The Political Economy of Preparedness: Geographic Variation in Financing, Capabilities & Costs

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Rising burden of outbreaks, disasters and other health emergencies

- Newly emerging and resurgent infectious diseases: Zika, MERS, Ebola
- Growing antibiotic resistance
- Incomplete vaccination coverage
- Globalization in travel and trade patterns
- Political instability, violence and terrorism risks
- Aging infrastructure: transportation, housing, food, water, energy systems
- Extreme weather events
- Cyber-security vulnerabilities

Health security requires collective actions across many activities and sectors

- Surveillance
- Environmental monitoring
- Laboratory testing
- Communication systems
- Response planning
- Incident management
- Emergency response
- Surge capacity
- Management & distribution of countermeasures
- Continuity of healthcare delivery
- Community engagement
- Workforce protection
- Volunteer management
- Education & training
- Drills & exercises
- Information exchange
- Evacuation & relocation
- Infrastructure resiliency
- Protections for vulnerable populations

Why a Health Security Index?

Track national progress in health security as a shared responsibility across sectors

- Raise public awareness
- Identify strengths and vulnerabilities
- Detect gains and losses
- Encourage coordination & collaboration
- Facilitate planning & policy development
- Support benchmarking & quality improvement
- Stimulate research & innovation

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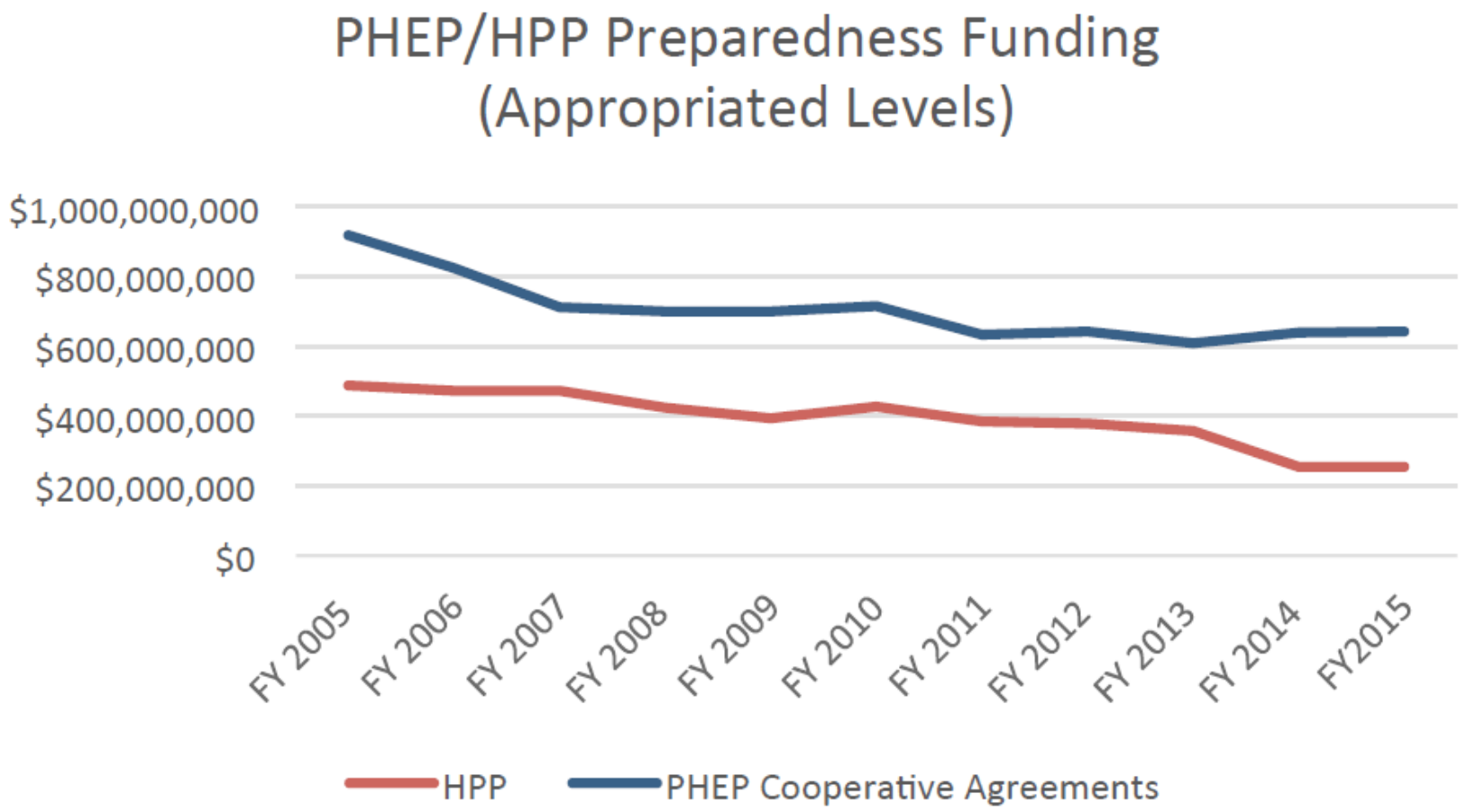
Uncertain risks & unstable resources



State per capita ($2015): Min: 0.35 Median: 2.03 Max: 50.0

Source: Trust for America's Health, 2017

Research questions

- How do health security levels vary across states and change over time?
- Do federal-state financing & policy mechanisms contribute to geographic variation in health security?
  - Federal preparedness financing
  - ACA-related health insurance coverage gains
- Do health security levels contribute to geographic and inter-temporal variation in disaster recovery spending?

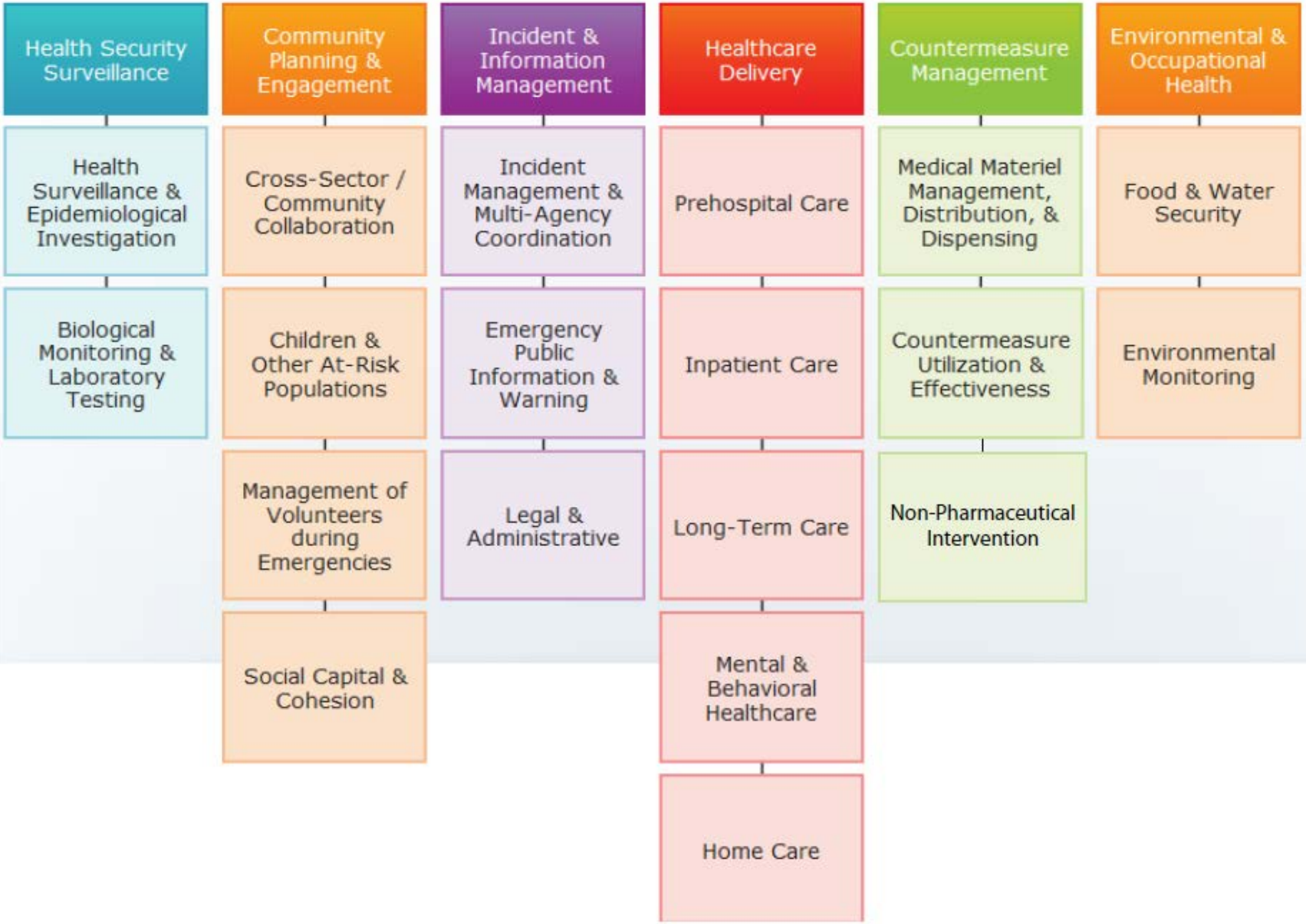
Measurement: National Health Security Index

- **139 individual measures**
  - Weighted average
- **19 subdomains**
  - Weighted average
- **6 domains**
  - Weighted average
- **State overall values**
  - Unweighted average
- **National overall values**

- Normalized to 0-10 scale using min-max scaling to preserve distributions
- Imputations based on multivariate longitudinal models
- Empirical weights based on Delphi expert panels
- Bootstrapped confidence intervals reflect sampling and measurement error
- Annual estimates for 2013-2016

Reliability by Domain	Alpha
Health security surveillance	0.712
Community planning & engagement	0.631
Incident & information management	0.734
Healthcare delivery	0.596
Countermeasure management	0.654
Environmental/occupational health	0.749

Index measurement domains & subdomains



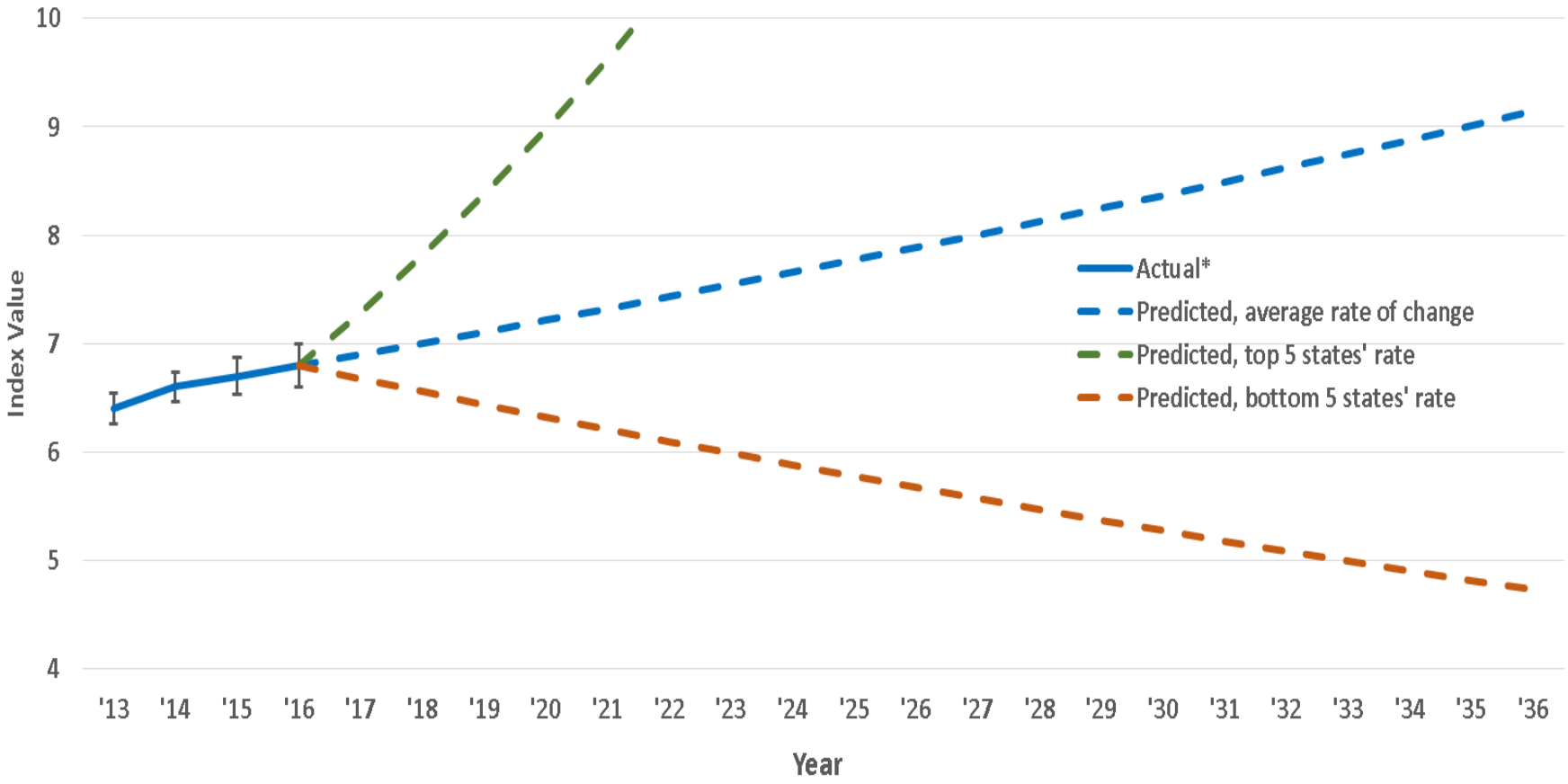
Analytic methods

- Index data for each state and year 2013-16
- Federal preparedness and recovery expenditures by state and year (Federal Funding Accountability and Transparency Act Reporting System)
- State health insurance coverage, social, and demographic characteristics by state and year (American Community Survey)
- We estimate GEE panel regression models:

$$E(\text{Index}_{i,t}) = B_0 + B_1\$\text{Preparedness}_{i,t} + B_2\text{Coverage}_{i,t} + B_3\text{Population}_{i,t} + e_i + e_t + e_{i,t}$$

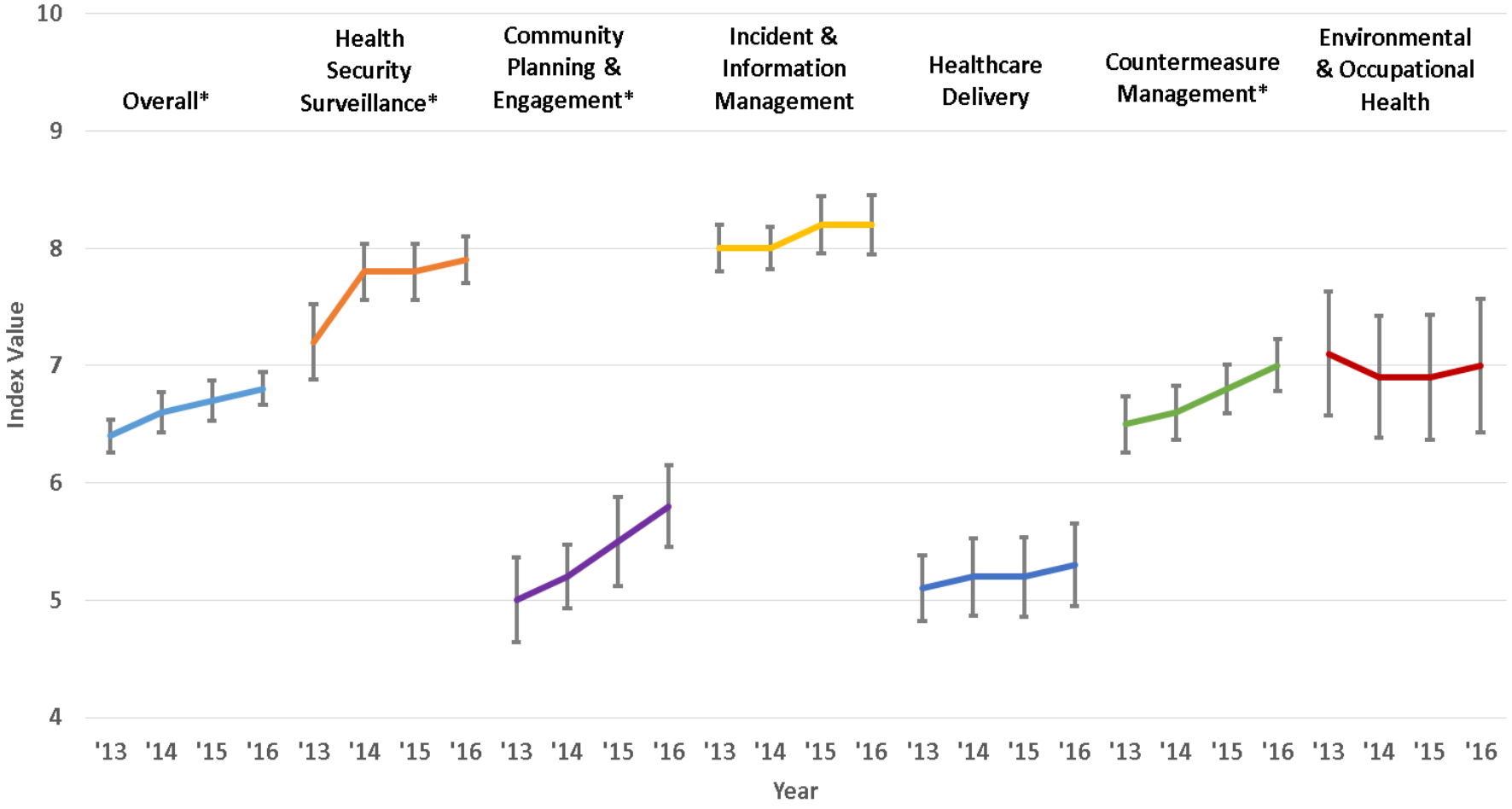
$$E(\$\text{Recovery}_{i,t}) = B_0 + B_1\text{Index}_{i,t} + B_2\text{Coverage}_{i,t} + B_3\text{Population}_{i,t} + e_i + e_t + e_{i,t}$$

Steady but slow progress



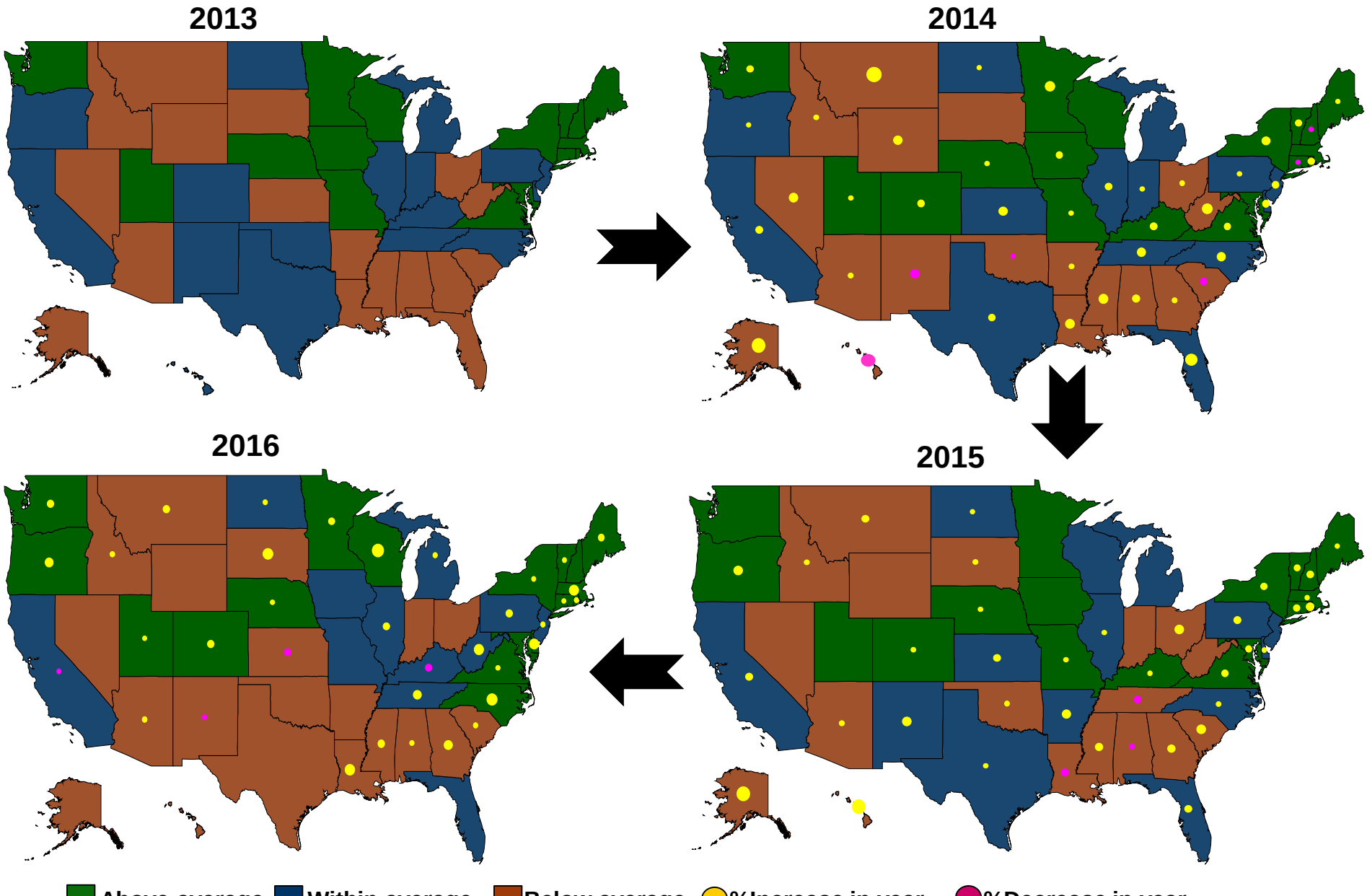
*statistically significant change

The U.S. improved in most domains during 2013-16, except healthcare delivery and environmental health

