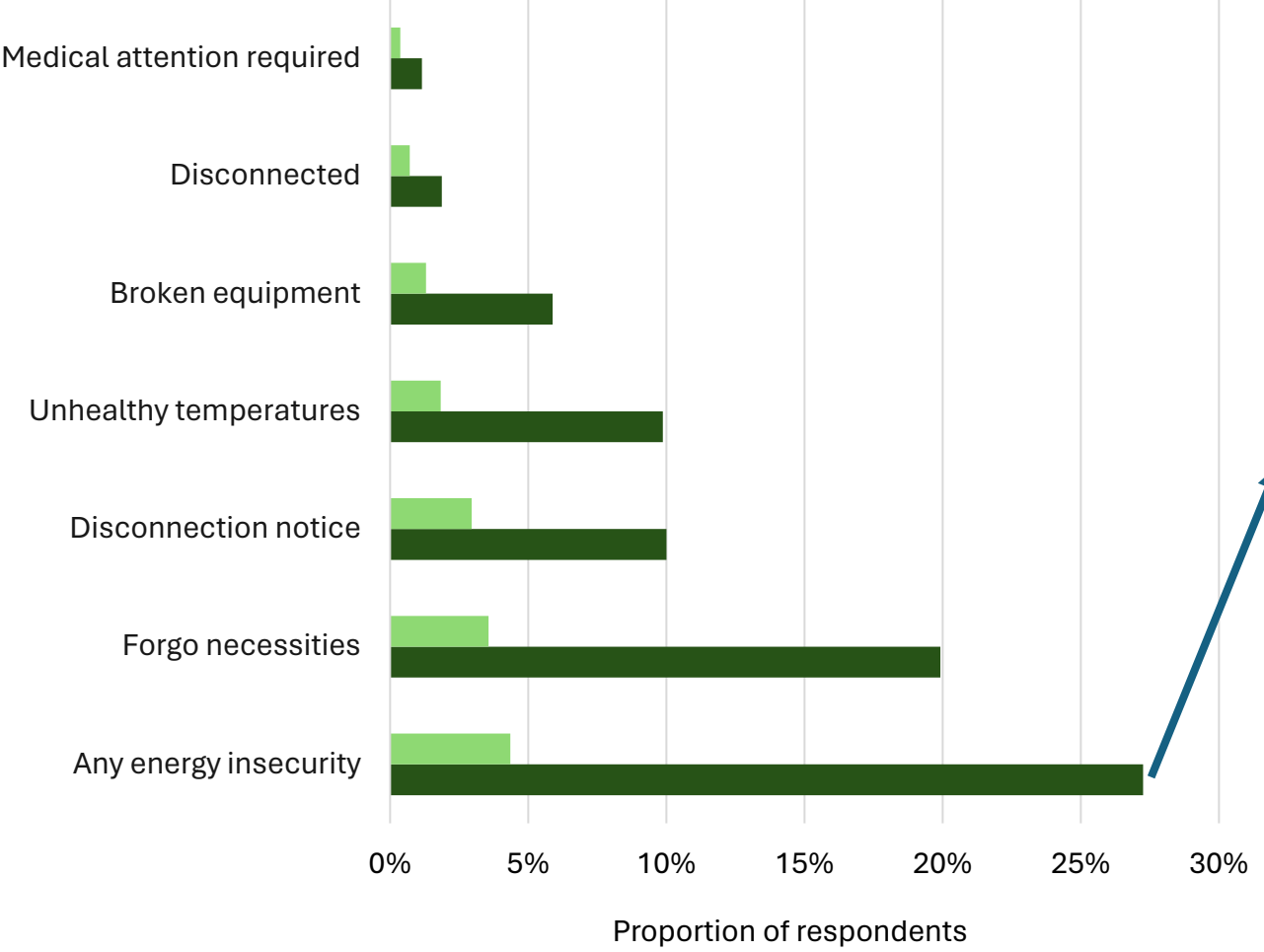


# Energy Assistance



Source: U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey (RECS)

# Energy Assistance

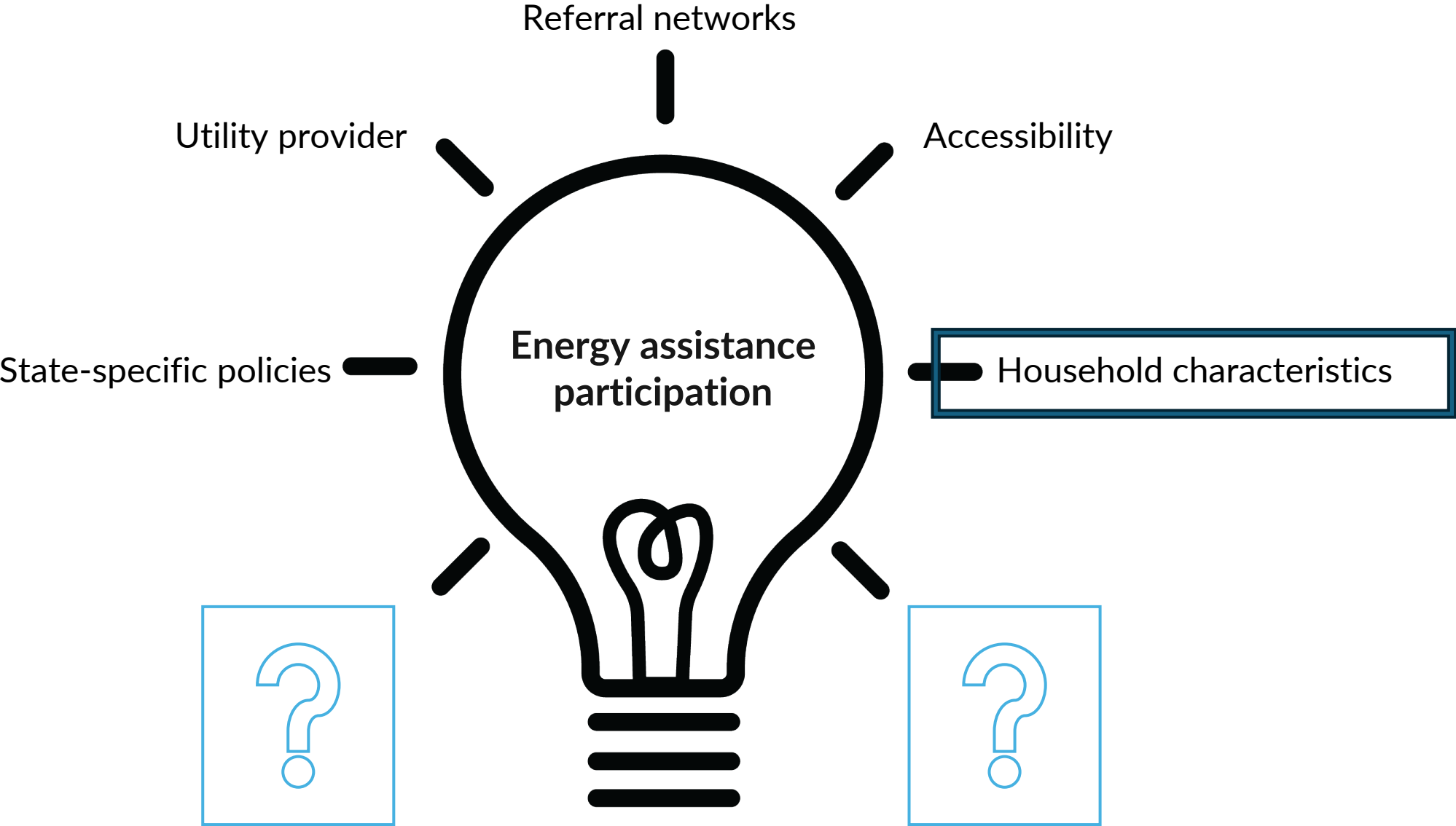


**16%** of energy insecure households received assistance

Source: U.S. Energy Information Administration, 2020 Residential Energy Consumption Survey (RECS)

# Local energy assistance framework

# Local energy assistance framework





# Spatial accessibility

## **Research question(s)**

What factors determine if a household participates in energy assistance?

