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Geographic Variation in Public Health Preparedness: the Influence of Federal Financing and Coverage Expansions

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Geographic Variation in Public Health Preparedness: the Influence of Federal Financing and Coverage Expansions

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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

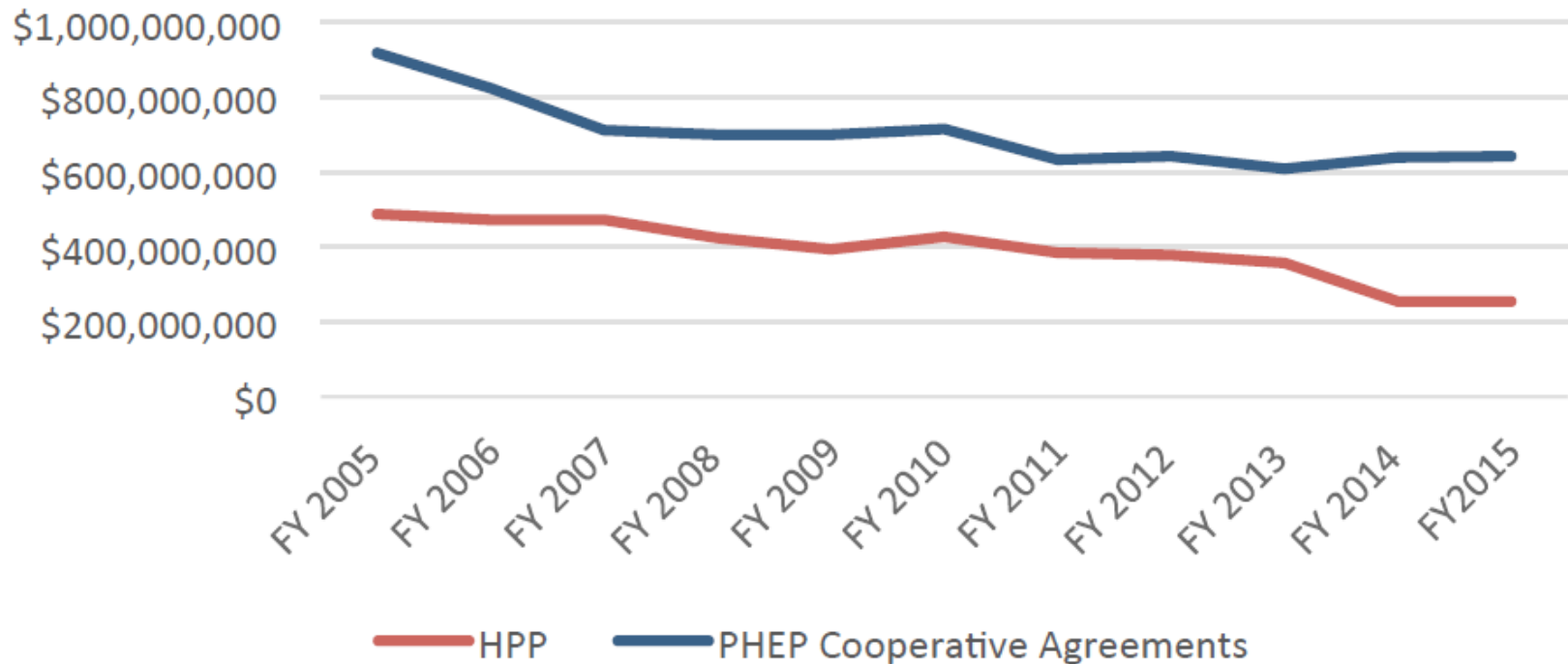


Health security requires collective actions across many activities and sectors

- 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

Uncertain risks & unstable resources

PHEP/HPP Preparedness Funding
(Appropriated Levels)



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

Research questions

- How do health security levels vary across states and change over time?
- Do federal-state policy mechanisms contribute to geographic & inter-temporal 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