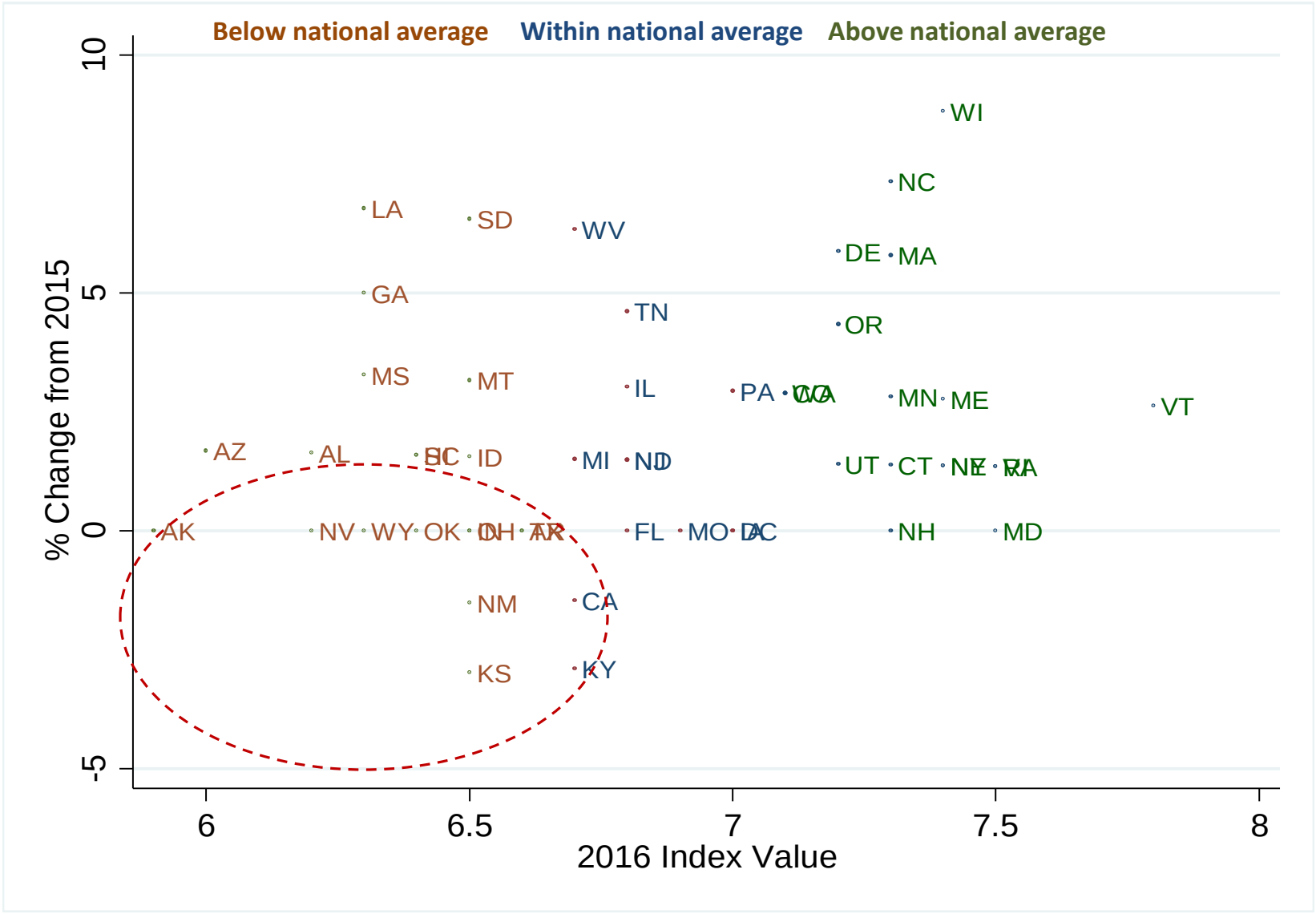


*statistically significant change

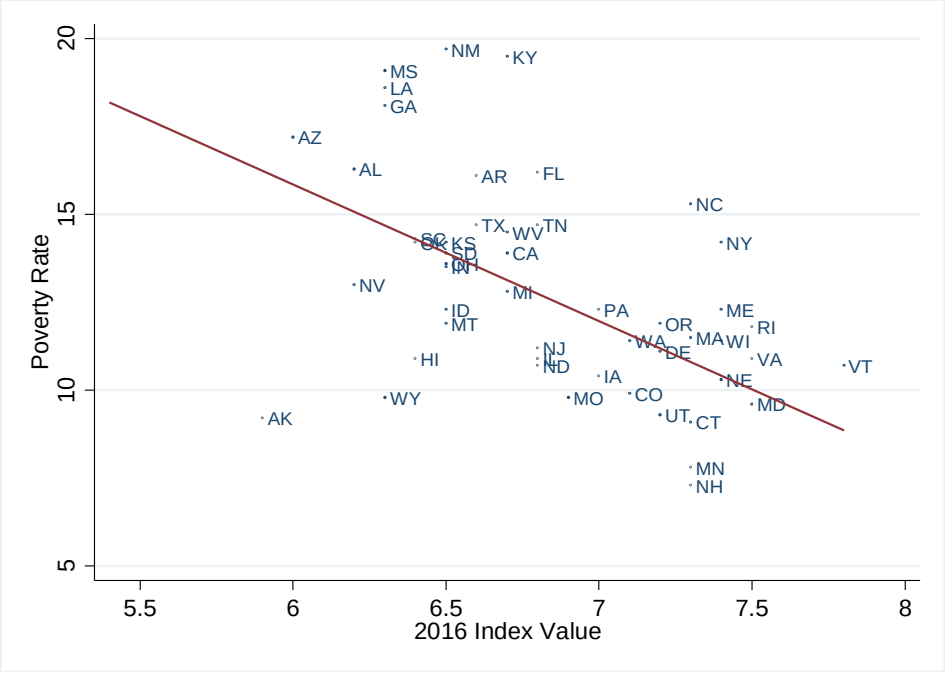
Geographic disparities in health security are large and persistent



Improvements occurred across the U.S., but 12 states trailed or lost ground

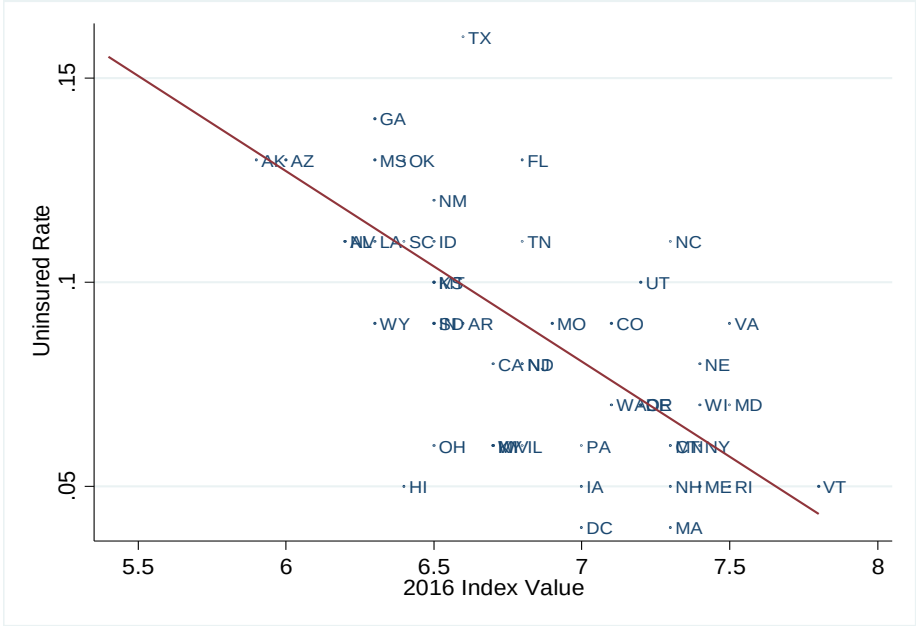


Health security tracks closely with social & economic determinants of health

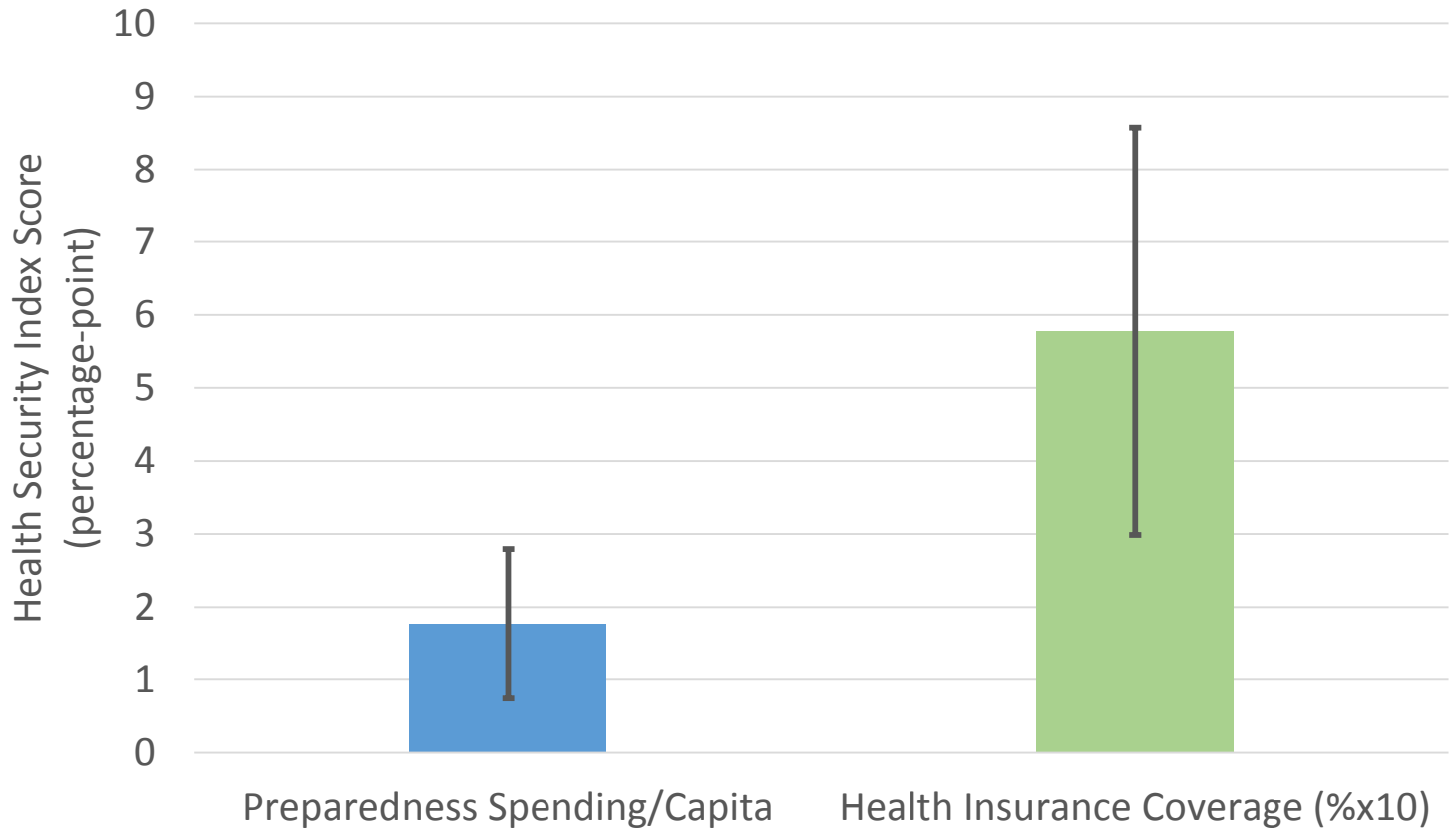


Percent of population below federal poverty threshold

Percent of population without health insurance coverage

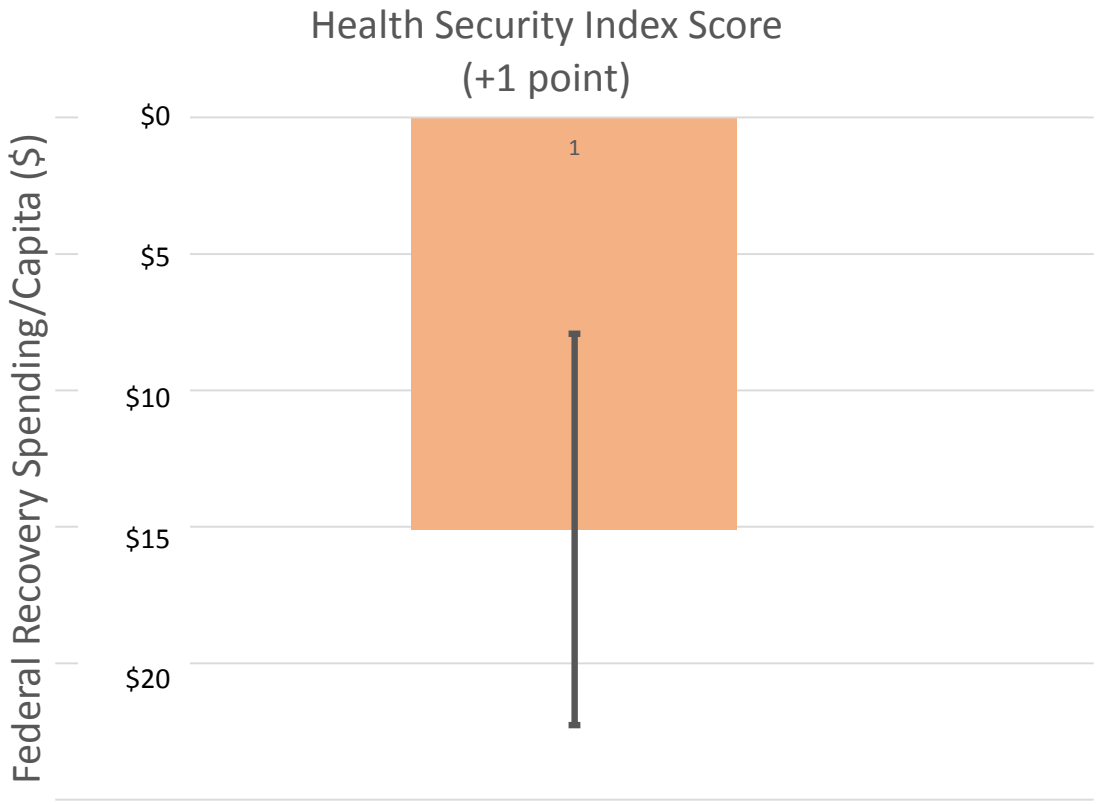


Changes in Health Security Associated with Federal Preparedness Spending and Coverage Gains



GEE panel regression estimates also controlling for state population size and density, poverty rate, educational attainment, state public health spending per capita, and time trends.

Changes in Federal Recovery Spending Associated with Gains in Health Security Index



GEE panel regression estimates also controlling for state population size and density, poverty rate, educational attainment, health insurance coverage, state public health spending per capita, and time trends.

Conclusions & Implications

- State health security appears highly sensitive to:
  - Dedicated federal financing
  - Health insurance coverage gains
- Stronger state preparedness levels appear to yield substantially lower federal recovery spending
- Revisions to federal funding formulas could reduce geographic disparities in health security

Caveats and cautions

- Imperfect measures & latent constructs
- Timing and accuracy of underlying data sources
- Unobserved within-state heterogeneity
- Short panel
- Observational, not causal, estimates

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How Workforce Policies & Infrastructure Shape Health Security Across the US: Implications for Employers

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Presenter Disclosures

Michael T. Childress

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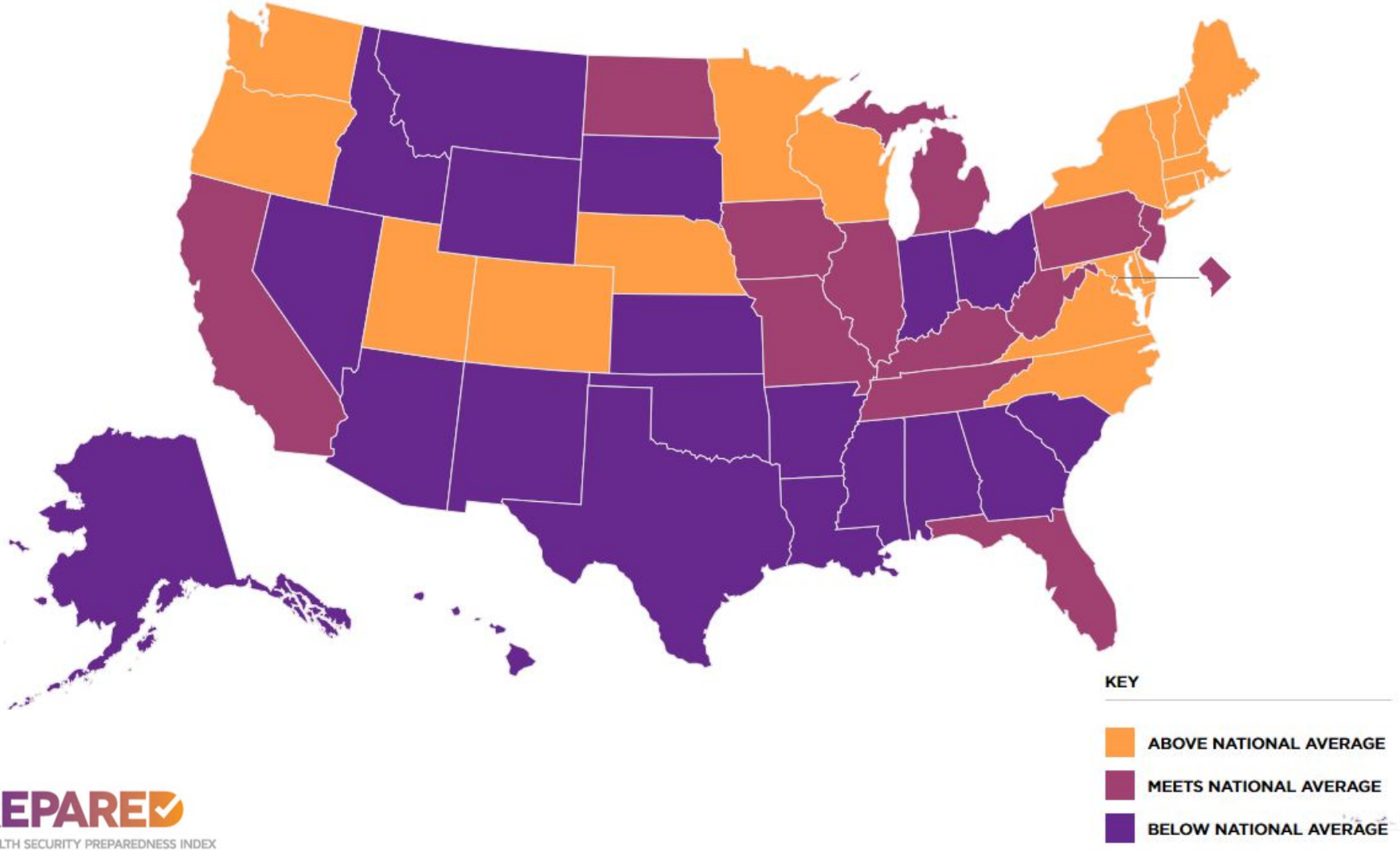
The 2017 Release of the Index



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What the Index measures

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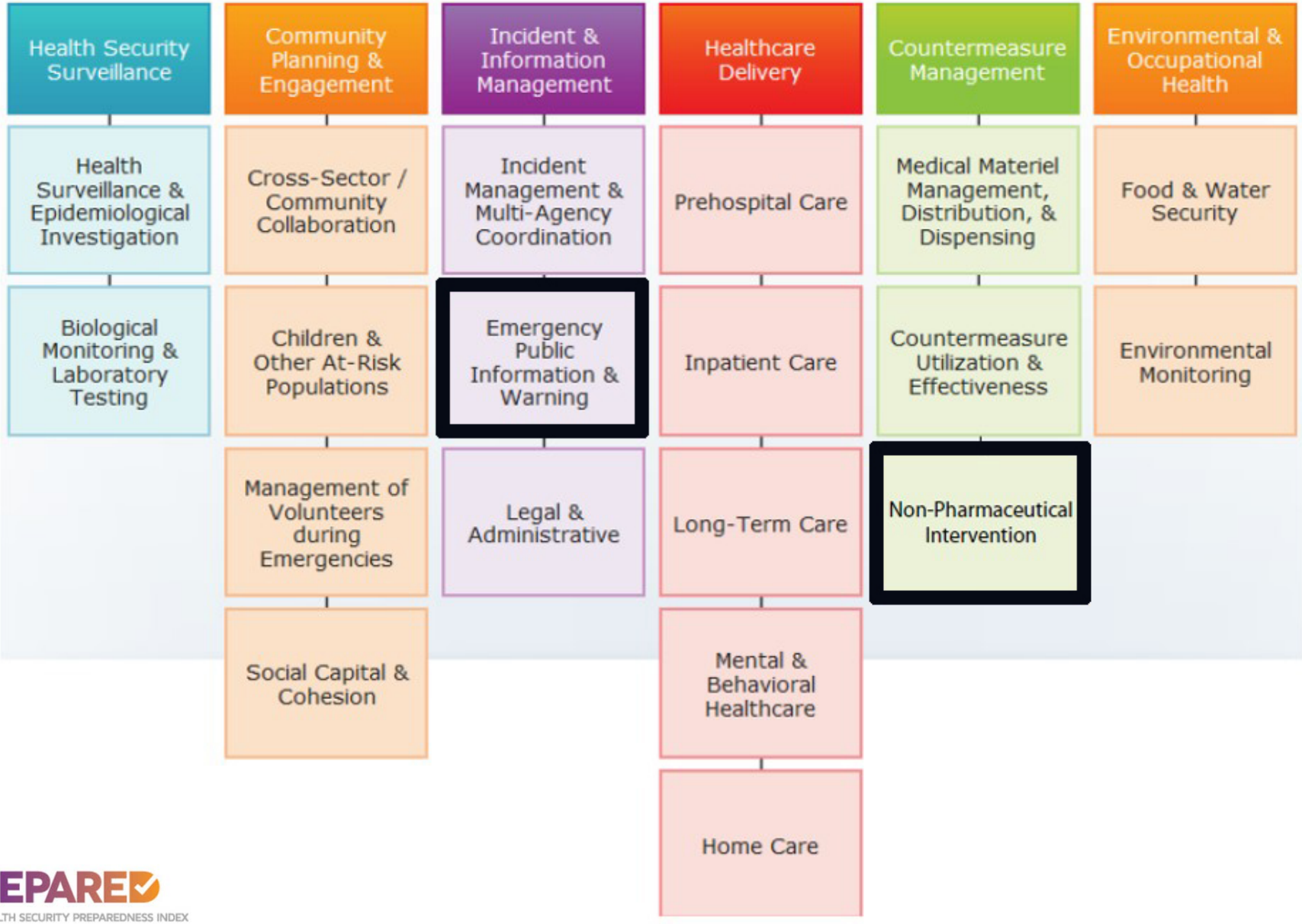
What the Index measures