# Research Design

## DATA

EIA 2020 Residential energy consumption survey

- Cross sectional, nationally representative
- Collected between 2020-2021
- 15,219 Census tracts in 31 states

## METHODS

1. Weighted logistic regression

$$\text{Logit}(P(2020EA_i = 1)) = \beta_0 + \beta_1 EA_{it} + B_2 EI_i + B_3 X_i + \gamma_s + \varepsilon_i$$

2. Energy insecurity analysis

# Results

	Variables	2020 recipient
Energy assistance	2019 recipient	++
	2018 recipient	++
	2017 recipient	+
	2016 recipient	++
Energy insecurity	Broken equipment	++
	Forgo necessities	++
	Unhealthy temperature	+
	Medical attention	+
	Disconnection notice	++
	Disconnected	++
	Characteristics	Yes
State FE	Yes	
N	18,496	

# Results

	Variables	2020 recipient
Energy assistance	<b>2019 recipient</b>	<b>54.46*</b>
	<b>2018 recipient</b>	<b>+*</b>
	<b>2017 recipient</b>	<b>+</b>
	<b>2016 recipient</b>	<b>+*</b>
Energy insecurity	<b>Broken equipment</b>	<b>+*</b>
	<b>Forgo necessities</b>	<b>+*</b>
	<b>Unhealthy temperature</b>	<b>+</b>
	<b>Medical attention</b>	<b>+</b>
	<b>Disconnection notice</b>	<b>10.23*</b>
	<b>Disconnected</b>	<b>+*</b>
	Characteristics	Yes
State FE	Yes	
N	18,496	

# Takeaways

Uncover key pathways to energy assistance participation:

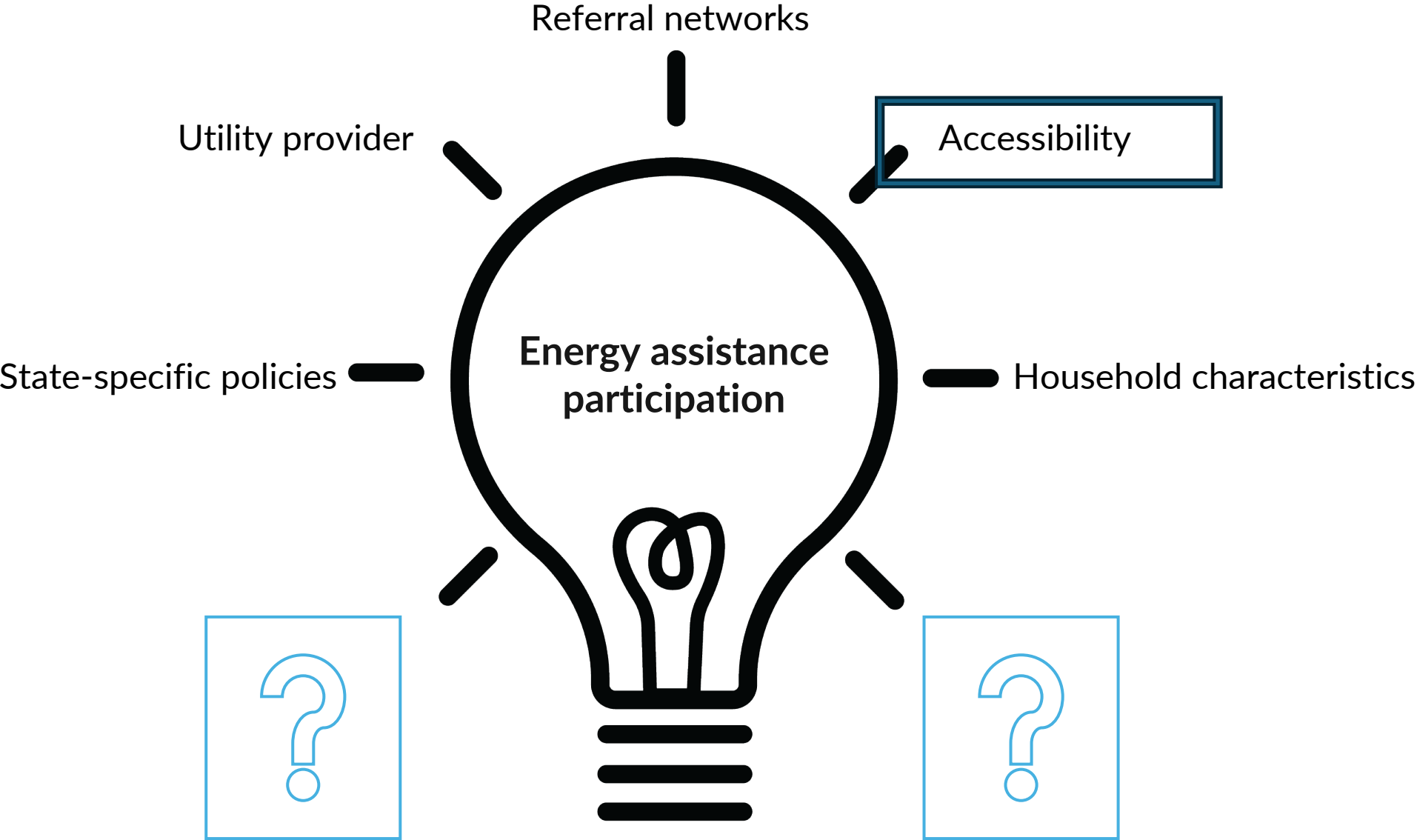
- Prior participation

- Official communication from utility provider (proxy for urgent need?)

Participation in assistance is not associated with a reduction in EI

Highlights insufficiency of energy assistance options for low-income customers

# Local energy assistance framework



# Spatial accessibility

## **Research question(s)**

Are energy assistance facilities spatially accessible to vulnerable populations?

Is local context related to spatial access to energy assistance?

Community-level socioeconomic characteristics?

Urban-rural disparities?

# Spatial accessibility

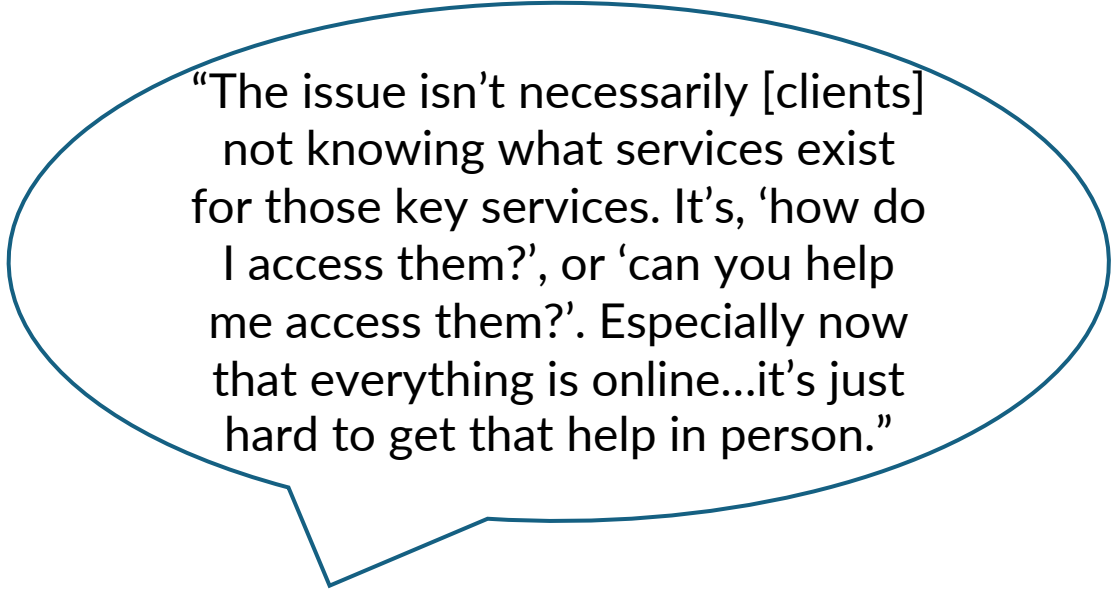
## Proximity to providers facilitates program participation