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Business & Health Security

- Facilitate supply chain contingency planning to mitigate disruptions
- Increase awareness about preparedness
- Foster social cohesion
- Encourage volunteerism within their workforce
- Harness technology to plan, respond, and recover

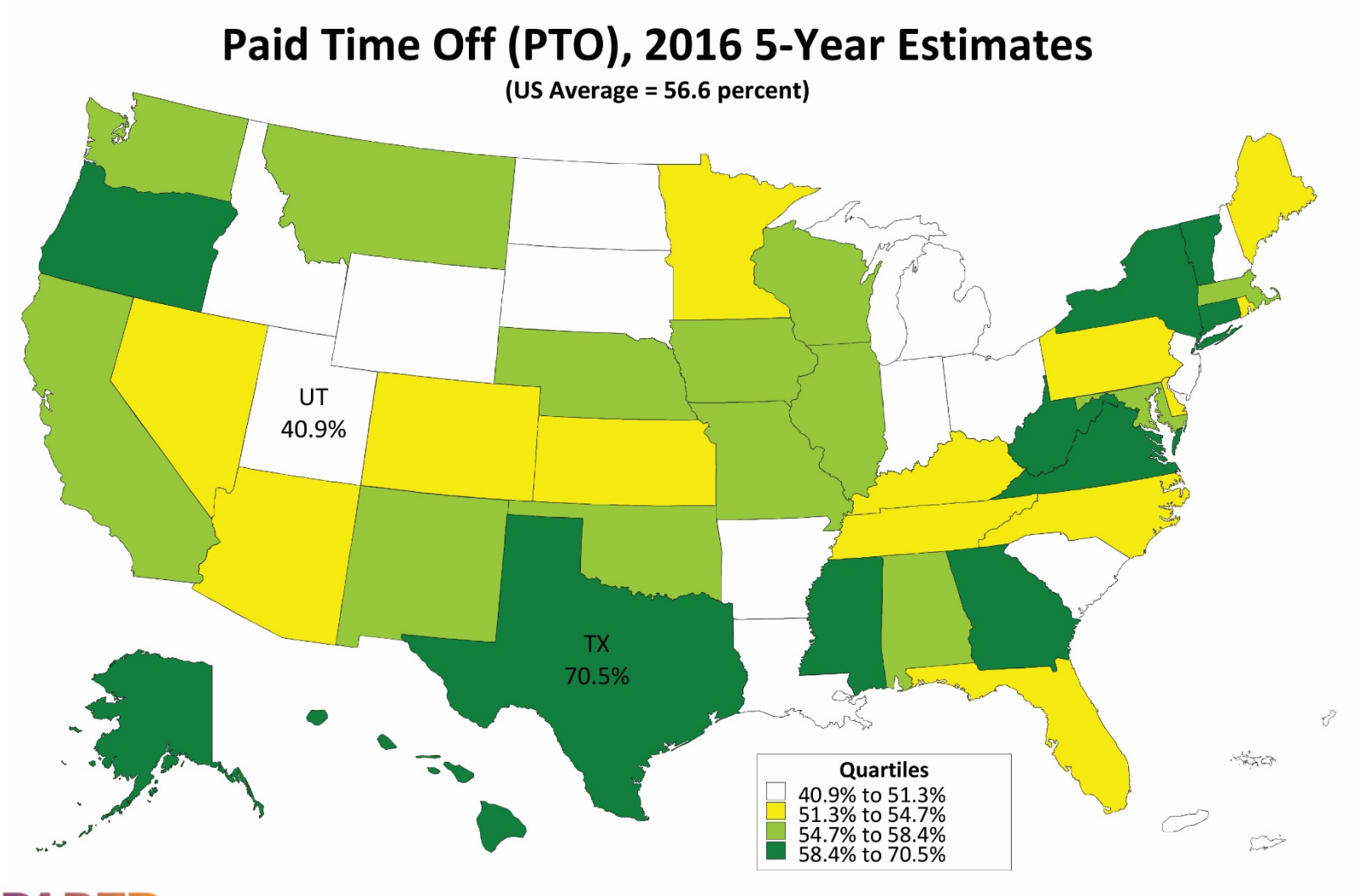
Direct Impact on Public Health

- Private sector plays a fundamental role in paid time off (PTO) & telecommuting
- These factors enhance compliance with social distancing policies used in infectious disease outbreaks

Selected Underlying Drivers

- Private Sector role
  - Paid Time Off: percent of employed population with some type of paid time off (PTO) benefit
  - Telecommuting: percent of employed population engaging in some work from home by telecommuting
- Infrastructure
  - Broadband: percentage of households with broadband in the home

Paid Time Off



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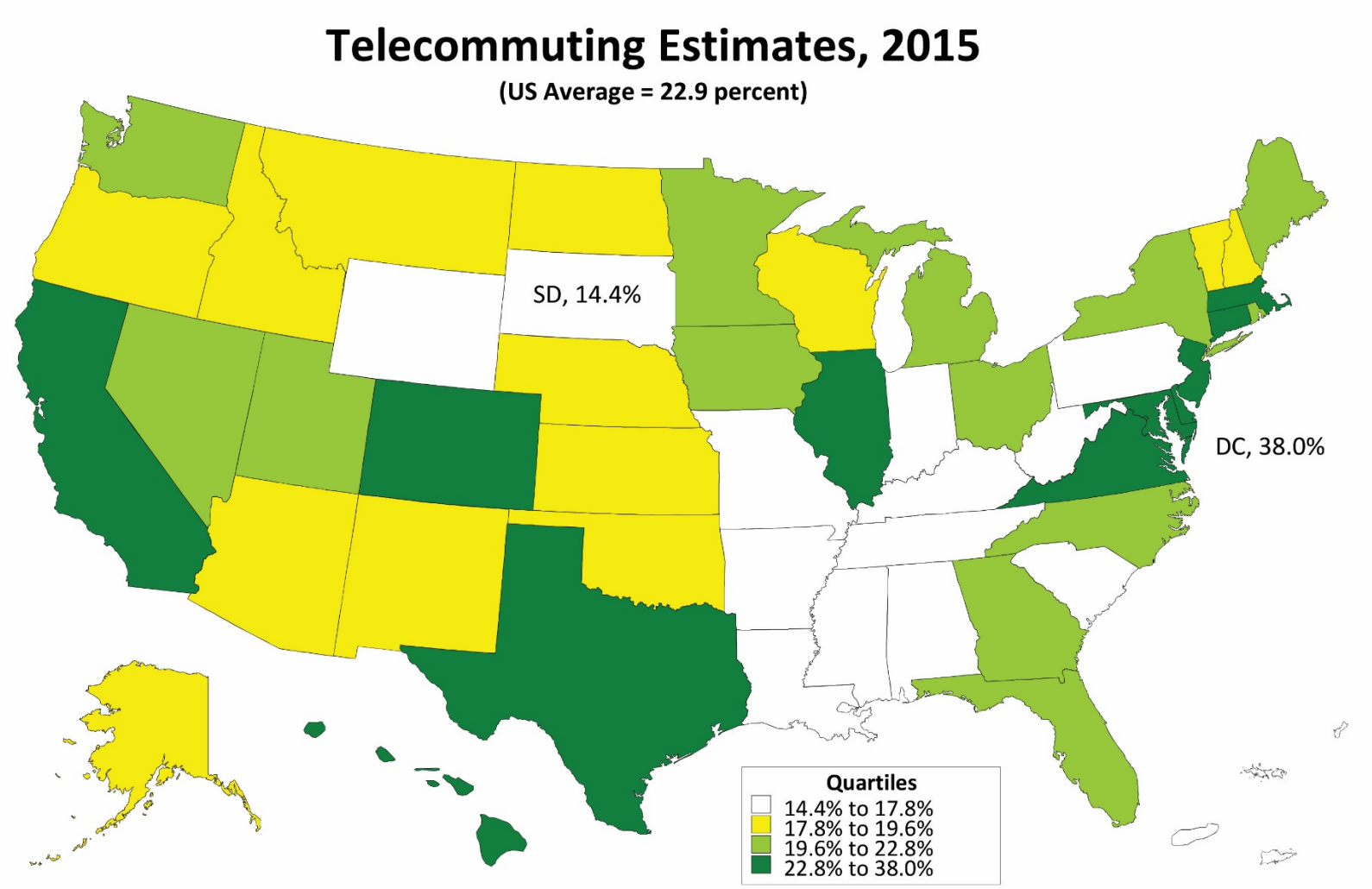
Telecommuters



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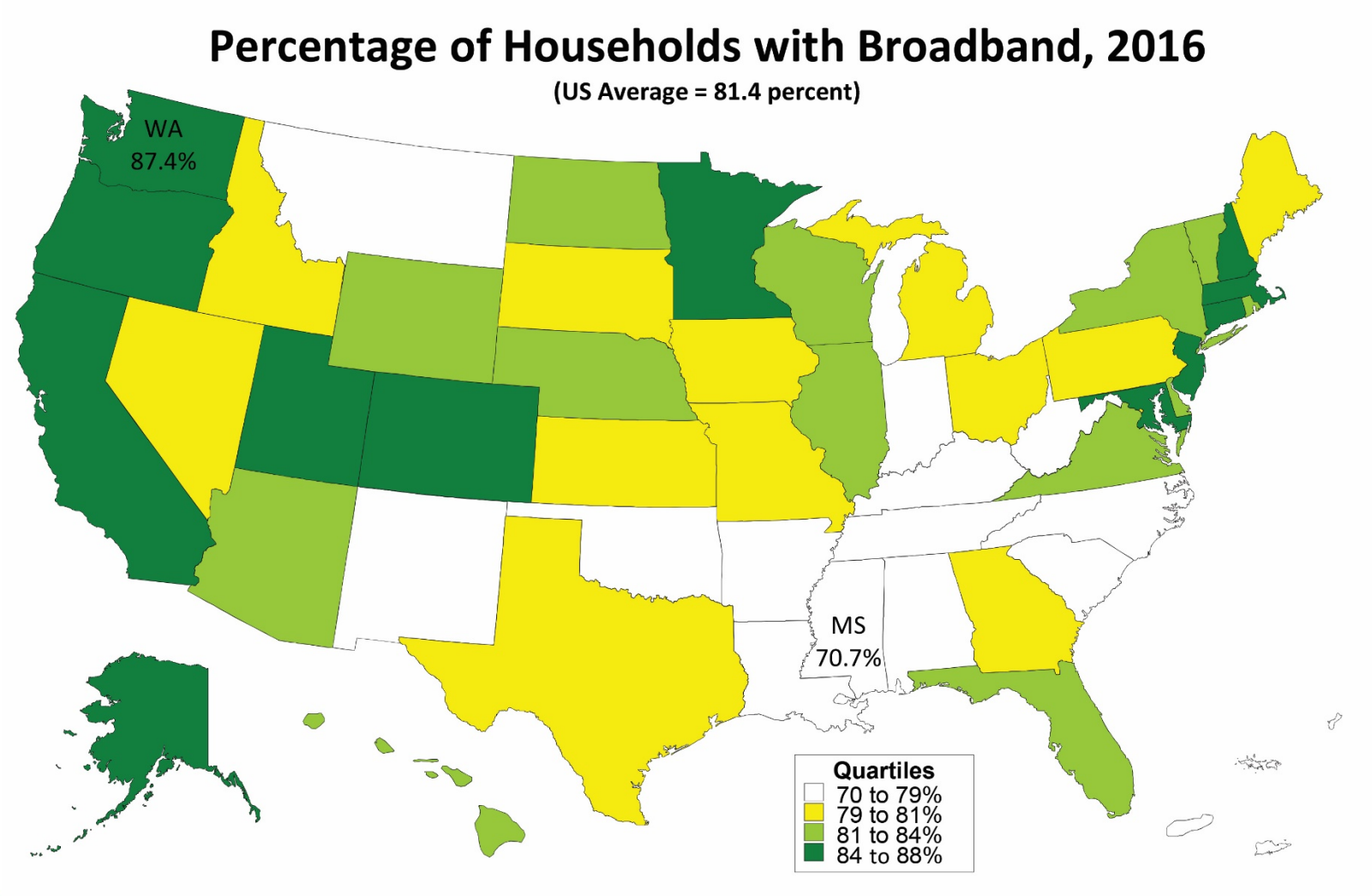
Broadband



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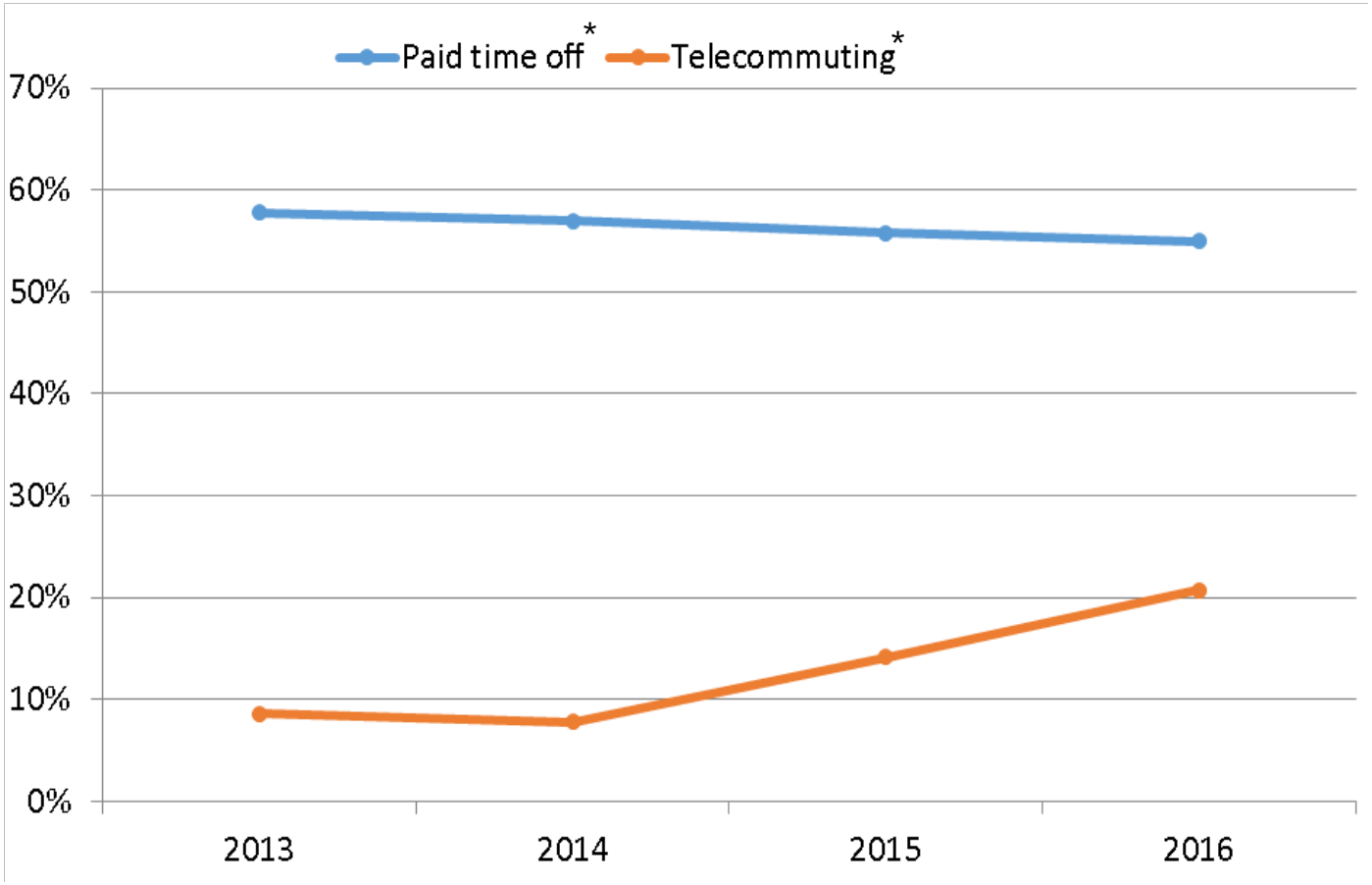
Underlying drivers: occupational

Percent of workers with paid time off & telecommuting opportunities



*statistically significant change

Estimates: Survey & Model-Based

ESTIMATED GROSS AND NET PERCENTAGE OF WORKERS (25 TO 54 YEARS) WITH PAID TIME OFF, AND HOUSEHOLDS WITH BROADBAND, AND TELECOMMUTERS						
	Paid Time Off		Household Broadband		Telecommuters	
Wages & Salary	**Gross**	**Net**	**Gross**	**Net**	**Gross**	**Net**
1st Quartile (lowest)	25%	55%	58%	62%	12%	18%
2nd Quartile	58%	58%	76%	77%	20%	24%
3rd Quartile	71%	69%	88%	86%	32%	31%
4th Quartile (highest)	73%	67%	95%	90%	47%	41%
Education						
Less than High School	33%	44%	55%	61%	9%	15%
High School	53%	56%	70%	73%	15%	18%
Some College	52%	61%	83%	83%	25%	27%
Bachelors or Higher	70%	69%	93%	88%	44%	40%
Race						
White (non-Hispanic)	57%	61%	83%	81%	31%	30%
Non-White (non-Hispanic)	55%	59%	74%	77%	26%	30%
Residence						
Non-Metro	54%	60%	76%	78%	19%	25%
Metro	58%	61%	81%	81%	31%	30%
Age						
Under 40	58%	58%	81%	81%	30%	31%
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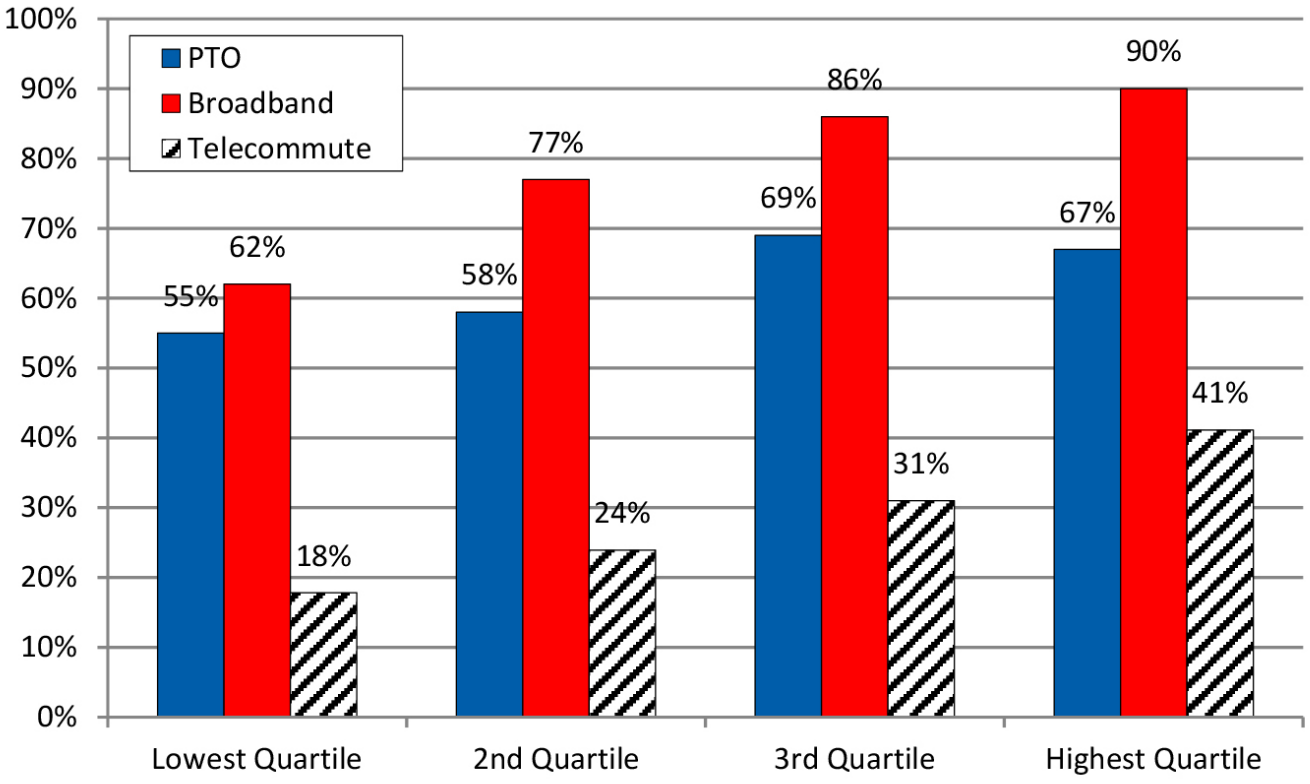
Blue Text indicates the control variables, and blue shading indicates statistical significance.