(Allard et al. 2003; 2022; Rossin-Slater 2013)

Commuting costs

Access to technology

Awareness and understanding



“The issue isn’t necessarily [clients] not knowing what services exist for those key services. It’s, ‘how do I access them?’, or ‘can you help me access them?’. Especially now that everything is online...it’s just hard to get that help in person.”

## What influences spatial access to social services?

(Murphy and Wallace 2010)

Program-specific

Regional variation



# Research Design

## DATA

Energy assistance facilities repository

DOE's Disadvantaged Communities dataset

American Community Survey

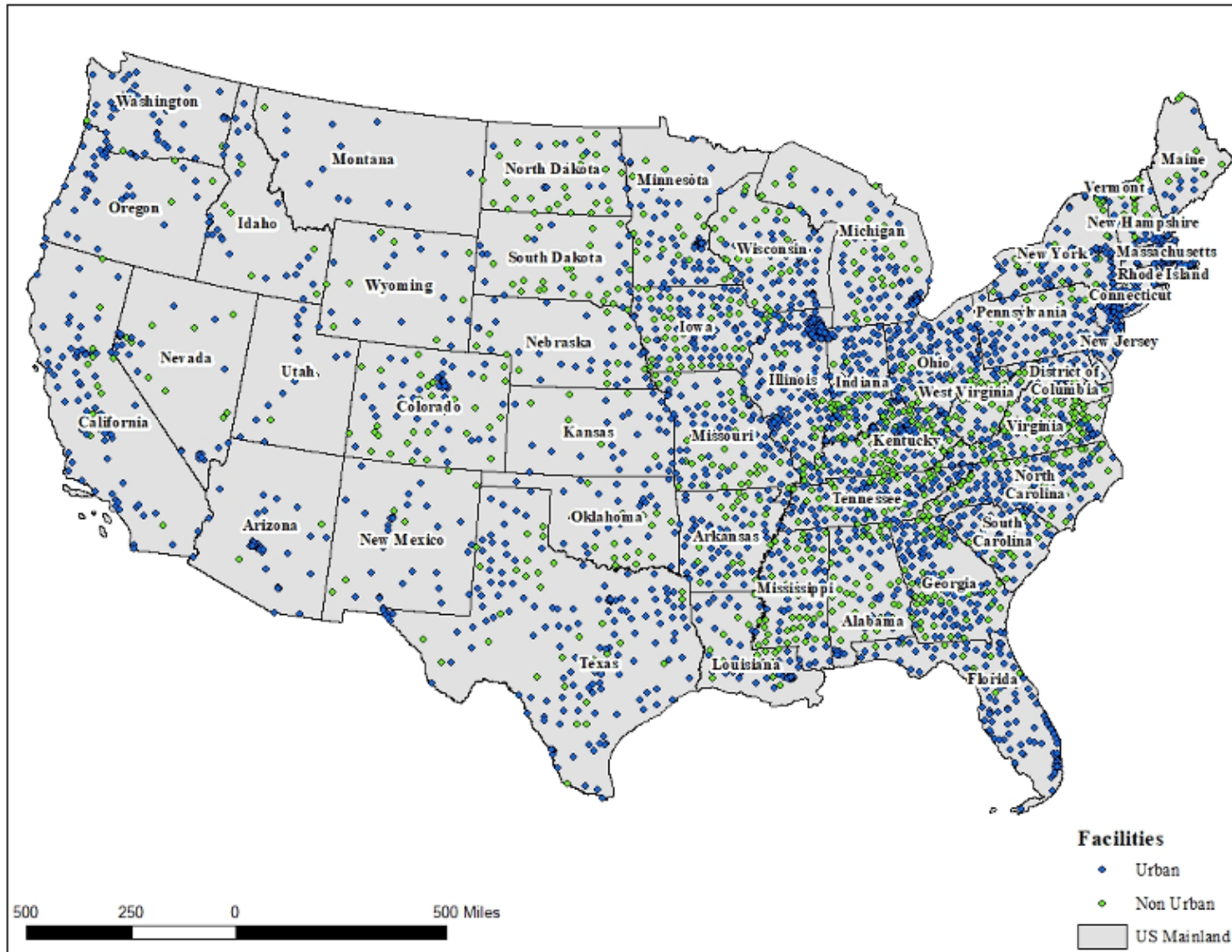
Tiger/line shapefiles

## METHODS

1. Spatial analysis
2. Linear regression

$$D_i = \beta_0 + \beta_1 U_i + \beta_2 R_i + \beta_3 EB_i + \beta_5 X_i + \gamma_i + \varepsilon_i$$

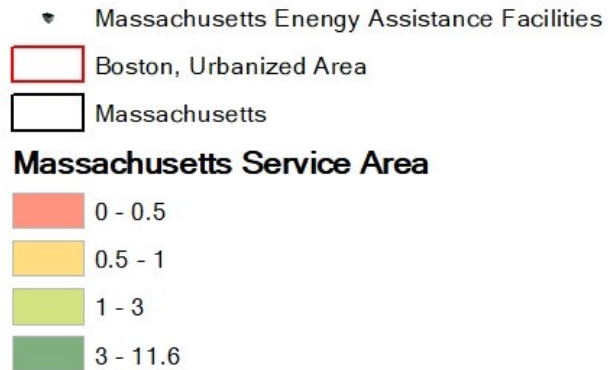
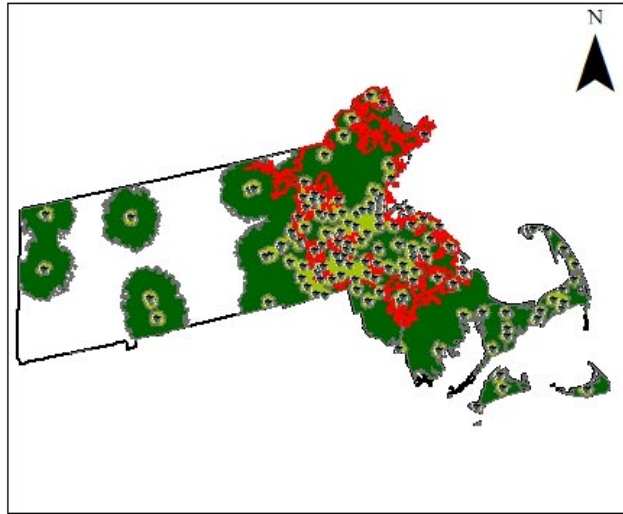
# Distribution of energy assistance facilities



3,424 facilities

~75% in urban areas

# Service area analysis



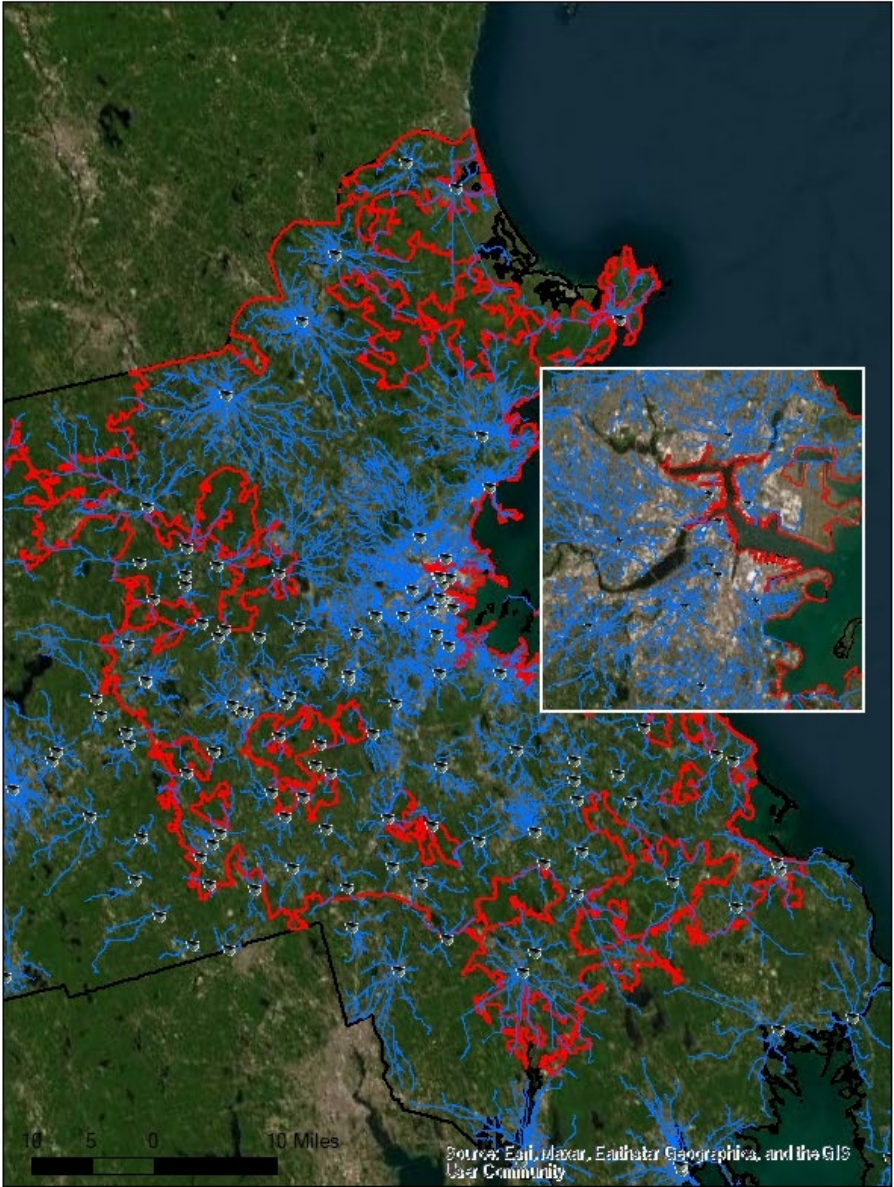
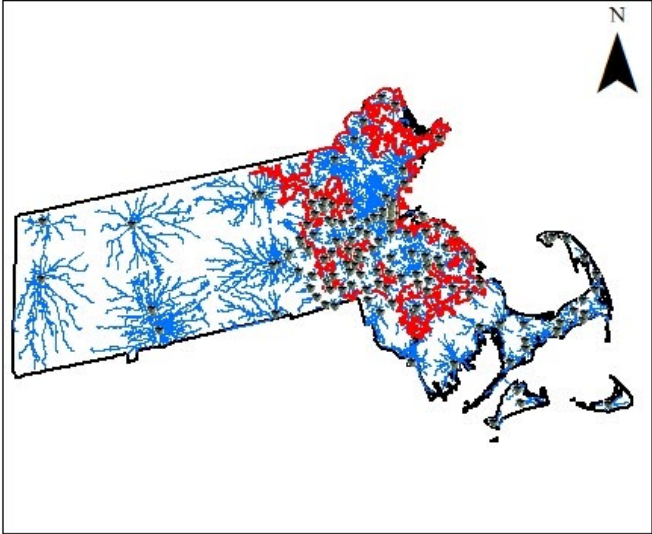
0-1 mile: 4.1%

1-3 miles: 17.9%

3-11.6 miles: 51.8%

Outside buffer: 26.2%

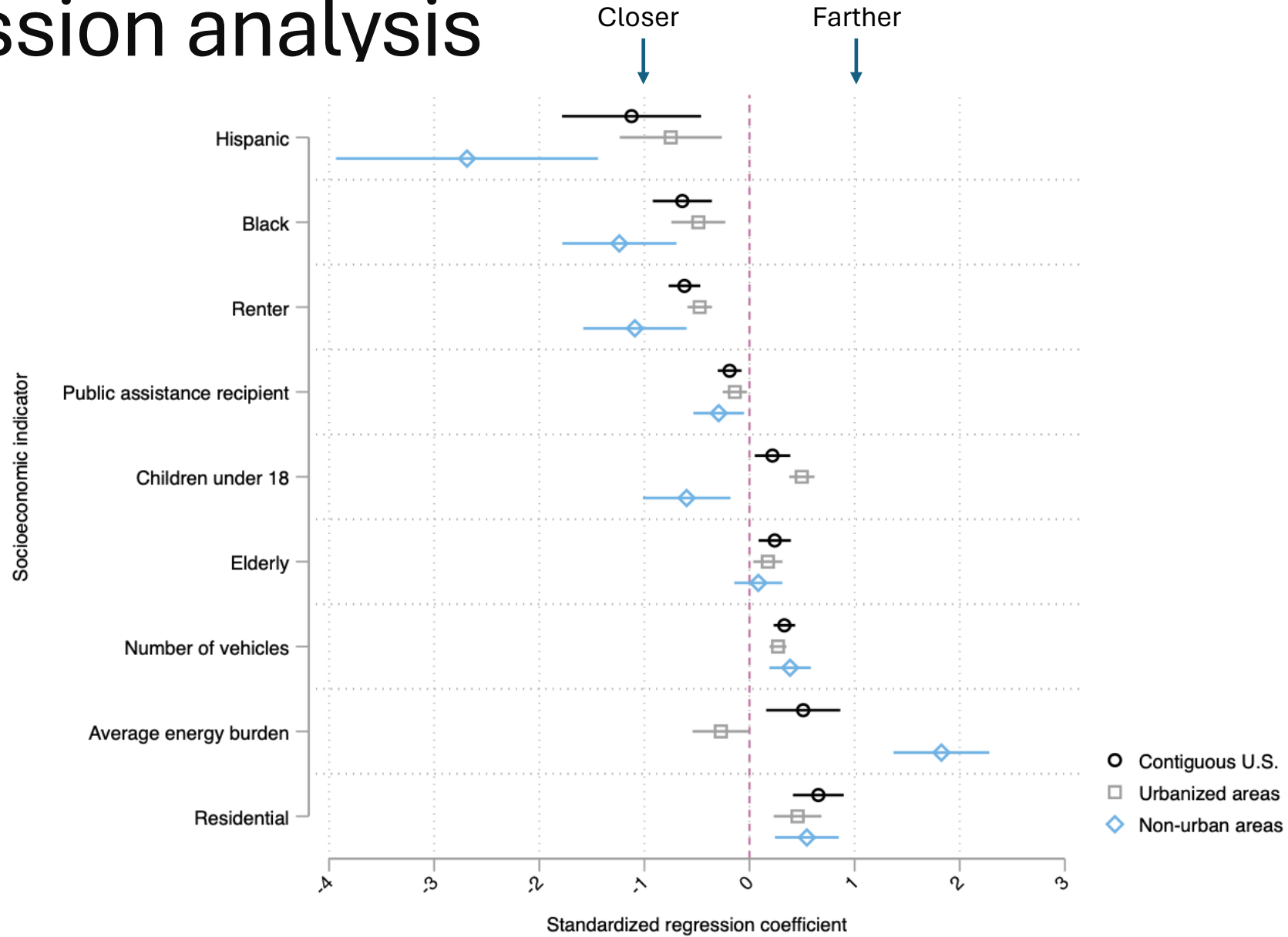
# Closest facility analysis



- ▼ Massachusetts Energy Assistance Facilities
- Closest Routes to the Facilities
- ▭ Boston, Urbanized Area
- ▭ Massachusetts