Money Matters: Income Effect

Estimated Relationship Between Income and Paid Time Off, Broadband at Home, & Telecommuting

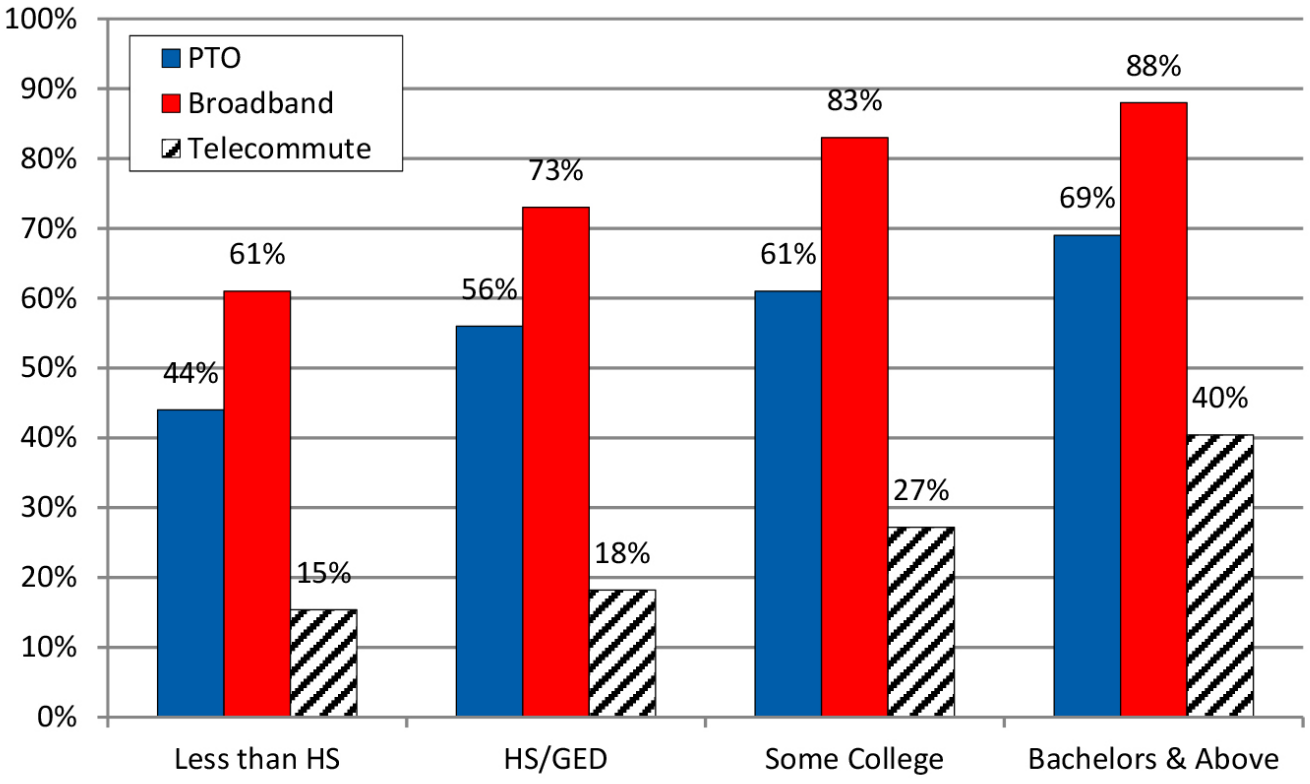
(net effect of income, ages 25 to 54 years)



School Pays: Education Effect

Estimated Relationship Between Education and Paid Time Off, Broadband at Home, & Telecommuting

(net effect of educational attainment, ages 25 to 54 years)



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Conclusions

- Vital role for the private sector
  - Preparedness is multisector
- Equity concerns
  - The less-advantaged are affected differently by disease outbreaks, disasters, and large-scale emergencies
- Solutions
  - Community leaders—from multiple sectors—will need to collaborate to address root causes

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Examining the Relationship between Preparedness and Planning for Climate Change: Trends in Environmental Health Protections

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Statistician, National Health Security Preparedness Index Program Office

American Public Health Association Annual Meeting

Atlanta, GA

7 November 2017

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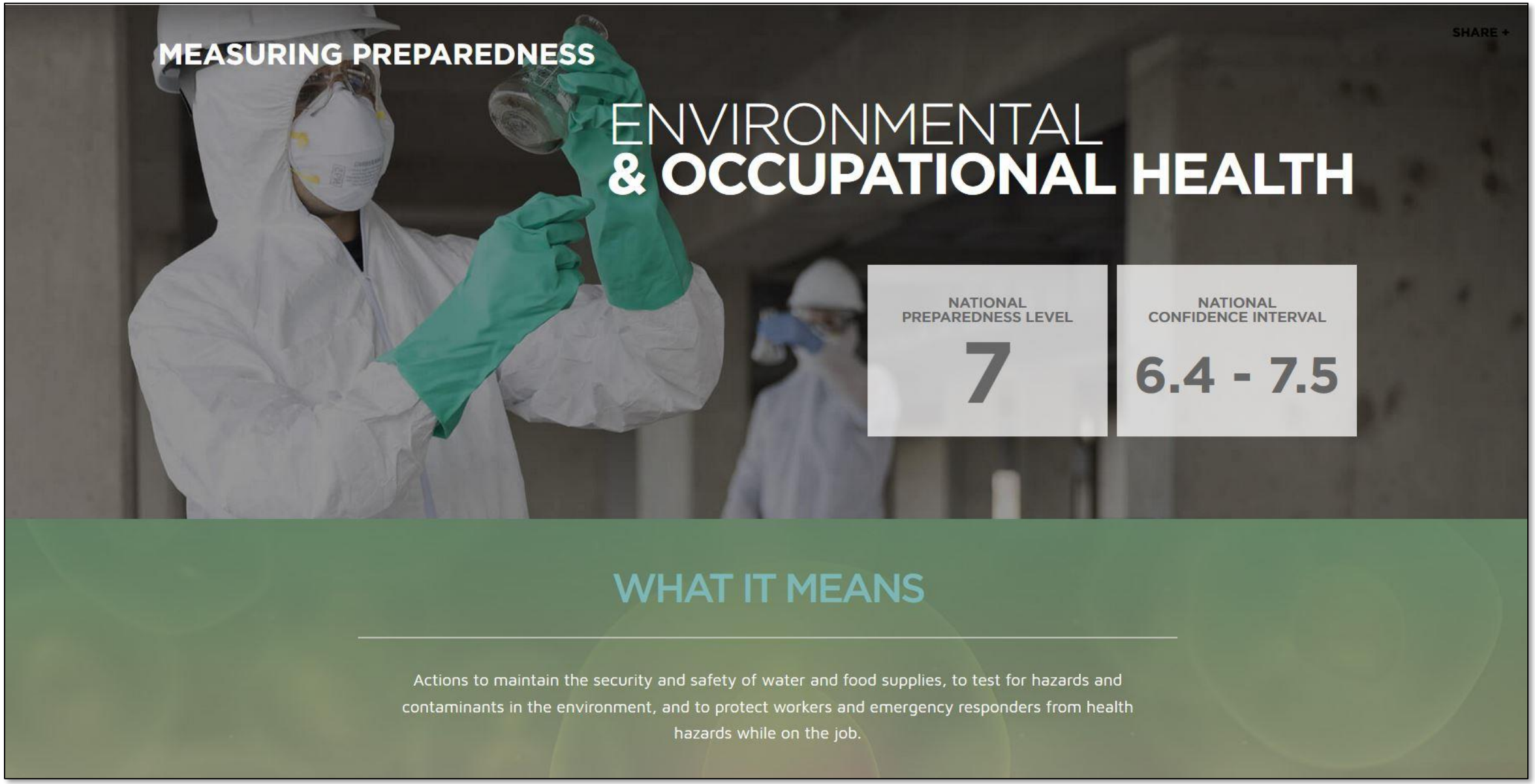
Overview: Index Environmental & Occupational Health Domain



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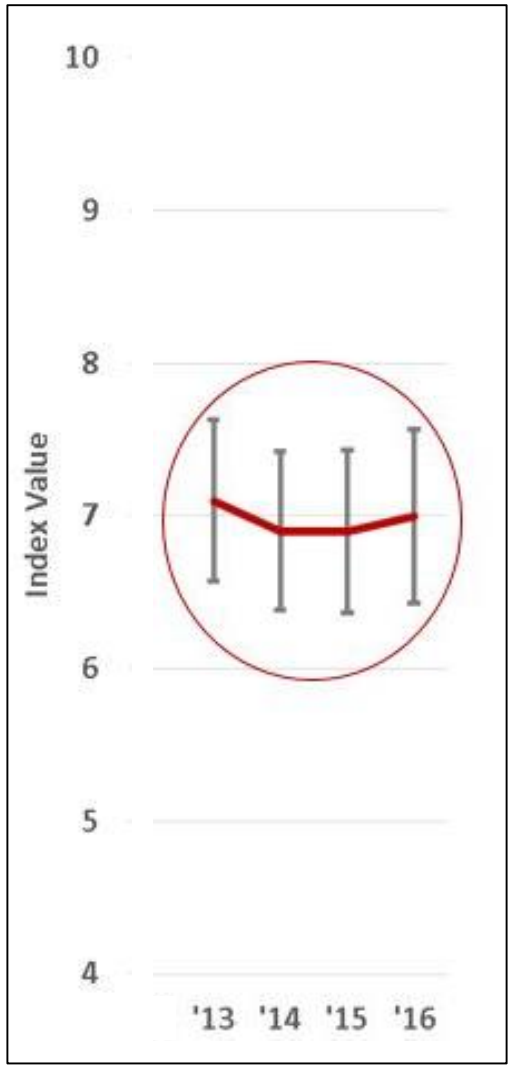
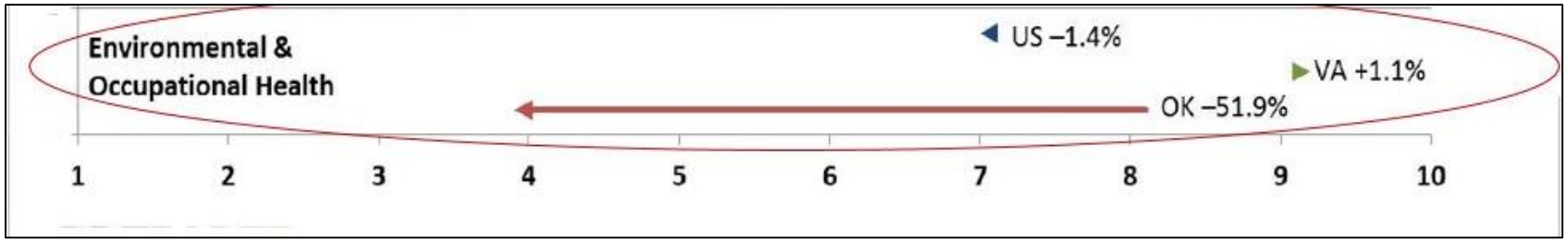
Trends in Environmental & Occupational Health Protections



- More than 40% of states have experienced declines in EOH protections since the first Index release in 2013
- 17% of top-tier states in overall health security are below the national average in EOH protections
- More than 1/3 of top-tier states in overall health security have experienced declines in EOH protections since the first Index release
- By 2016, the top EOH state reflected EOH protections 2.4X higher than its lowest-scoring counterpart



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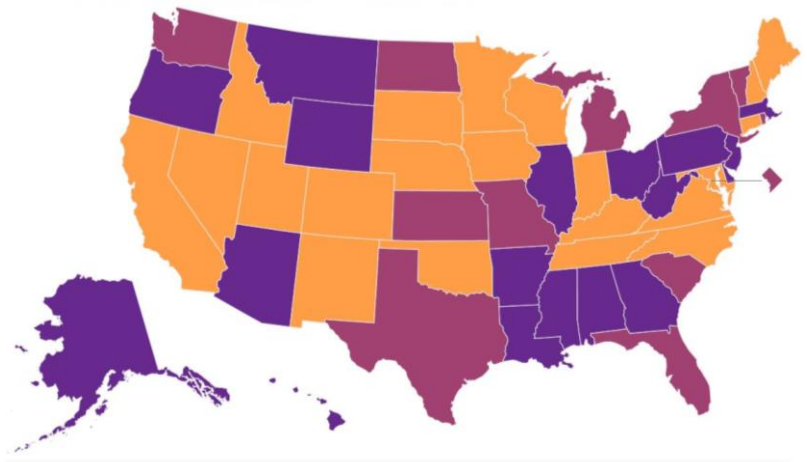
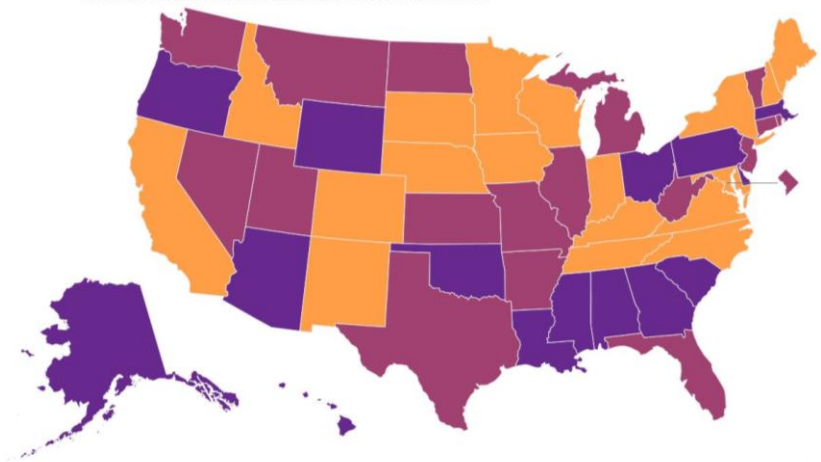
Trends in EOH Protections: Geographic Disparities

2013



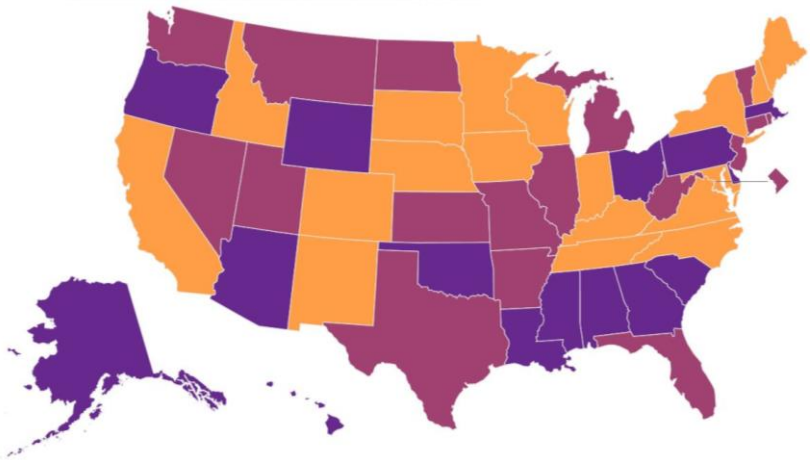
2014



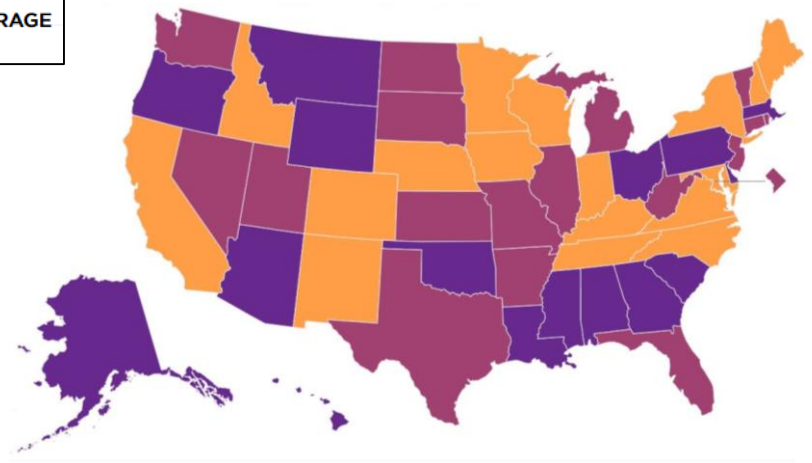
KEY

- ABOVE NATIONAL AVERAGE
- MEETS NATIONAL AVERAGE
- BELOW NATIONAL AVERAGE

2015



2016



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Environmental & Occupational Health Domain Measures

FWS: FOOD WATER SECURITY | EM: ENVIRONMENTAL MONITORING

The sufficient availability, access, use, and protection of safe and clean food and water resources to support human well-being and health.

MEASURE	MEASURE DESCRIPTION
m275_dw	Does your laboratory provide or assure testing for the following environmental matrices (Drinking water)?
m275_pww	Does your laboratory provide or assure testing for the following environmental matrices (Private well water)?
m275_rec	Does your laboratory provide or assure testing for the following environmental matrices (Recreational water)?
m275_sur	Does your laboratory provide or assure testing for the following environmental matrices (Surface water)?
m275_ust	Does your laboratory provide or assure testing for the following environmental matrices (Underground storage tanks)?
m275_wst	Does your laboratory provide or assure testing for the following environmental matrices (Waste water)?
m276	For which of the following organisms or their toxins does your state public health laboratory provide or assure testing for food and or water samples to assist with foodborne disease outbreak investigations: Bacillus cereus, Brucella sp., Campylobacter sp., Clostridium botulinum, Clostridium perfringens, Cryptosporidium sp., Cyclospora cayetanensis, Listeria monocytogenes, norovirus, Salmonella, Shigella, Staphylococcus aureus, STEC non-O157, STEC O157, Vibrio sp., Yersinia enterocolitica. The state's value is equal to the percentage of these tests performed.
m195	Percent of population in the state whose community water systems meet all applicable health-based standards through approaches that include effective treatment and source water protection

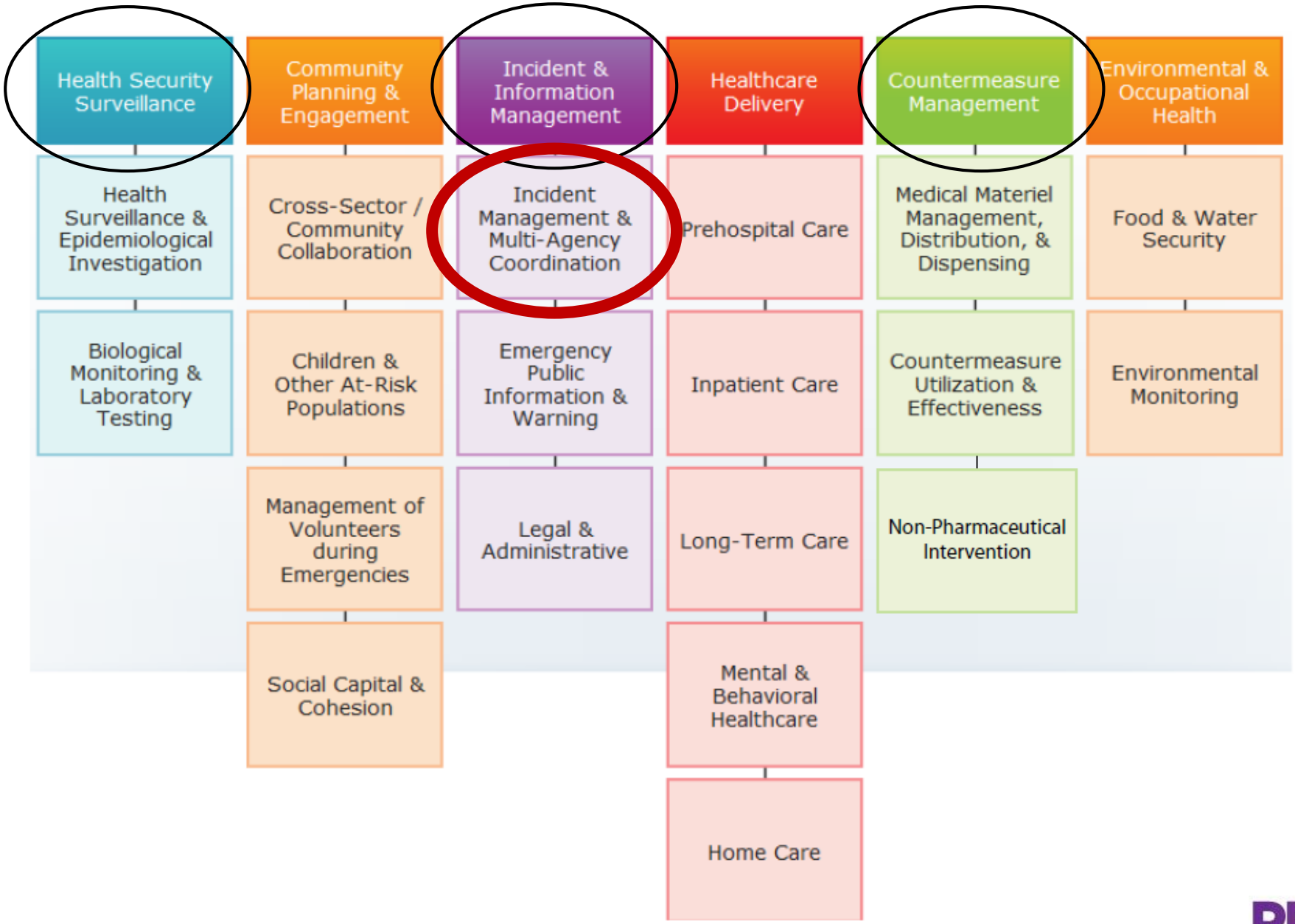
Environmental & Occupational Health Domain Measures

FWS: FOOD WATER SECURITY | EM: ENVIRONMENTAL MONITORING

The systematic collection and continuous or frequent standardized measurement and observation of: environmental specimens (air, water, land/soil, and plants) analyzing the presence of an indicator, exposure, or response (warning and control), including monitoring the environment for vectors of disease to give information about the environment to assess past and current status and predict future trends

MEASURE	MEASURE DESCRIPTION	SOURCE
m202	Does your state public health laboratory provide or assure testing for air?	
m257_aiha	Does the American Industrial Hygiene Association (AIHA) provide certification or accreditation of your state public health laboratory?	
m257_epa	Does the U.S. Environmental Protection Agency (EPA) provide certification or accreditation of your state public health laboratory?	
m257_nelac	Does the National Environmental Laboratory Accreditation Conference (NELAC) provide certification or accreditation of your state public health laboratory?	
m197	Does your state public health laboratory provide or assure testing for radiologic agents in environmental samples?	
m196	Does your state public health laboratory provide or assure testing for environmental samples in the event of suspected chemical terrorism?	
m272	Does your state public health laboratory test for contaminants in environmental samples: asbestos, explosives, gross alpha and gross beta, inorganic compounds (e.g., nitrates), metals, microbial, lead, persistent organic pollutants, pesticides (including organophosphates), pharmaceuticals, radon, or volatile organic compounds? The state's value is equal to the percentage of these tests performed.	
m273	Does your state public health laboratory provide or assure testing for hazardous waste?	
m274	State participates in the National Plant Diagnostic Network (NPDN)	
m904	Number of Environmental Scientists and Specialists, including Health per 100,000 population	