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

# Regression analysis



# Spatial accessibility – National analysis

## Takeaways

We aim to help administrators visualize the physical gaps in coverage

83 million individuals live outside of service area

On average, facilities are located farther from residential areas

Non-urban communities with higher energy burdens are located farther from energy assistance facilities

# Spatial accessibility – State analysis

## Data

### Minnesota Electronic Household Energy Automated Technology (eHEAT) system data (2000-2020)

Department of Commerce administers LIHEAP and WAP

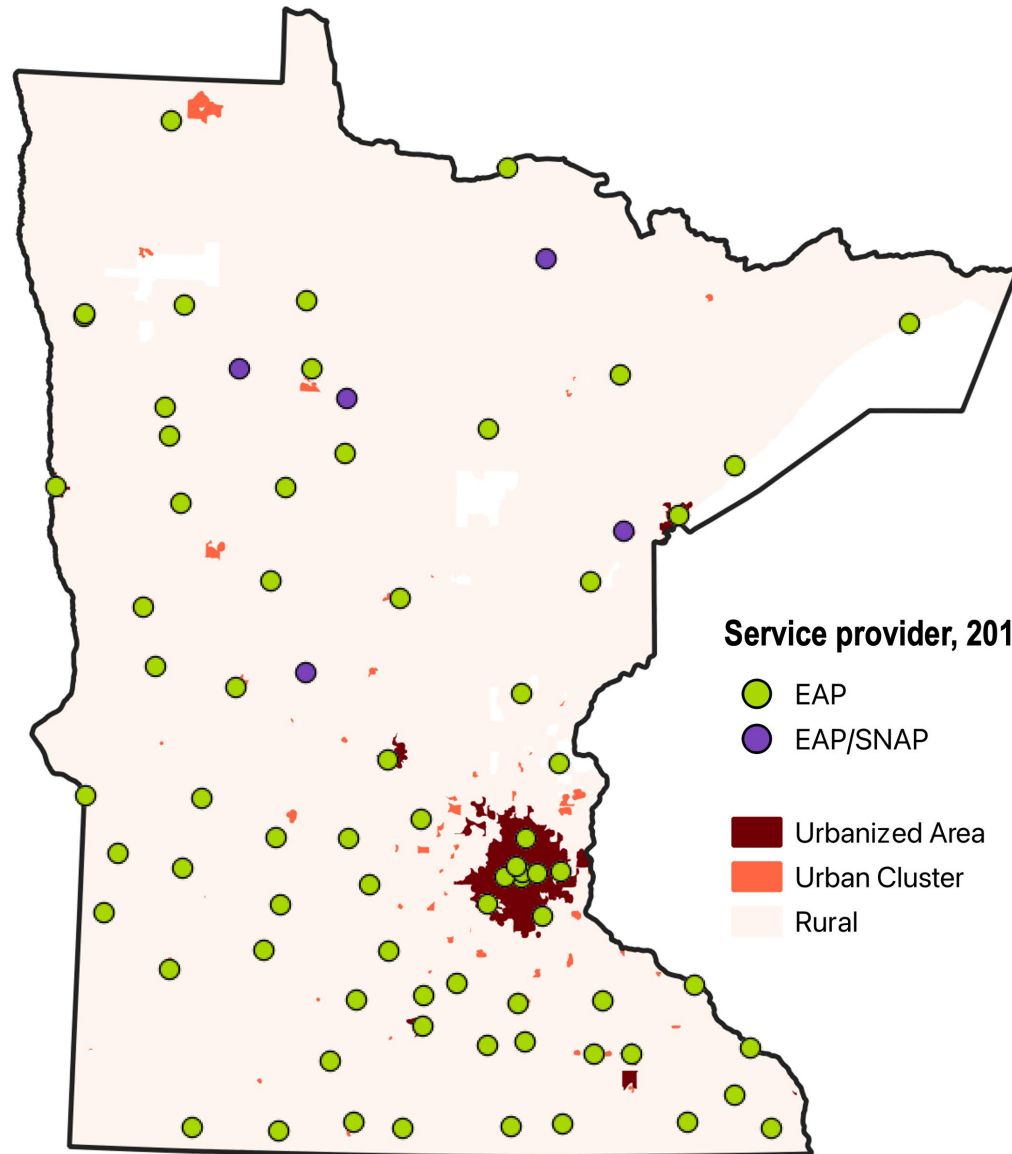
Applications are processed through MN's proprietary eHEAT

Service provider, household income, size, building type, fuel used, fuel expenditure, benefits received, income sources, demographic indicators, and geographic identifiers

### U.S. Census Bureau

American Community Survey (ACS)

# Distribution of energy assistance facilities, 2019



76 facilities

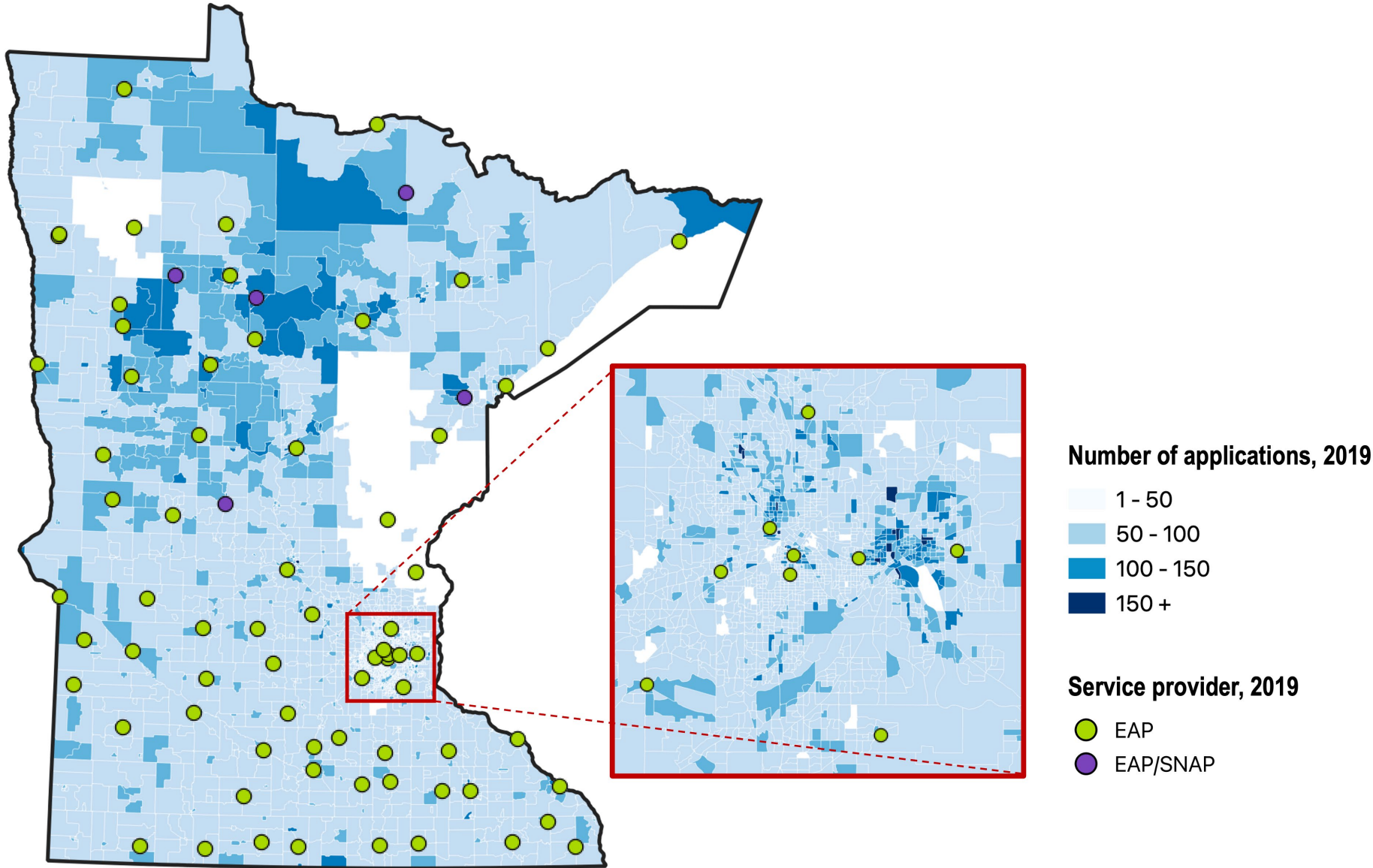
17% urbanized areas  
(50,000+)