Additional EOH-Relevant Measures



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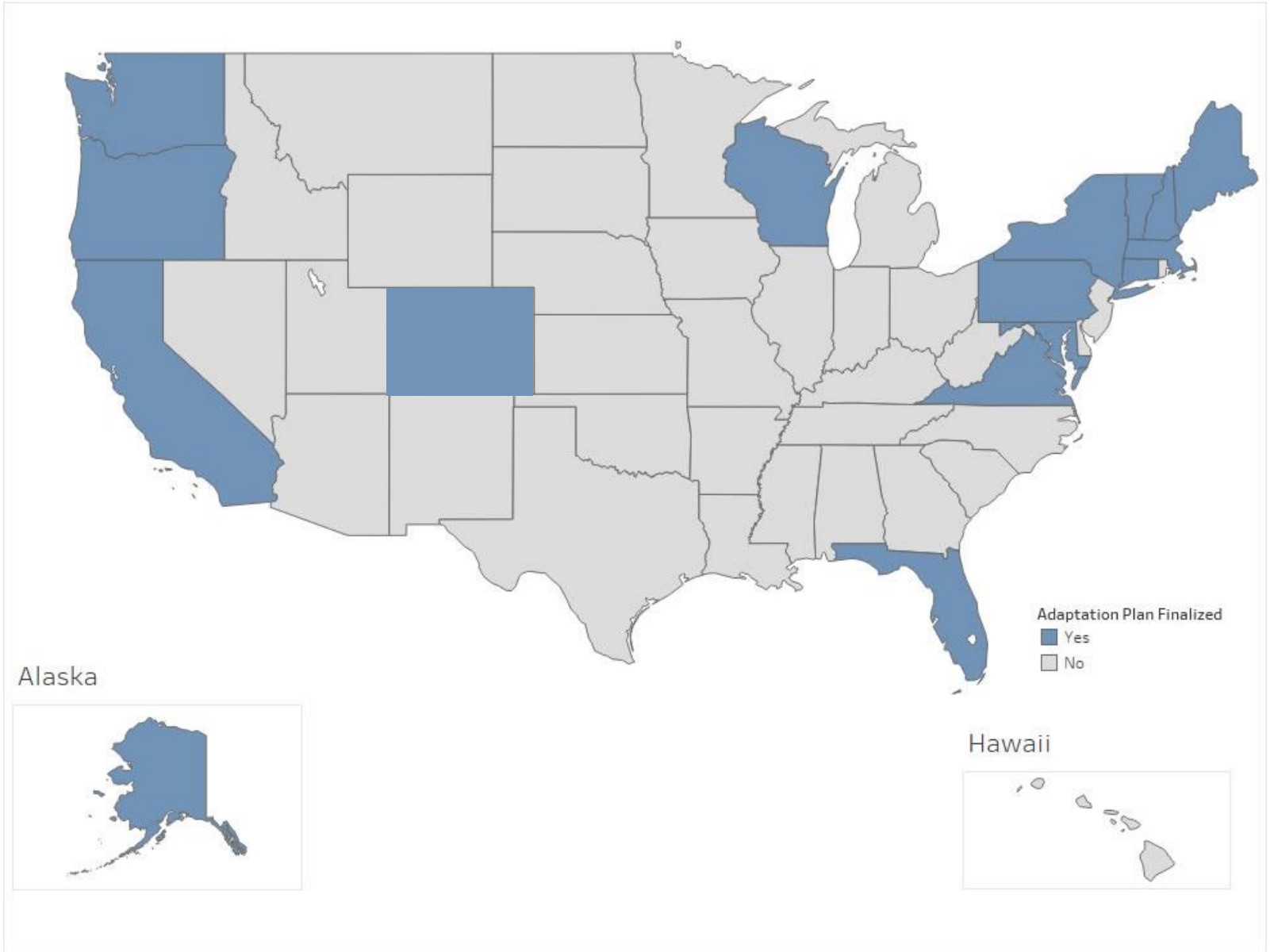
IIM-IMMAC Measure of Interest

m334	Does state have a climate change adaptation plan?

Measure Name	M334
Measure Source	Center for Climate and Energy Solutions (C2ES), State and Local Climate Adaptation
Data date(s)	2014 - 2016
Limitations	The measure is an indicator of state planning for climate change; however, it only indicates if a state has a plan. The quality of the plan is not evaluated. The degree to which the plan is being implemented is also not evaluated.

Finalized State Climate Adaptation Plans



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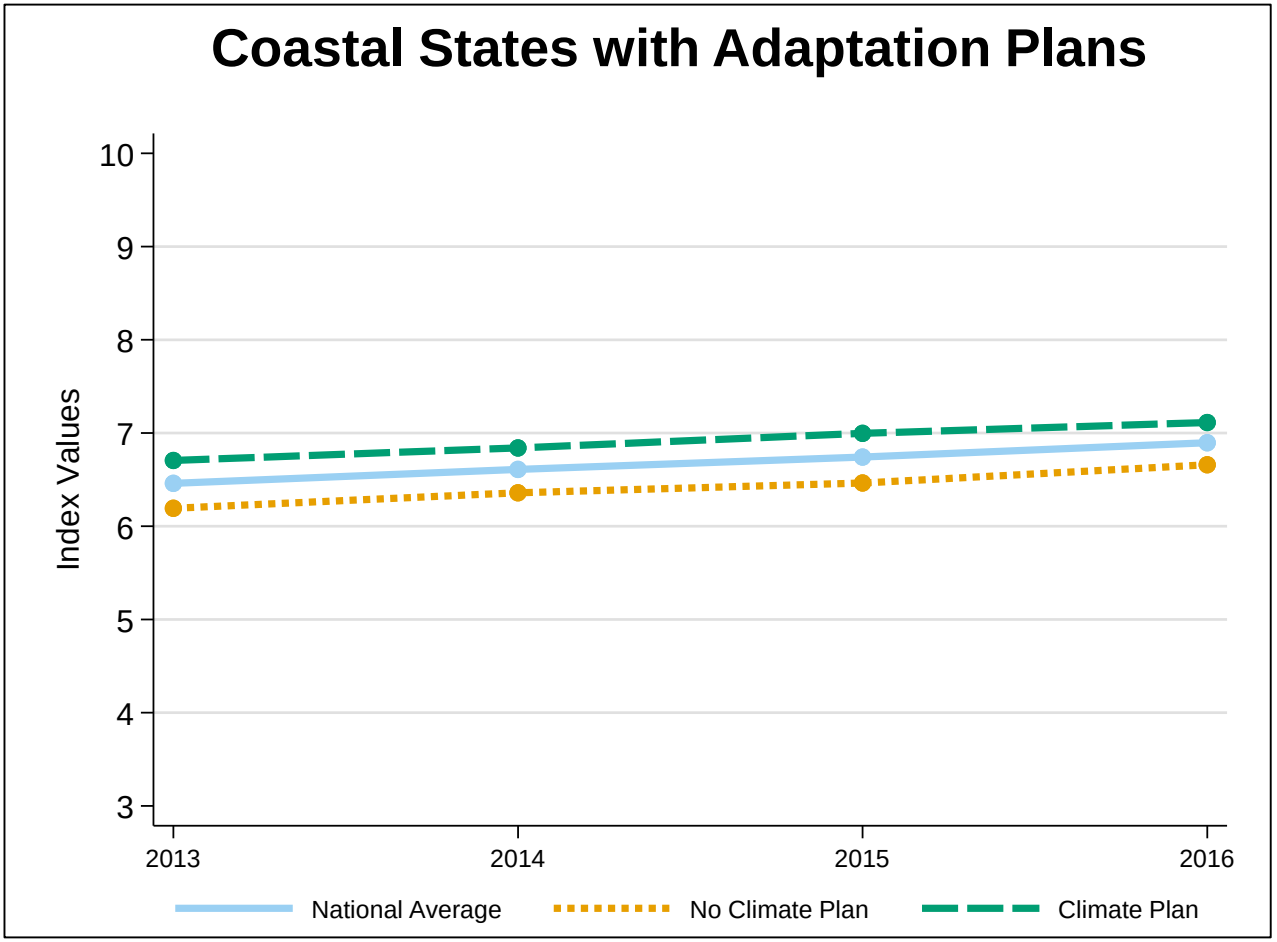
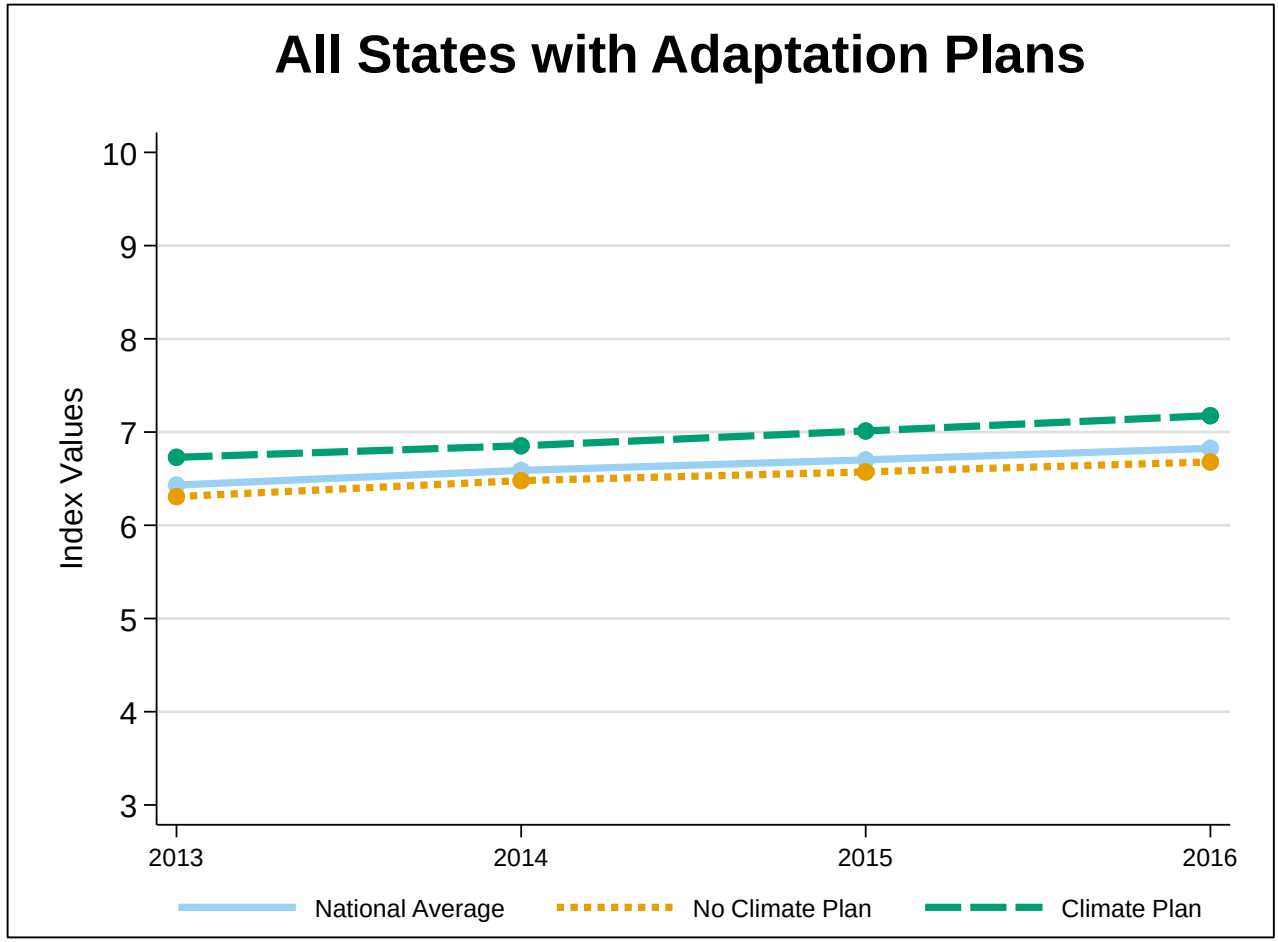
Overall Health Security





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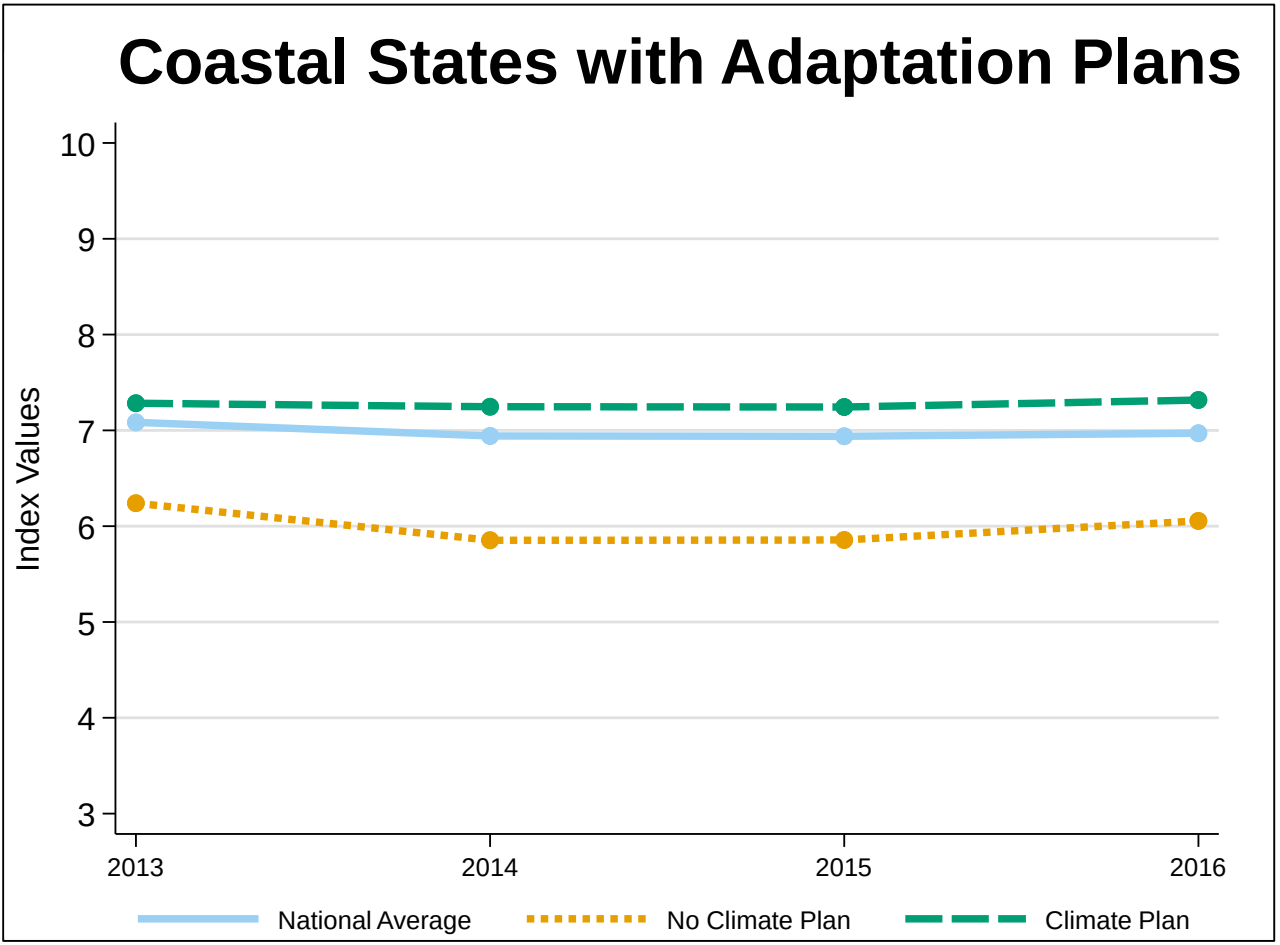
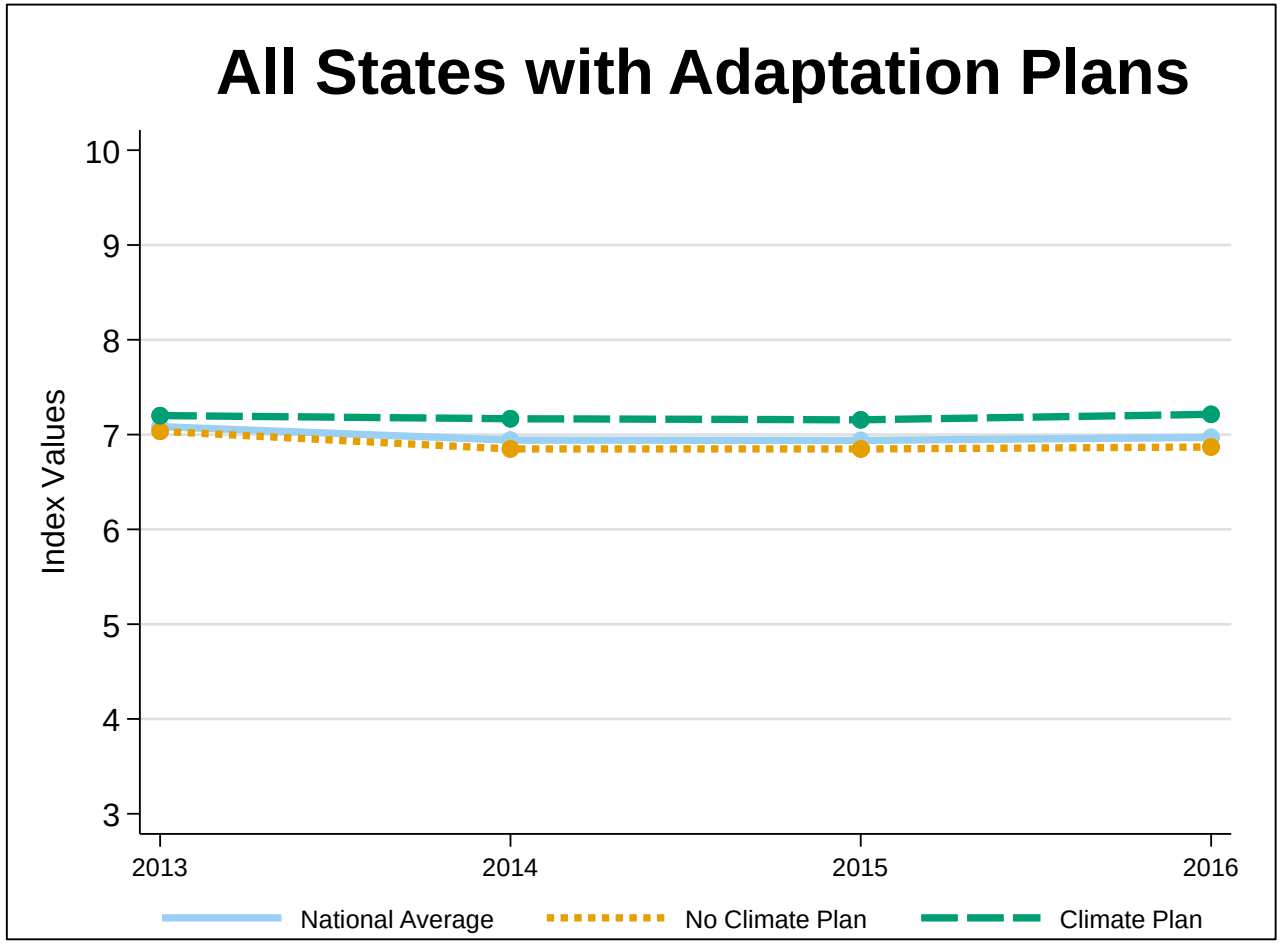

Coastal States with Adaptation Plans
Index Values
10
9
8
7
6
5
4
3
2013
2014
2015
2016
National Average
No Climate Plan
Climate Plan


All States with Adaptation Plans
Index Values
10
9
8
7
6
5
4
3
2013
2014
2015
2016
National Average
No Climate Plan
Climate Plan

Why?

m334	Does state have a climate change adaptation plan?

Measure Name	M334
Measure Source	Center for Climate and Energy Solutions (C2ES), State and Local Climate Adaptation
Data date(s)	2014 - 2016
Limitations	The measure is an indicator of state planning for climate change; however, it only indicates if a state has a plan. The quality of the plan is not evaluated. The degree to which the plan is being implemented is also not evaluated.