47% urban clusters  
(2,500 - 50,000)

36% rural areas



# Distribution of LIHEAP applications, 2019



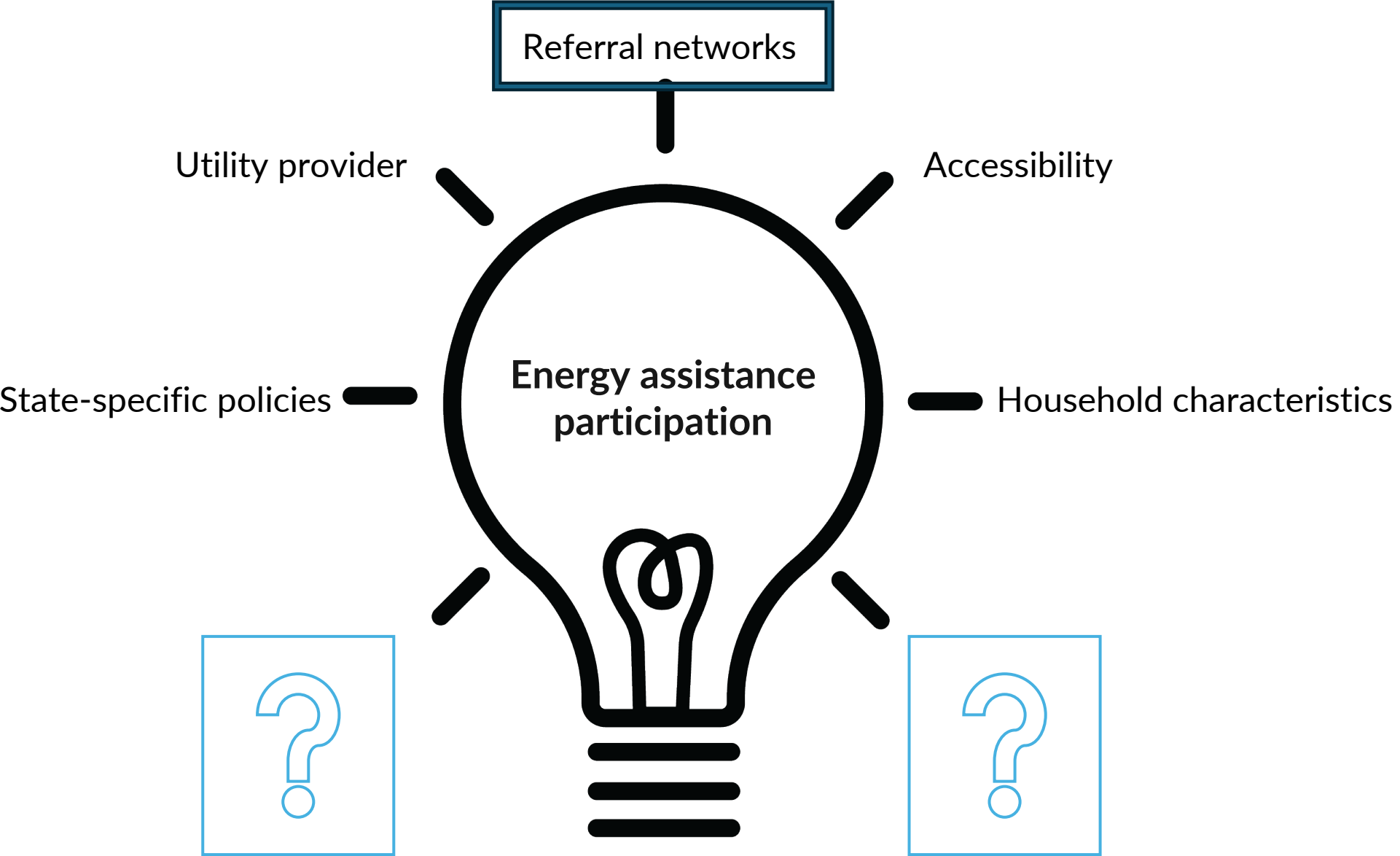
# Spatial accessibility – State analysis

## **Preliminary Takeaways**

Application density is higher closer to energy assistance facilities

For every 10-mile increase, application numbers drop

# Local energy assistance framework



# Spatial accessibility

## **Research question(s)**

Do referral networks, such as nonprofit organizations, in a community facilitate LIHEAP applications?

# Information and referral networks: next up

## The role of formal/informal referral networks

(Holcomb et al. 2022; Schneider 2009; Small 2006)

Nonprofit organizations?

Information sharing?