15 Heterogeneous State Climate Adaptation Plans

- Timelines
  - Plan finalization dates range from 2008 to 2016
  - 75% of coastal states had finalized plans before the first non-coastal state plan was finalized in 2011
  - Only 1 new plan since the first Index release in 2013
- Length: from 12 pages to >400
- Leadership
  - Most authored by governor-appointed commissions/task forces
  - Some by state environmental agencies
  - One by a state health agency
- Collaborative Roles
  - Less than half of steering committees included public health sector representation
  - Stakeholder-engaged processes often included public health sector representation on workgroups

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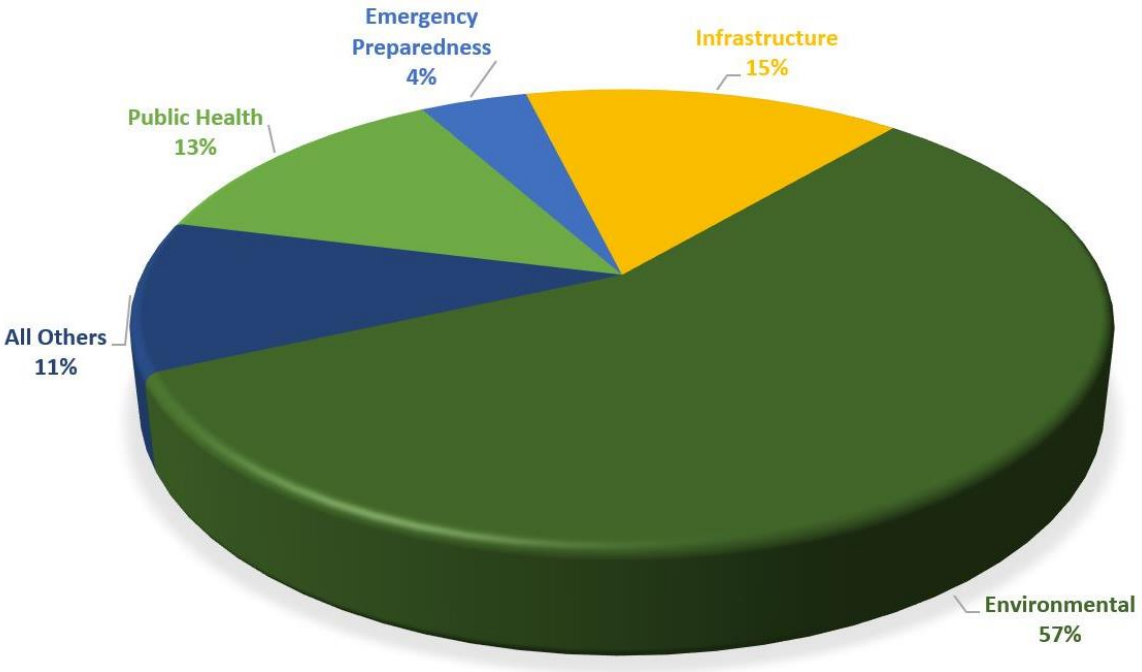
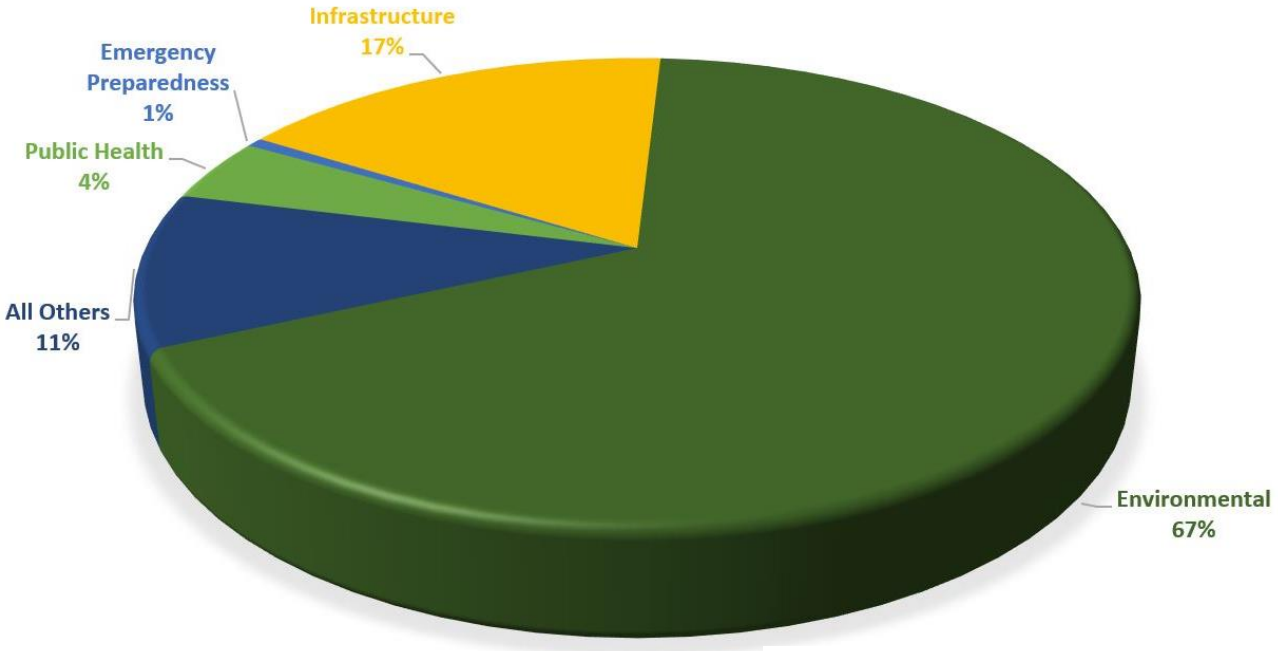
State Adaptation Goals by Sector

Coastal States



Non-Coastal States



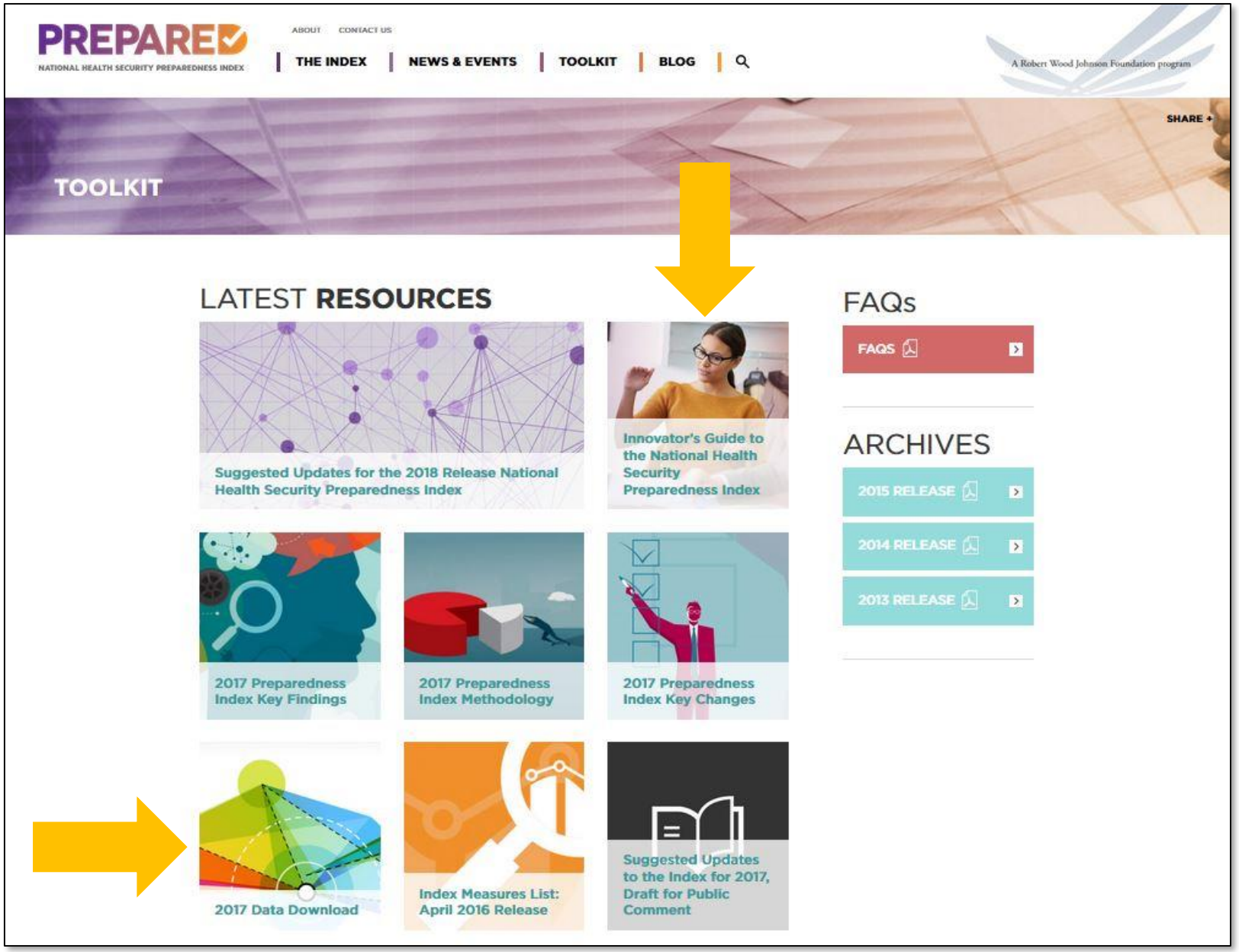
Common Themes: Adaptation Goals

- Public Health Goals
  - Extreme Heat
  - Other Extreme Weather Health Hazards
  - Surveillance (Food, Water, Air)
  - Water Quantity and Quality
  - Vector Control
  - Smoke Emergencies
  - Vulnerable Populations
  - Preparedness Planning

- Emergency Management Themes
  - Early Warning Systems
  - Information Sharing
  - Emergency Response Planning

- Index findings can:
  - Point to gaps in protections at domain, subdomain, and measure levels
  - Be triangulated with other data to:
    - Prioritize areas for improvement
    - Examine potential drivers and contributors to gaps
    - Seek and learn from benchmarks
    - Identify and convene stakeholders
    - Develop and implement strategies for improvement
  - Track progress over time in target areas
- Including public health representatives and goals in collaborative planning for climate adaptation and similar long-range strategic initiatives can help identify relevant protections to strengthen health security

Accessing Index Data



- Strengthen the Index's Environmental and Occupational Health Domain through
  - New Subdomains, e.g.
    - Built Environment
    - Hazardous Waste Management
    - Responder Health and Safety
  - New Measures to Populate These Subdomains
- Need more consistent and systematic data collection on environmental and occupational health protections

Acknowledgements

- Glen Mays, Michael Childress, Nurlan Kussainov, and Ann Kelly – National Health Security Preparedness Index Program Office

- Georgetown University, Georgetown Law, and the Georgetown Climate Center

- Robert Wood Johnson Foundation

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HealthSecurity@uky.edu

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Convening Partners, Empowering Communities: What the Index Teaches Us about Health Security

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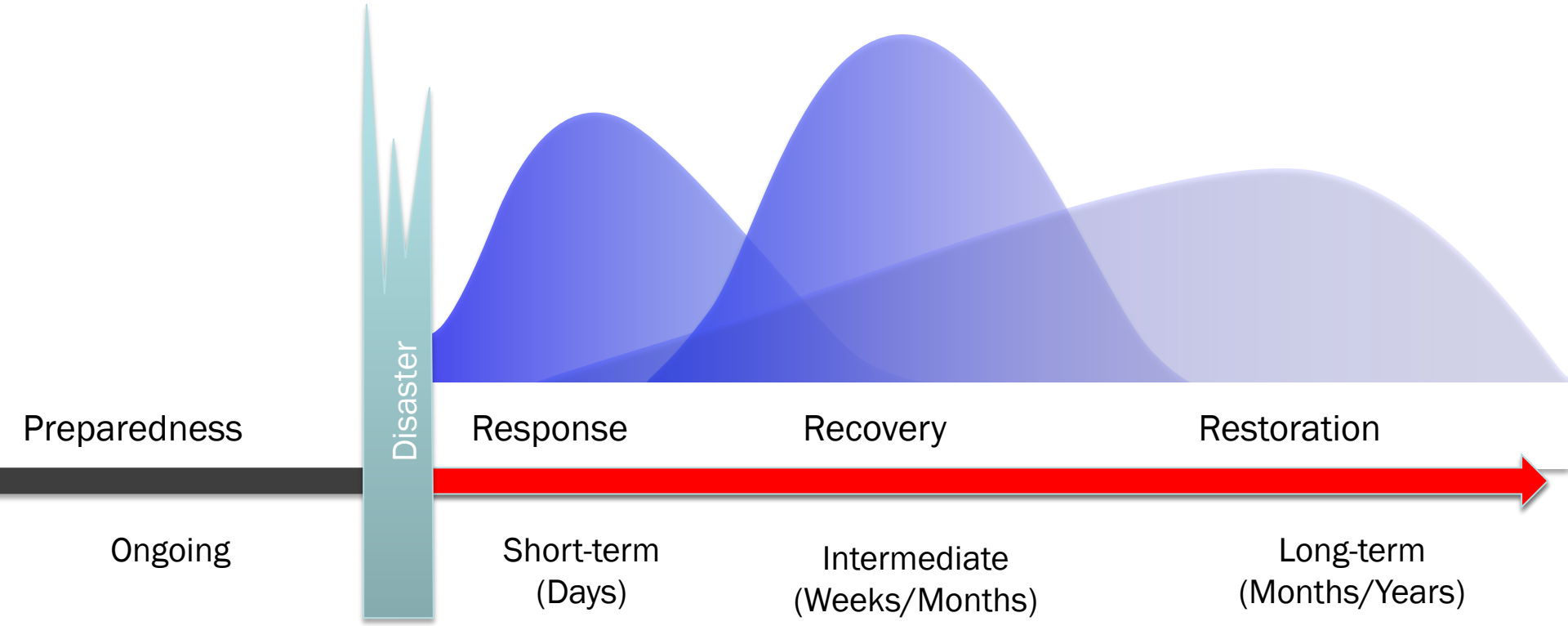
November 7, 2017
APHA

Anita Chandra, DrPH*
RAND Corporation

Ana- Marie Jones*
Interpro

** Members of NHSPI National Advisory Committee*

There are key stages of response and recovery; community planning key across phases



Chandra et al.

Health security threats can disrupt social and economic fabric

Population displacement can break social ties in a community

Particularly difficult for vulnerable populations

Often no comprehensive plan to restore community networks

We know that community planning, volunteers, and partnerships key to resilience

See Chandra
www.
laresilience.org

Past events demonstrated need for community engagement

- Jurisdictions that engage in partnerships pre-event tend to be in a better position for response
- Volunteers are critical to response and recovery
- Challenges in locating at-risk populations for resource distribution, later recovery

It's important to train, respond, and plan with our community partners. Knowing community partners was a big help; we didn't need to introduce anyone-we all knew each other.

CPE scale includes actions to:

develop and maintain supportive relationships among government agencies, community organizations, and individual households; and

develop shared plans for responding to disasters and emergencies.

Key items In CPE

Subdomains	Sample item
Cross sector community collaboration	Is your state education agency a member of the state emergency planning committee?
Children and other at-risk populations	Proportion of a state's children 19 and younger who reside within 50 miles of a pediatric trauma center
Management of volunteers during emergencies	Percentage of Medical Reserve Corps volunteers who are nurses or advanced practice nurses
Social capital and cohesion	Voting-eligible population highest office turnout rate
Key data sources: PHAB, National Longitudinal Survey of Public Health Systems, BLS, ASPR-HPP	

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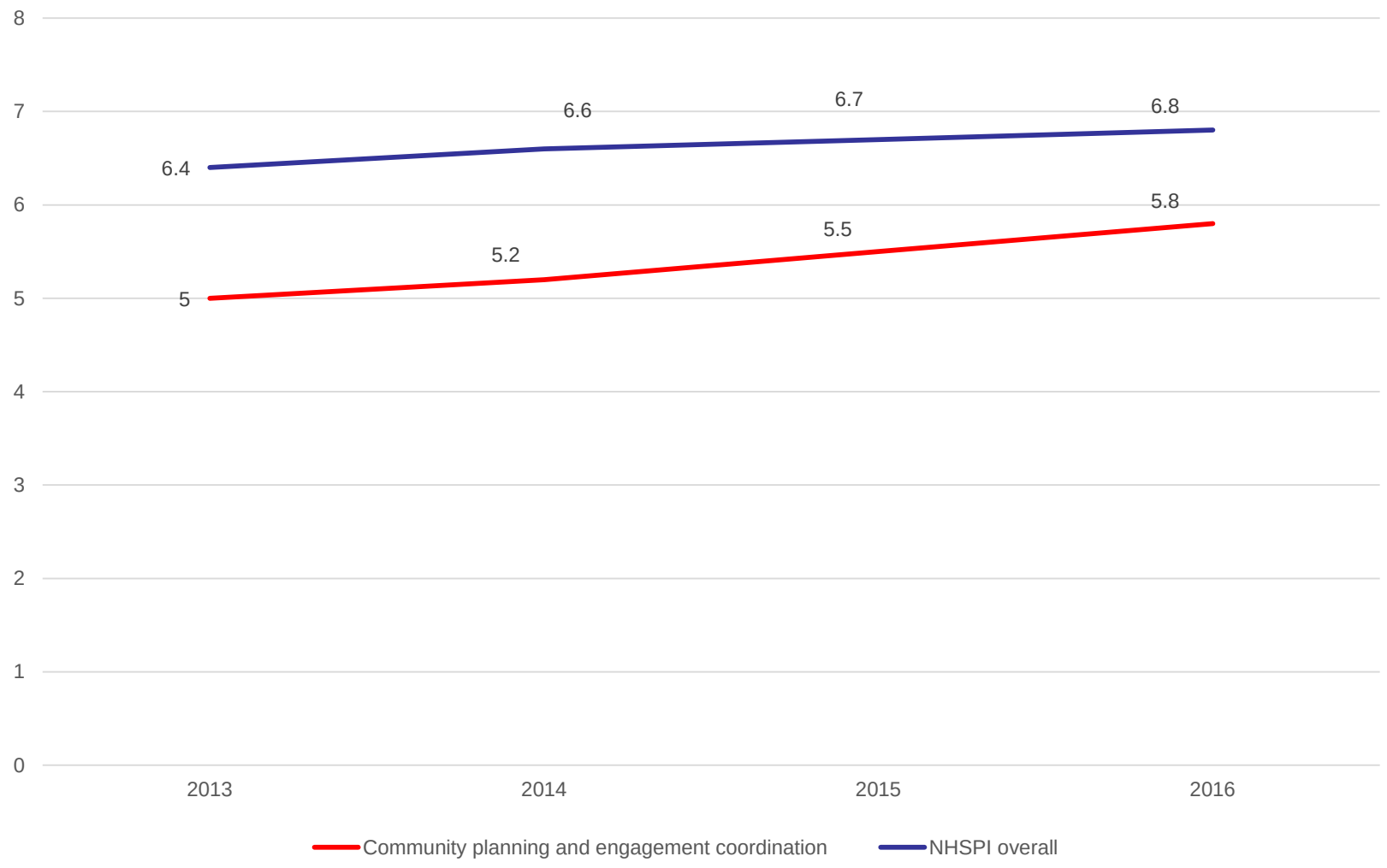
Improvements over four years in community planning and engagement



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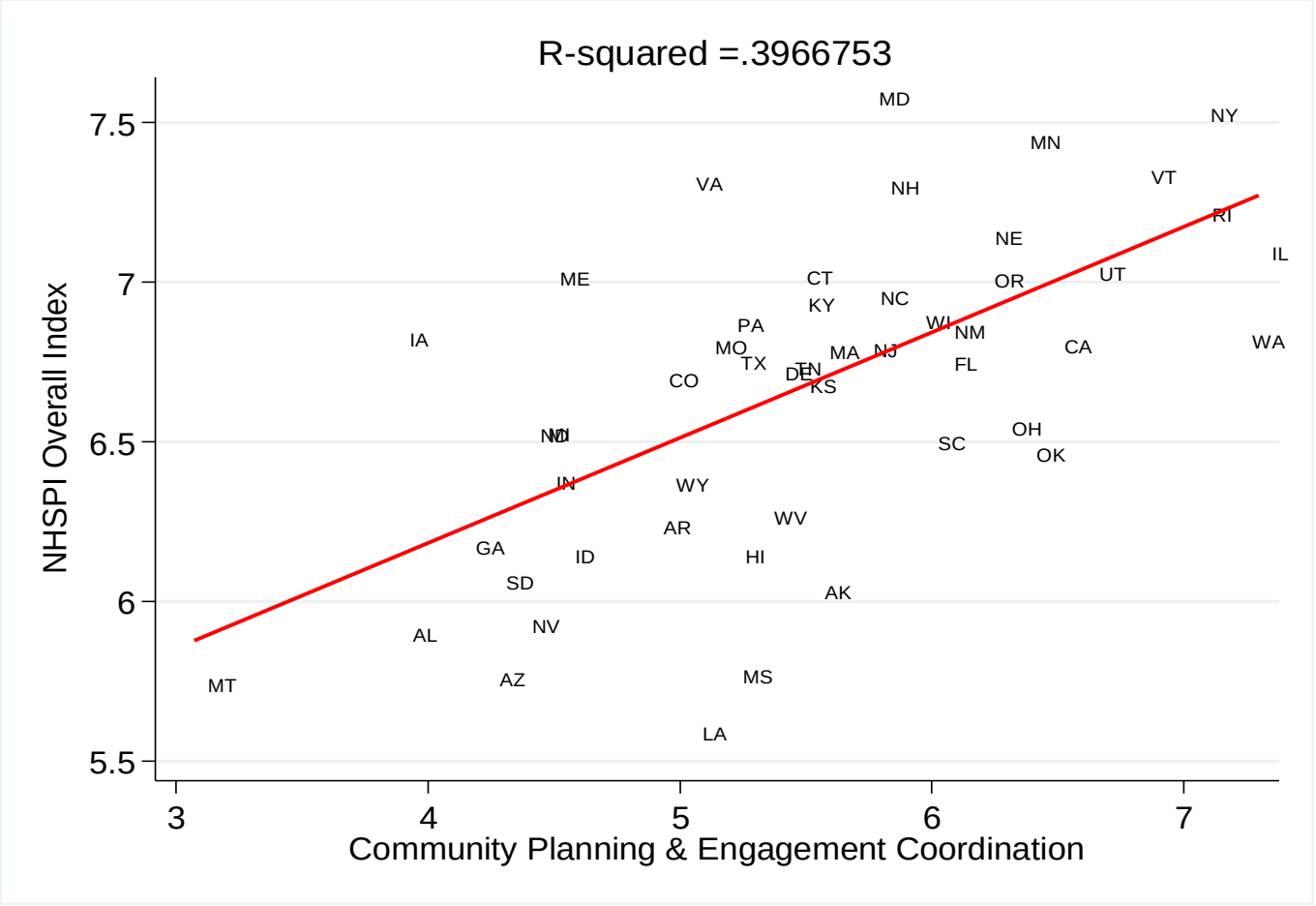
CPE explains about 40% of variation in state NHSPI



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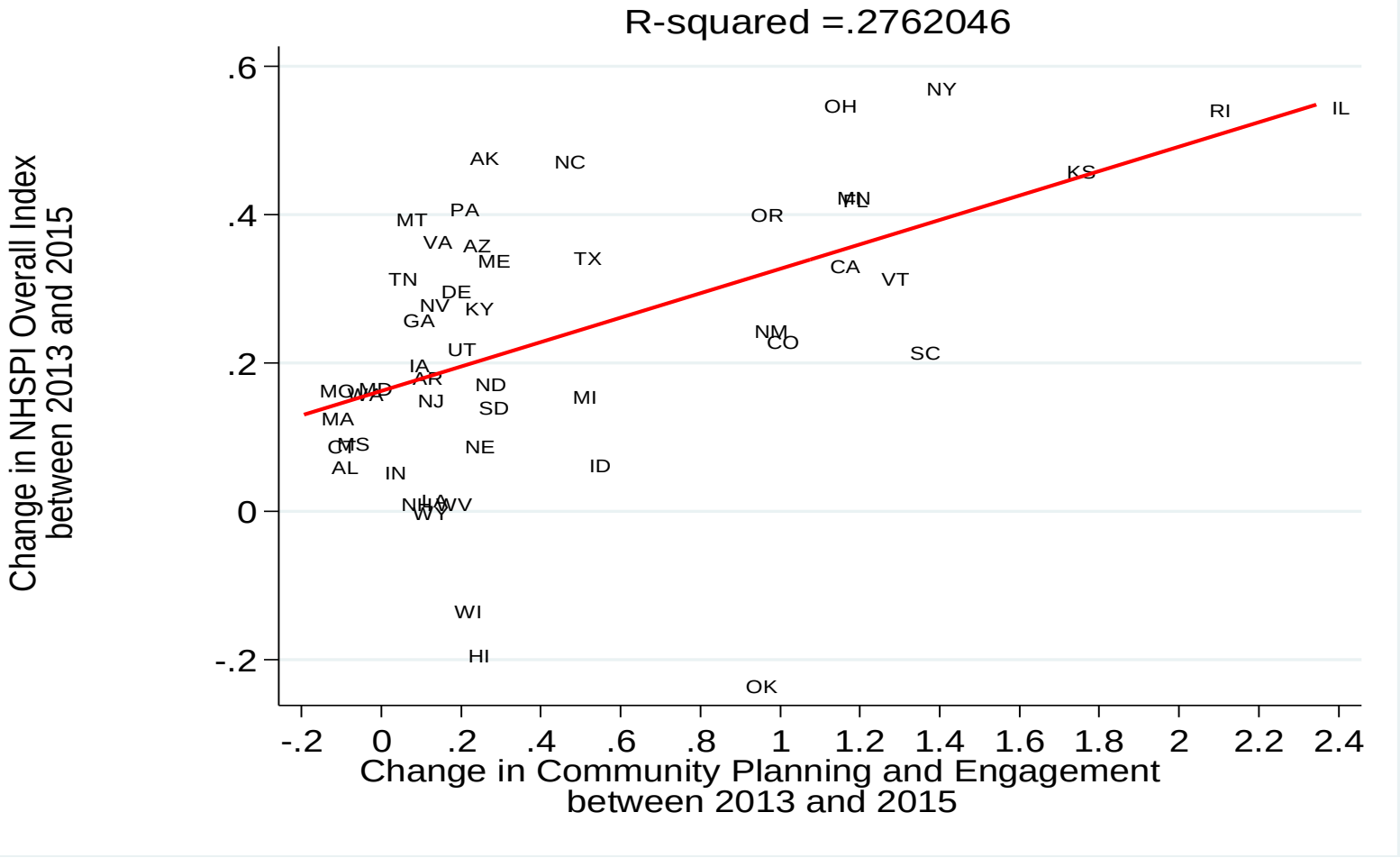
Explains some change in state NHSPI scores over time



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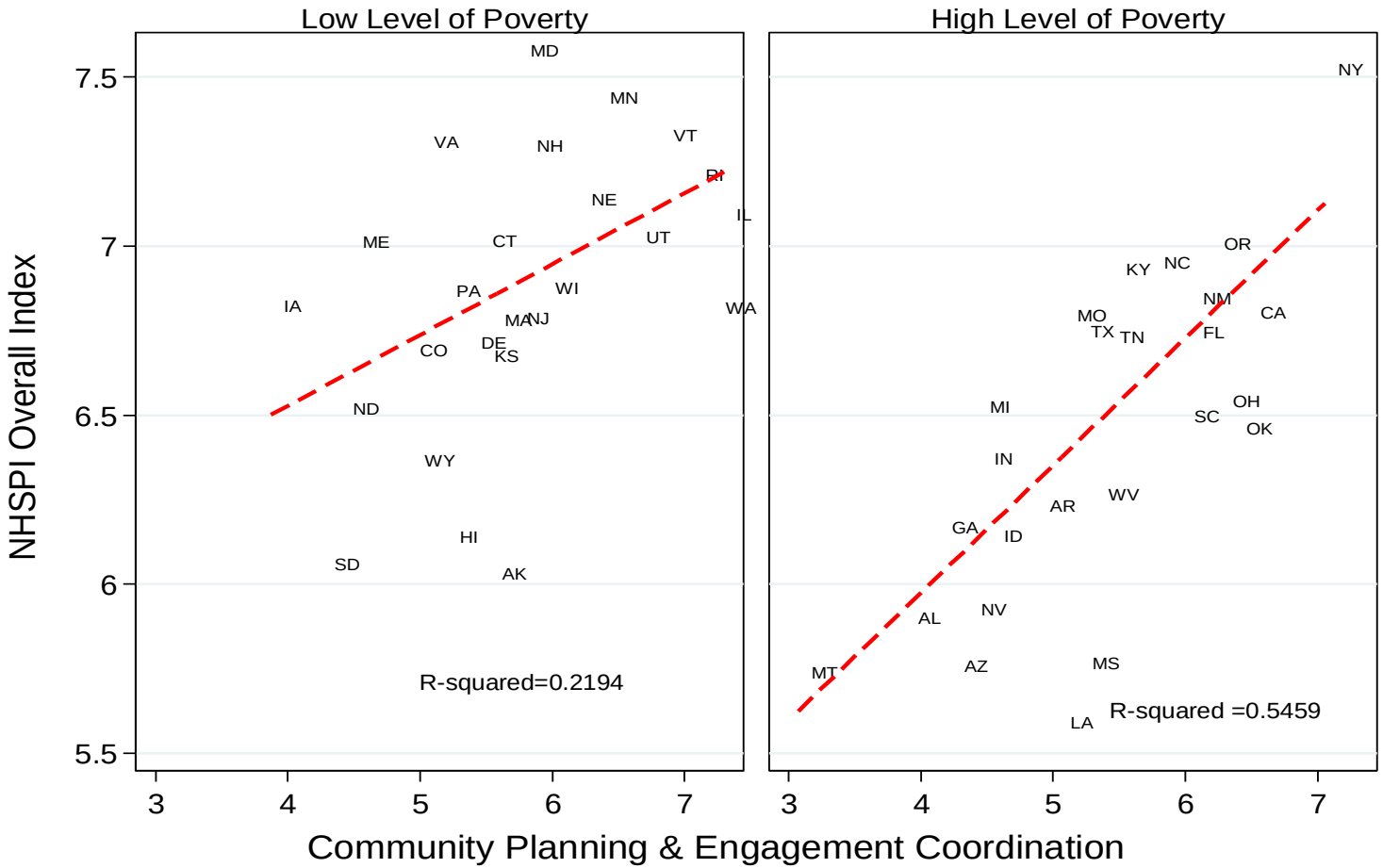
CPE explains 55% of health security variation in high poverty states



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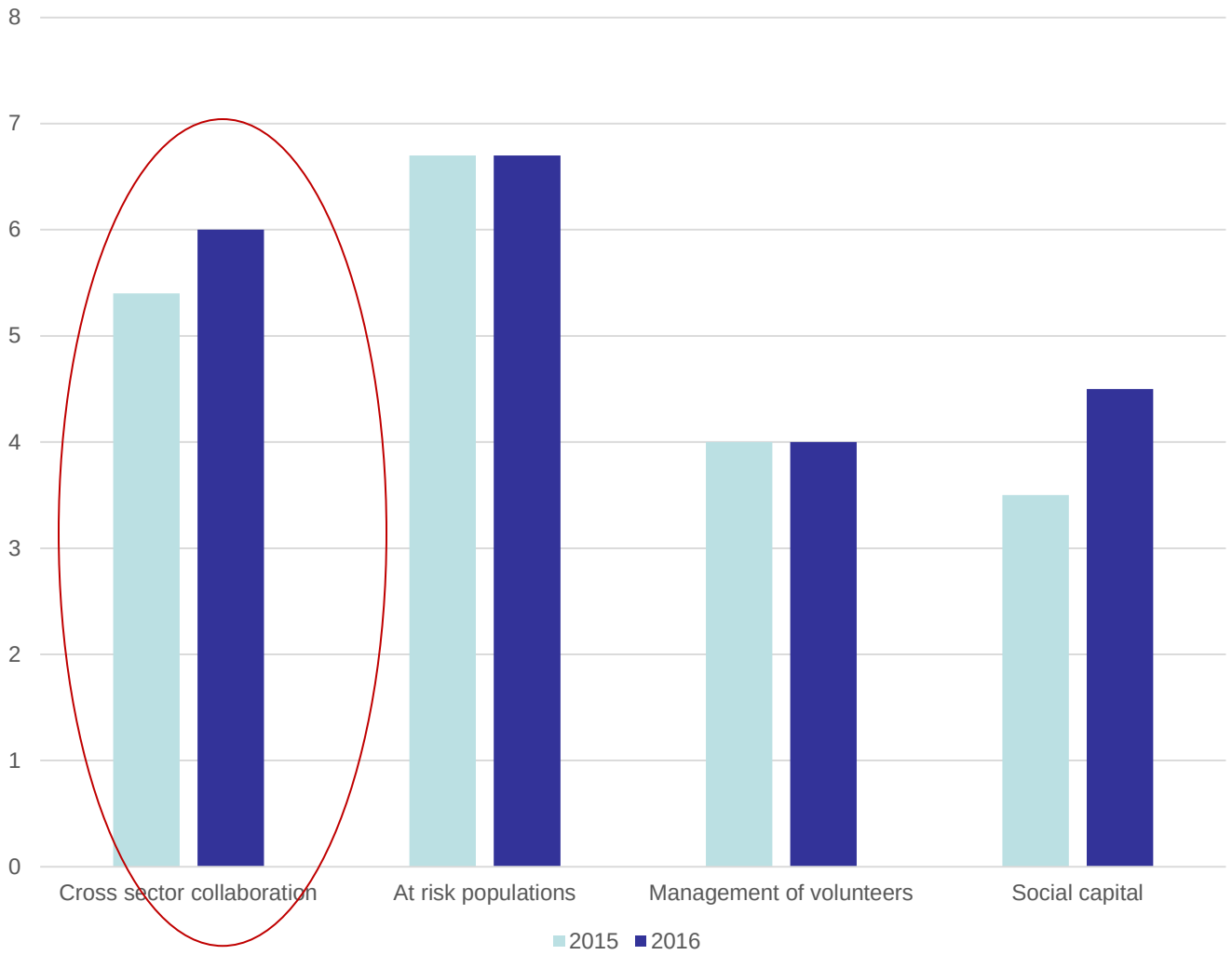
In last 2 years, CPE subdomains improved or steady



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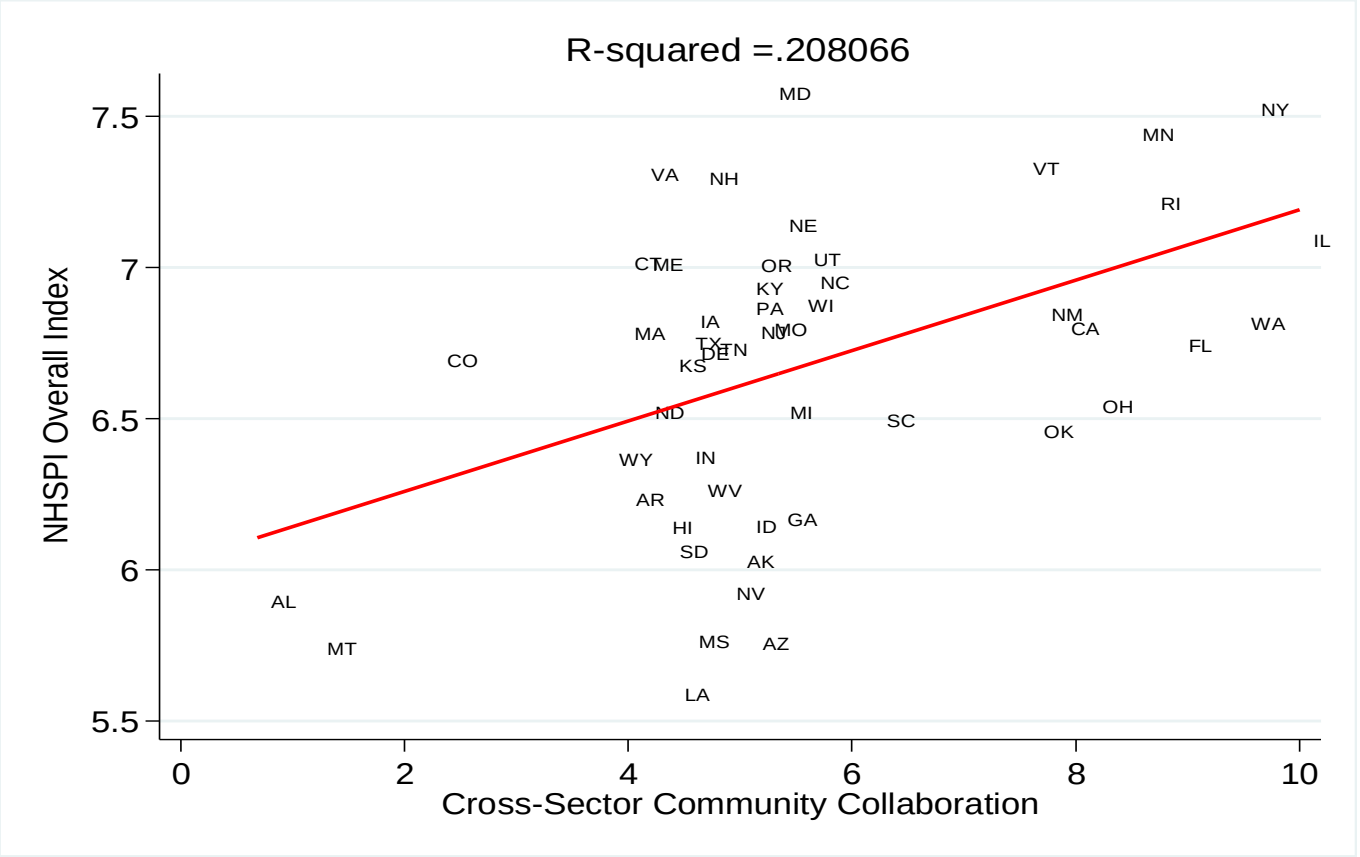
Cross sector collaboration does not explain much NHSPI change



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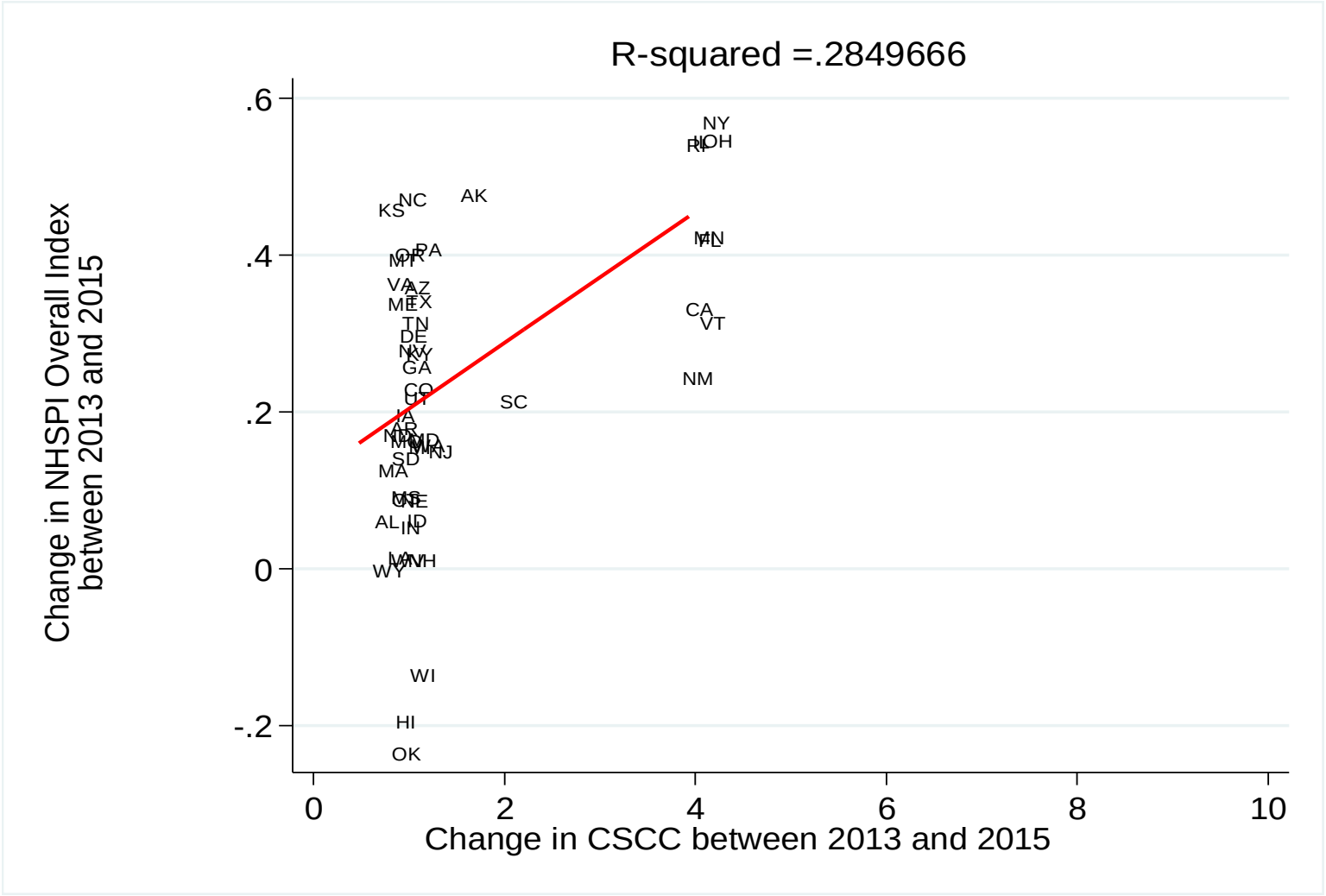
But explains modest state change in NHSPI over time



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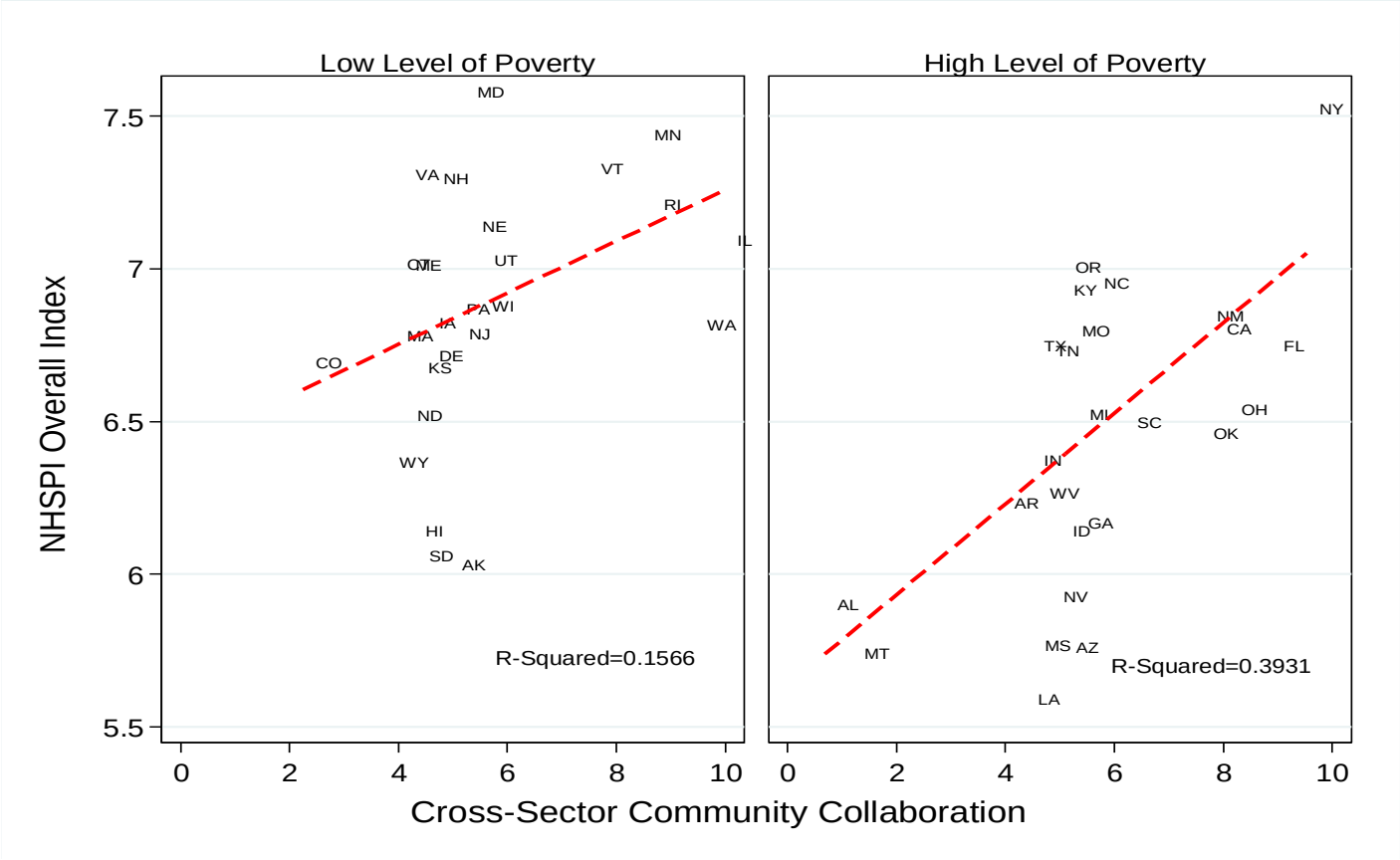
And does explain 40% of variation for high poverty states