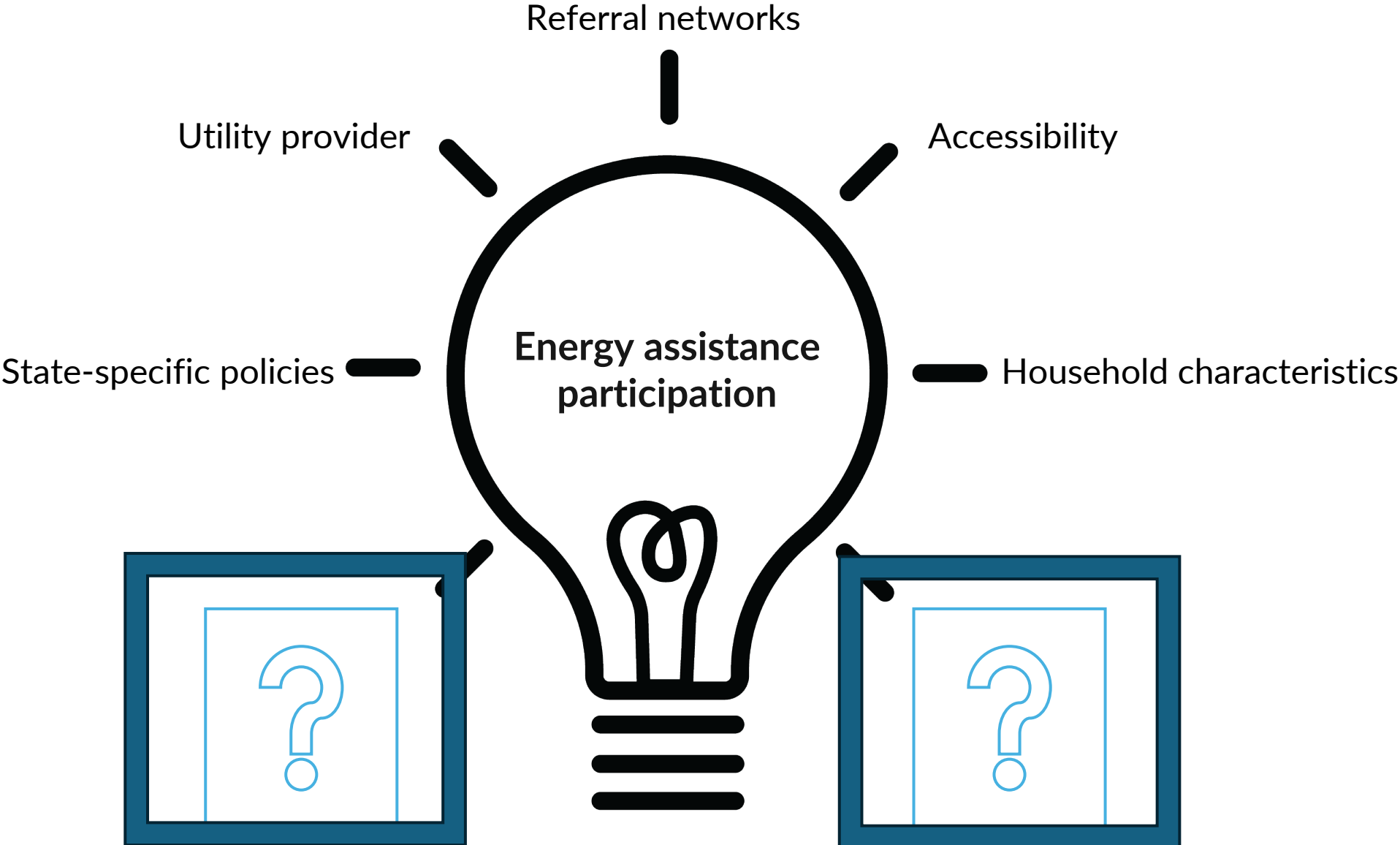
Building community social capital?

Medical offices?

“We just completed our client survey for the year and still, over half of the people that come through intake are referred by community partners. And then about 20% come through word of mouth. So still, after 14 years of social media and all these other things, 70% still come basically through a warm handoff...it’s really [about] enriching those connections, because those are the most meaningful connections back to warm handoffs and community continuity.”

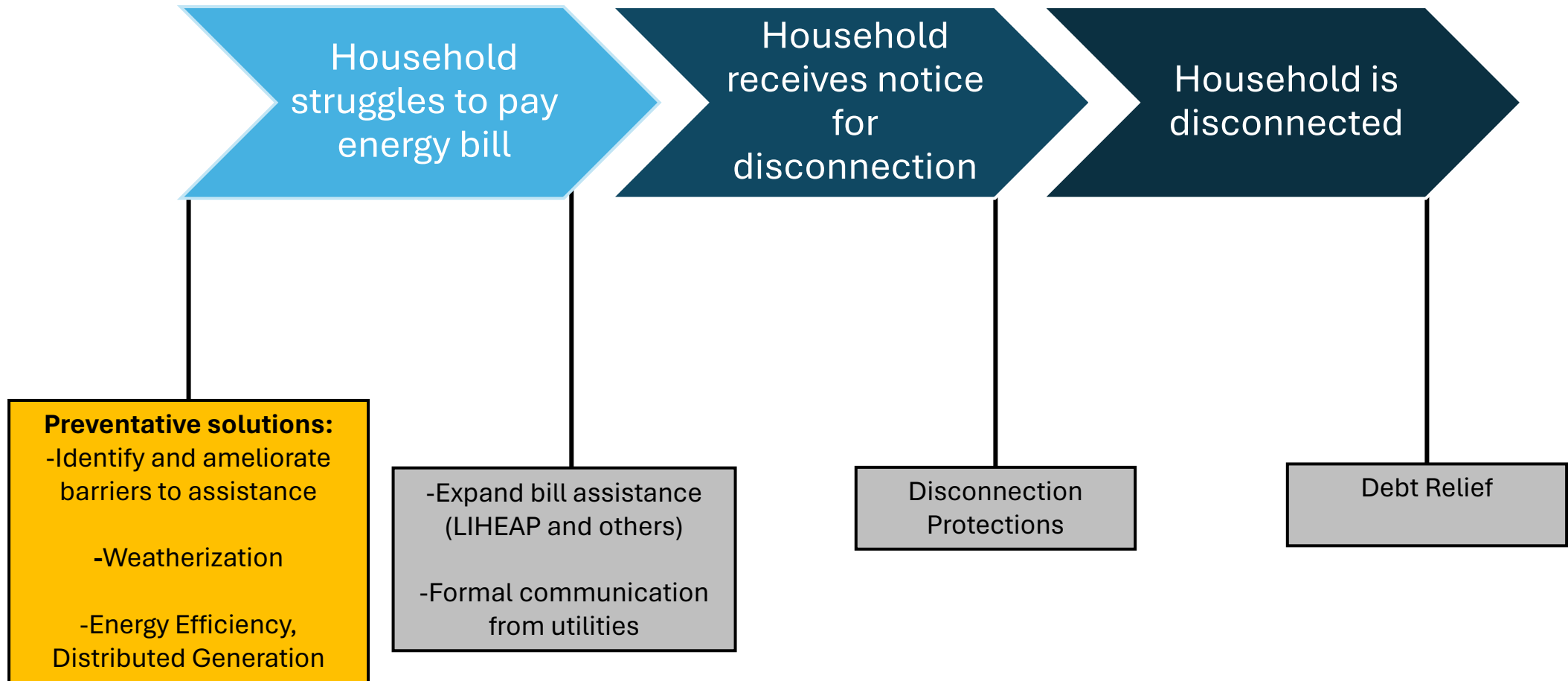
“Part of a social justice attitude is making sure that they know that the whole community is there for them, and to make sure that we’re building deliberate spokes to additional programming.”

# Local energy assistance framework



# Policy implications

# Policy implications





# Thank you!

I welcome feedback and questions.

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# Select Citations

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# Source of additional images in PPT

1. <https://thefifthestate.com.au/columns/spinifex/energy-poverty-urgently-end-2/>
2. <https://pcappliancerepair.wordpress.com/2015/09/13/orange-and-yellow-flames-on-a-gas-range-what-causes-them/>
3. <https://www.onlyinyourstate.com/west-virginia/cheap-homes-wv/>
4. <https://www.wboy.com/news/marion/fire-officials-warn-about-dangers-of-space-heaters-in-homes/>
5. <https://allairsystemsny.com/using-an-oven-to-heat-a-house-heres-why-its-a-bad-idea/>