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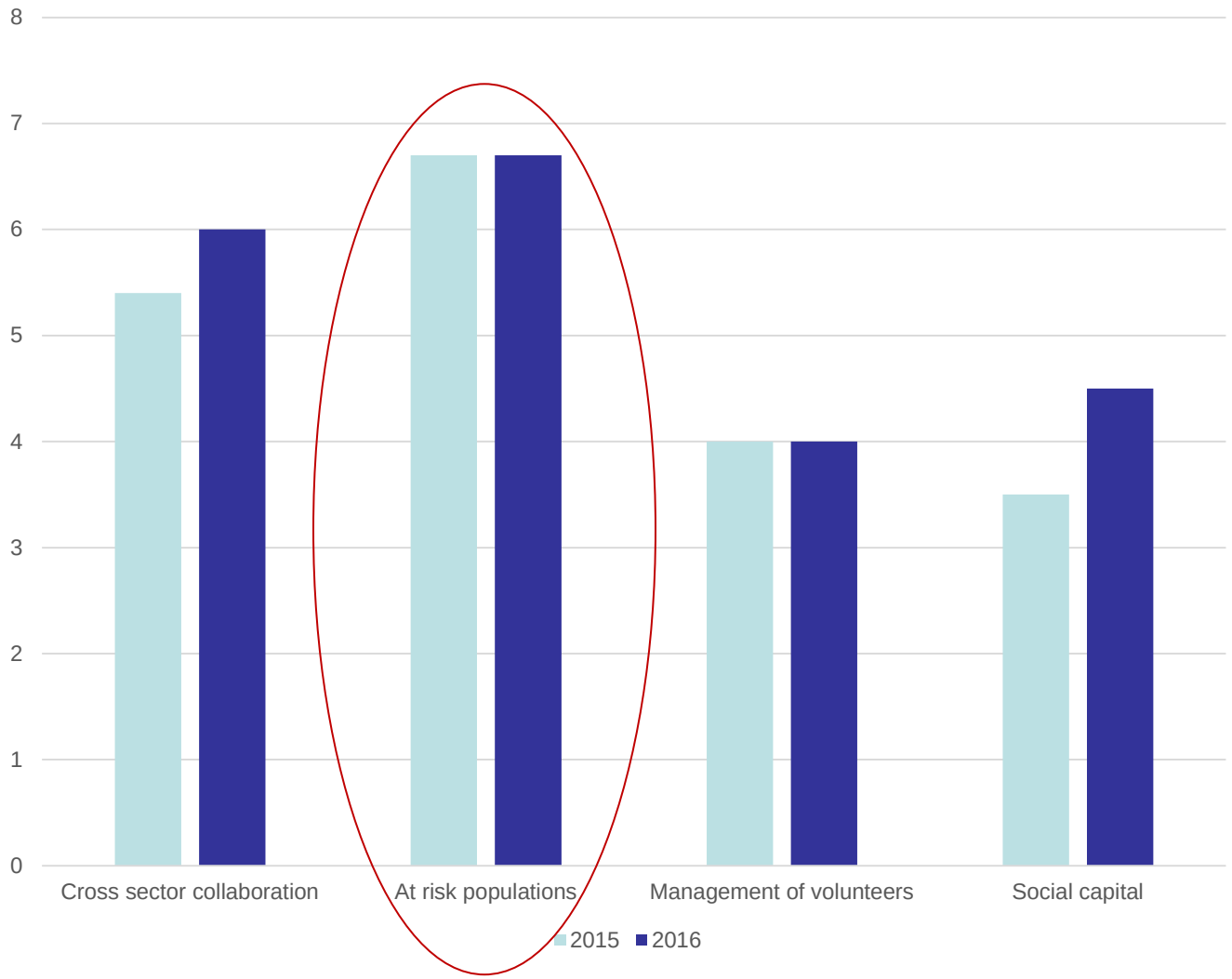
At-risk populations



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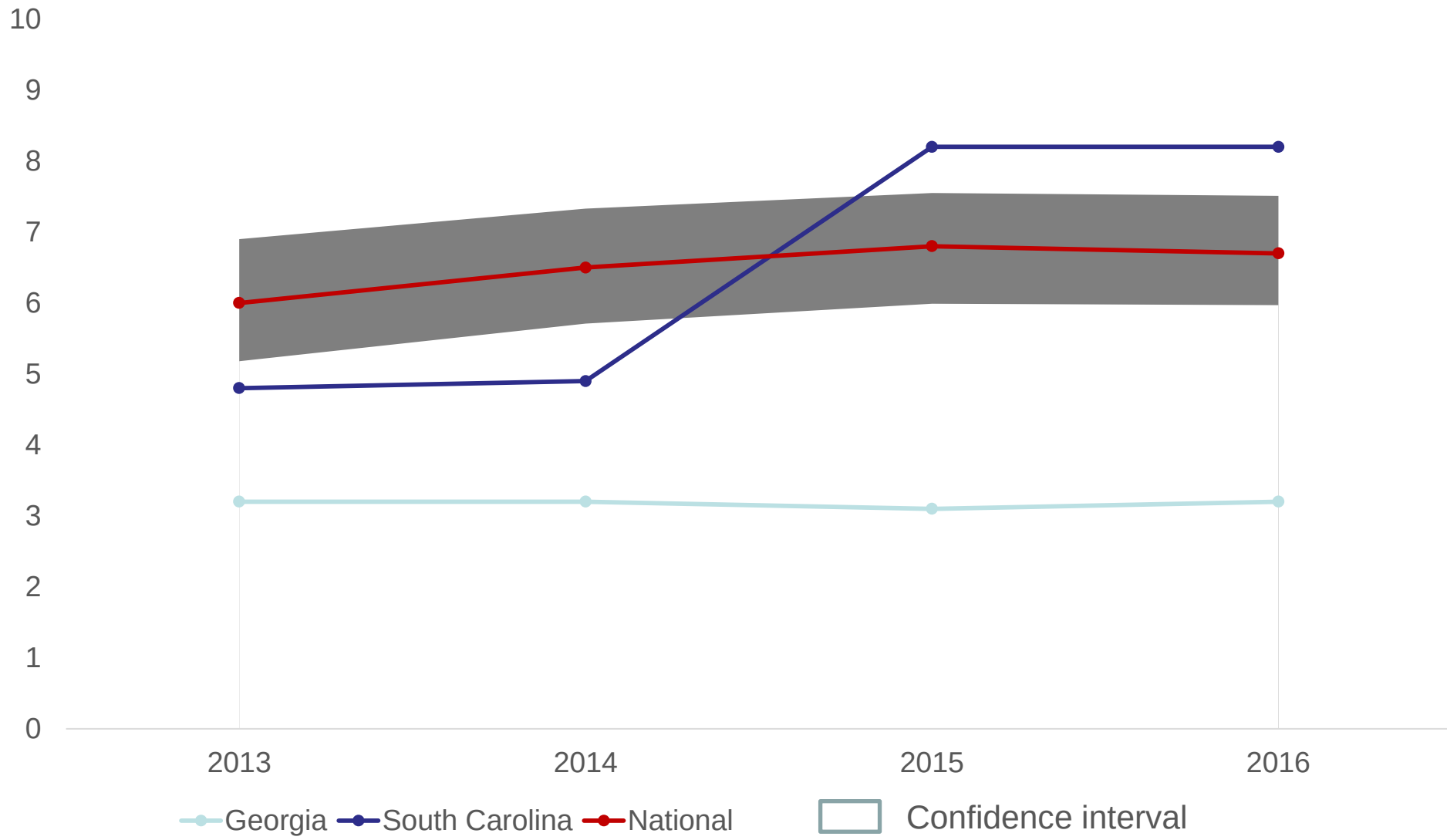
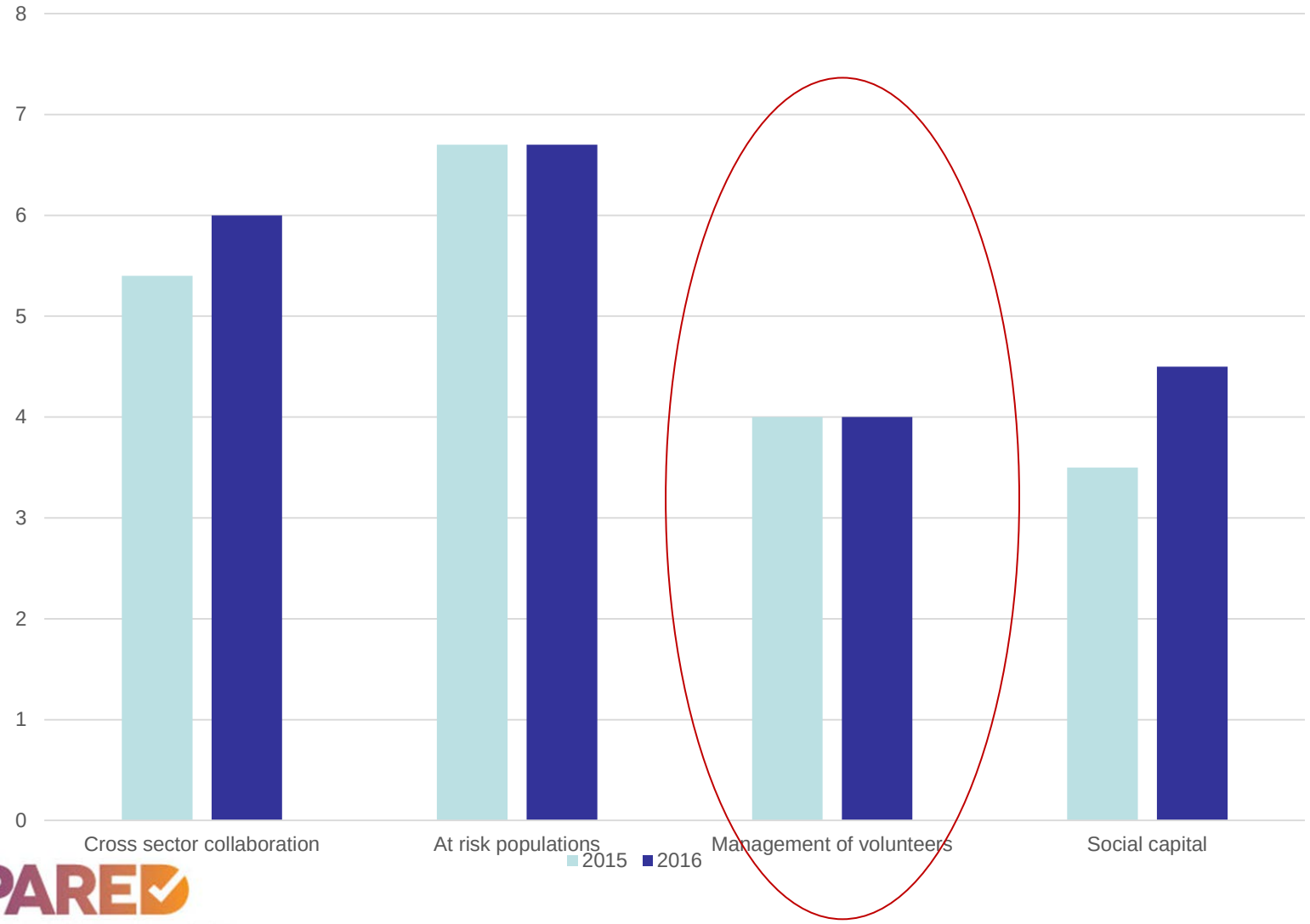
State examples: Children and at-risk populations



Management of volunteers



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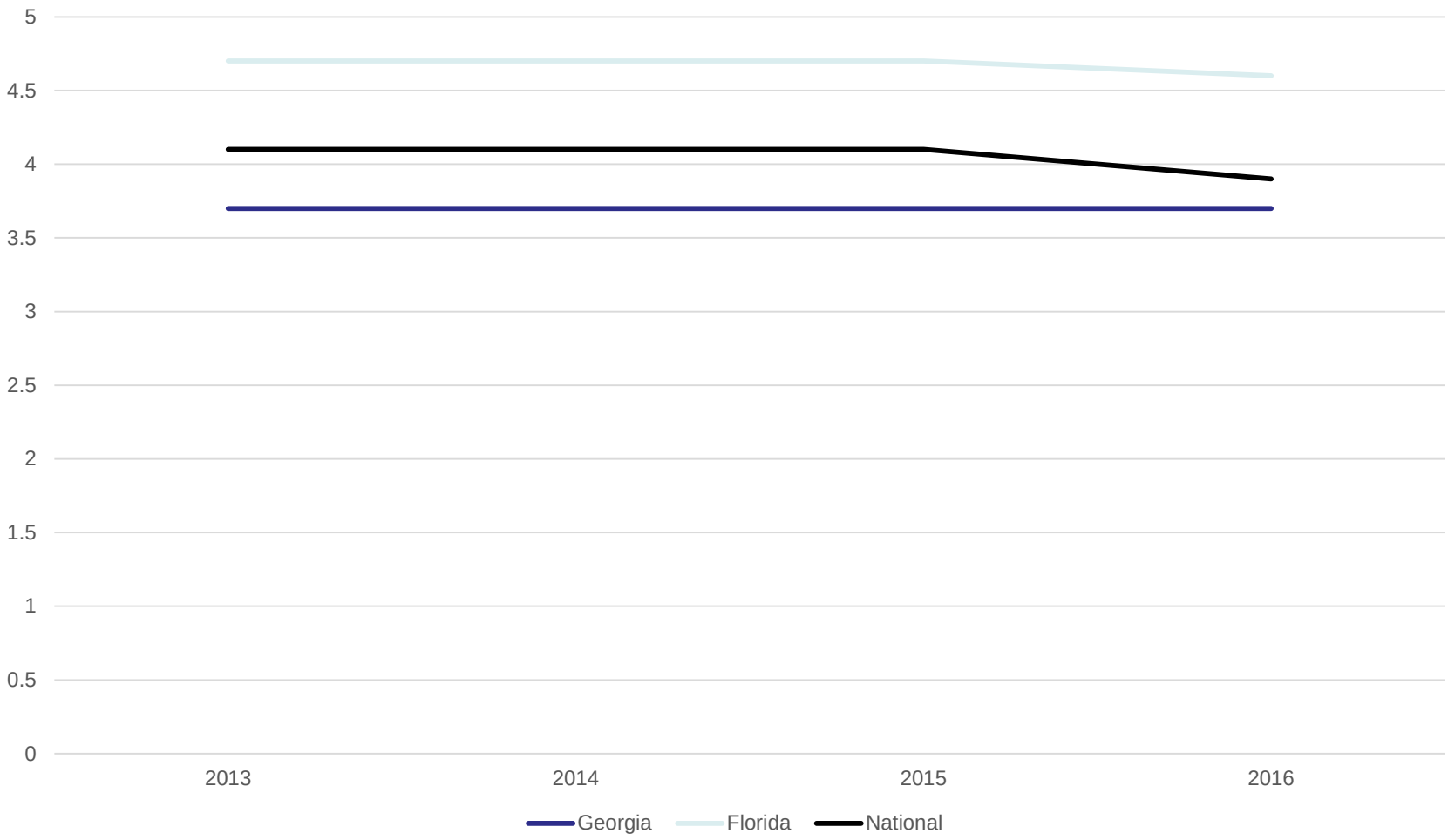
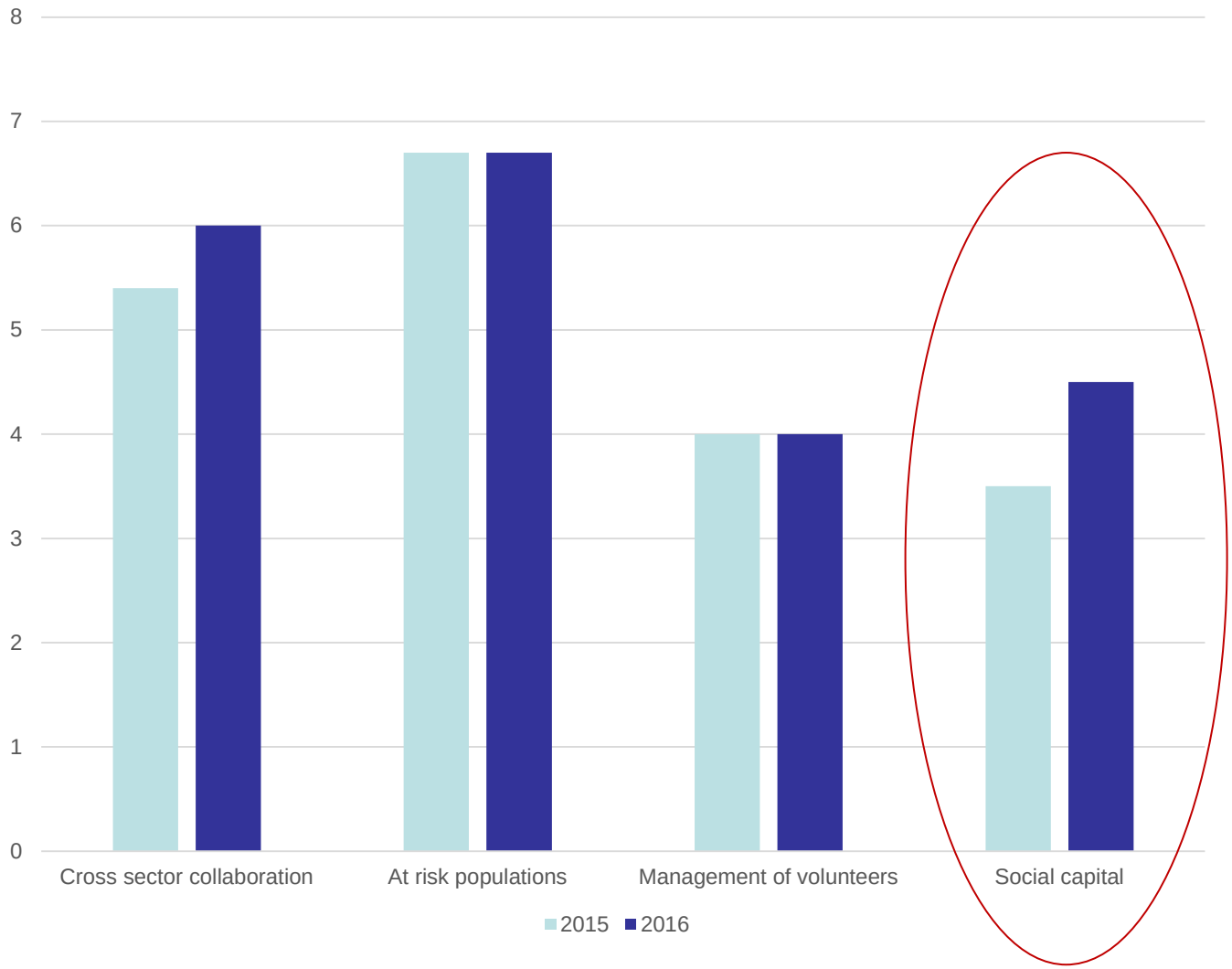
State examples: Volunteer management



Social capital and cohesion



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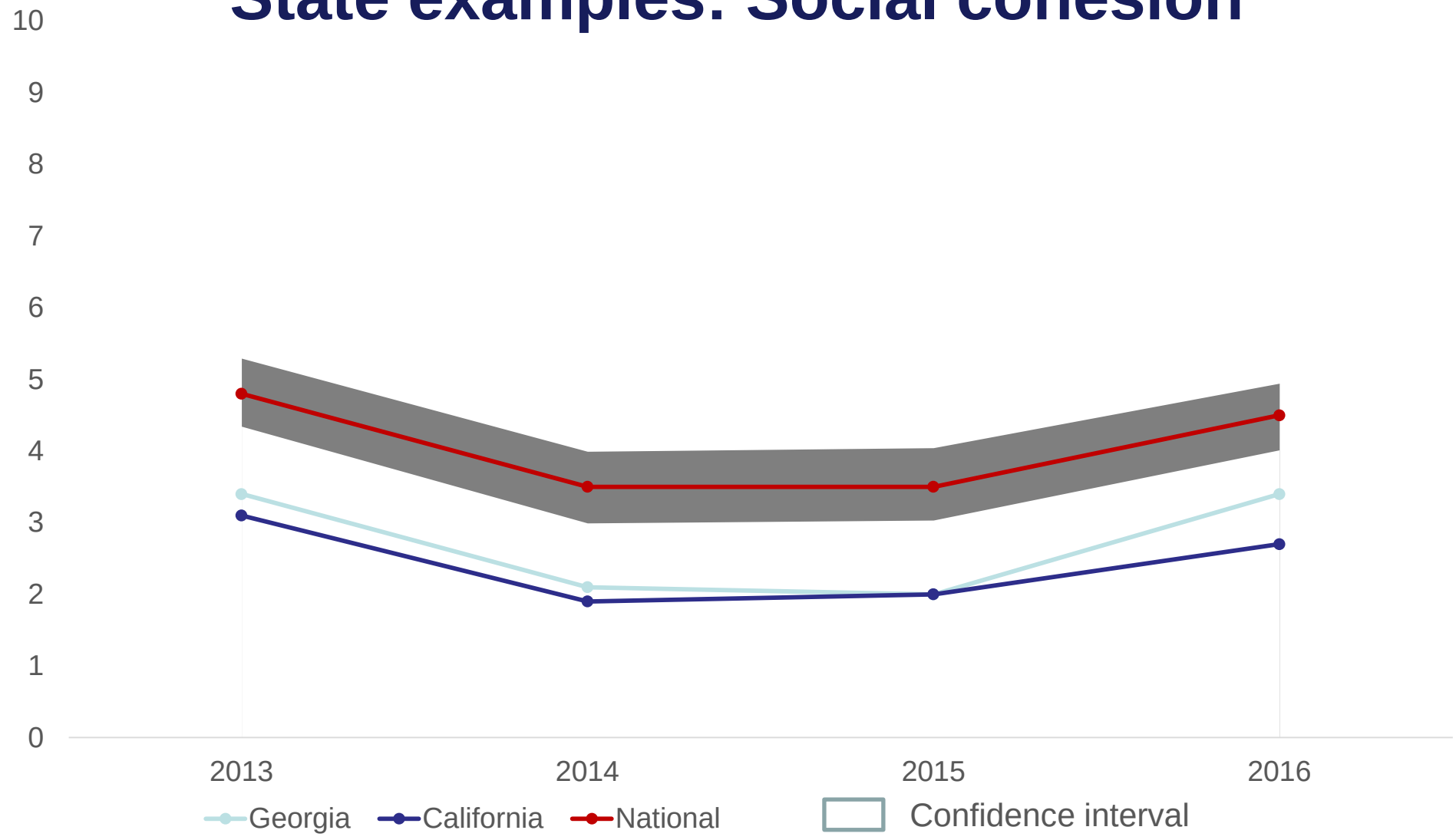
State examples: Social cohesion



Key Findings: Summary

- **Community planning and engagement improving, but still work to do in social capital and management of volunteers**
- **Community planning explains some of the variation we see by states in NHSPI**
- **Variation is pronounced in higher poverty states, suggesting that partnerships and collaboration may intersect with other social factors critical for health security**

Research: Next steps

- **Examining links between other public health data on community health and key CPE subdomains**
- **Exploring further poverty findings along with other social status (e.g., demographic) variables by state**
- **Linking research on community partnerships (e.g., strength of networks) with NHSPI findings**

For More Information

National Program Office

Supported by The Robert Wood Johnson Foundation

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