# Extra information

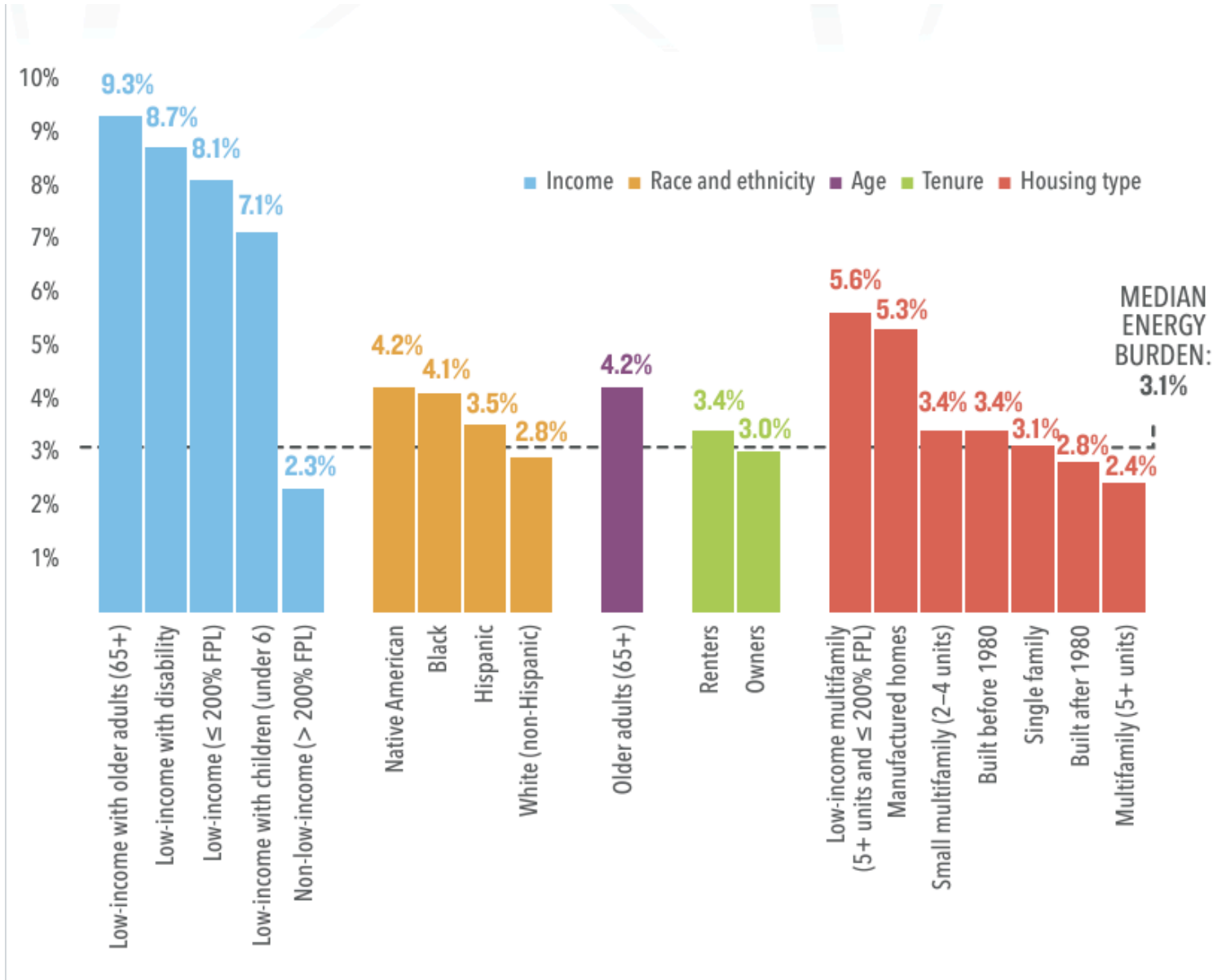
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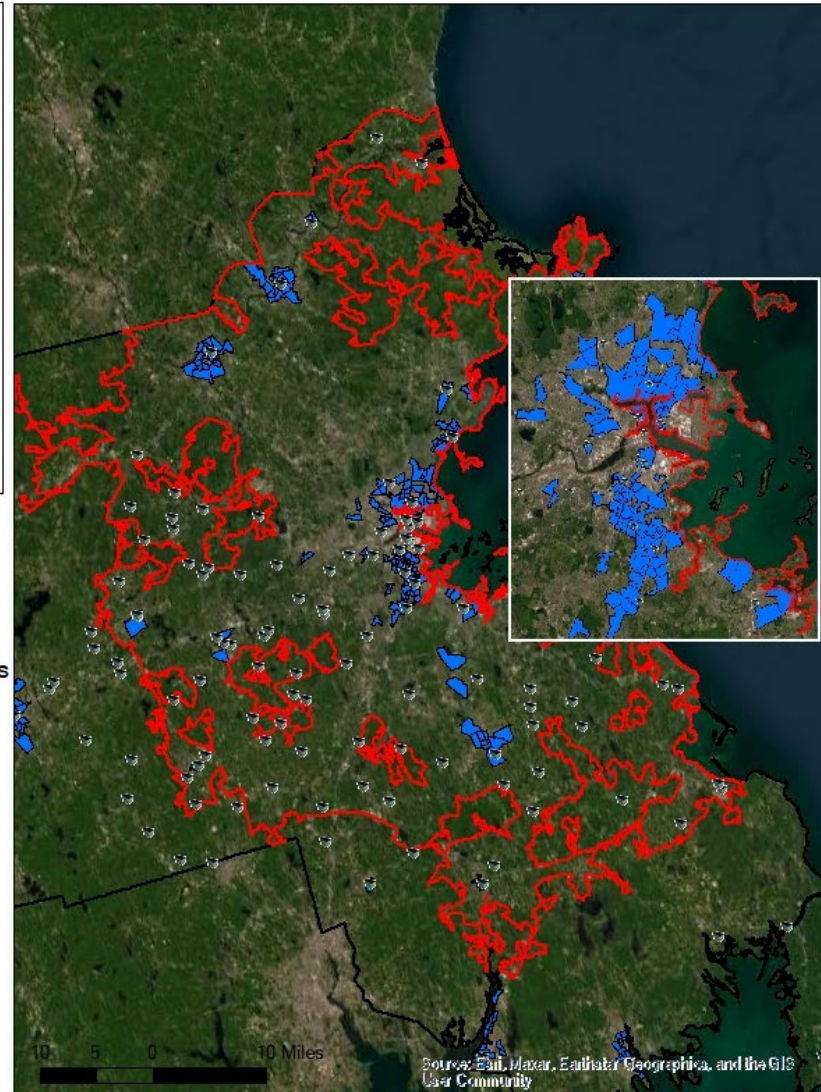
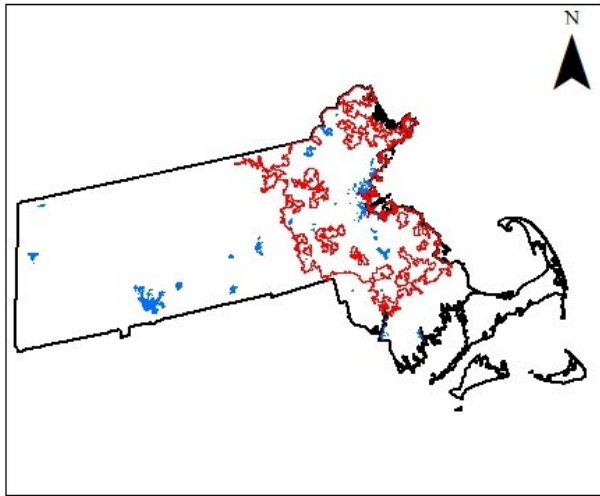
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# Energy burden



Source: Drehobl, A., & Ross, L. (2016). Lifting the high energy burden in America's largest cities: How energy efficiency can improve low income and underserved communities.

# Disadvantaged Communities (DACs)



- ◆ Massachusetts Energy Assistance Facilities
- ▭ Boston, Urbanized Area
- ▭ Massachusetts DAC Tracts
- ▭ Massachusetts

Are facilities located in DACs?

8% - DACs

7.3% - urban DACs

17.8% - non-urban DACs