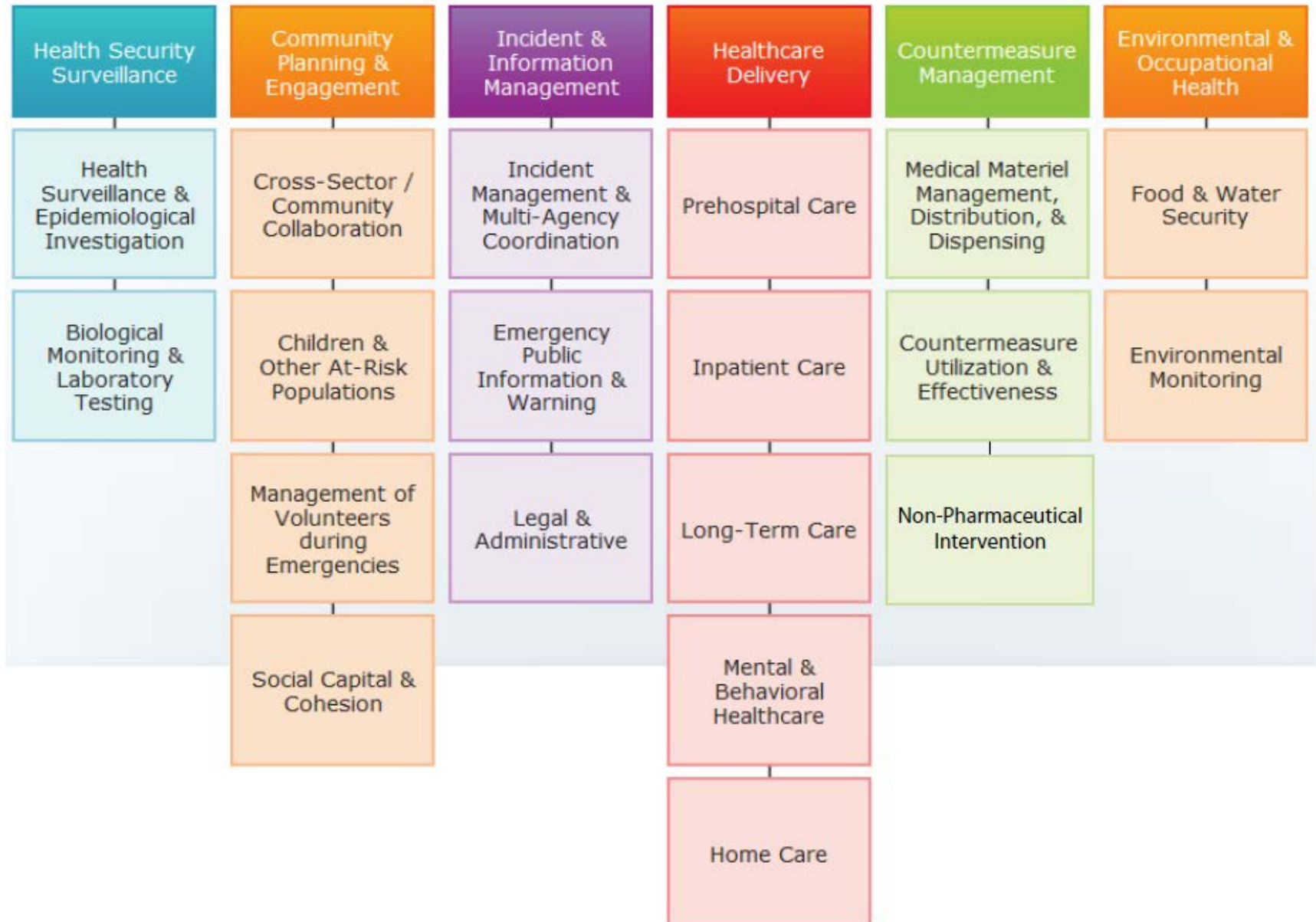
Unweighted
average

- 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



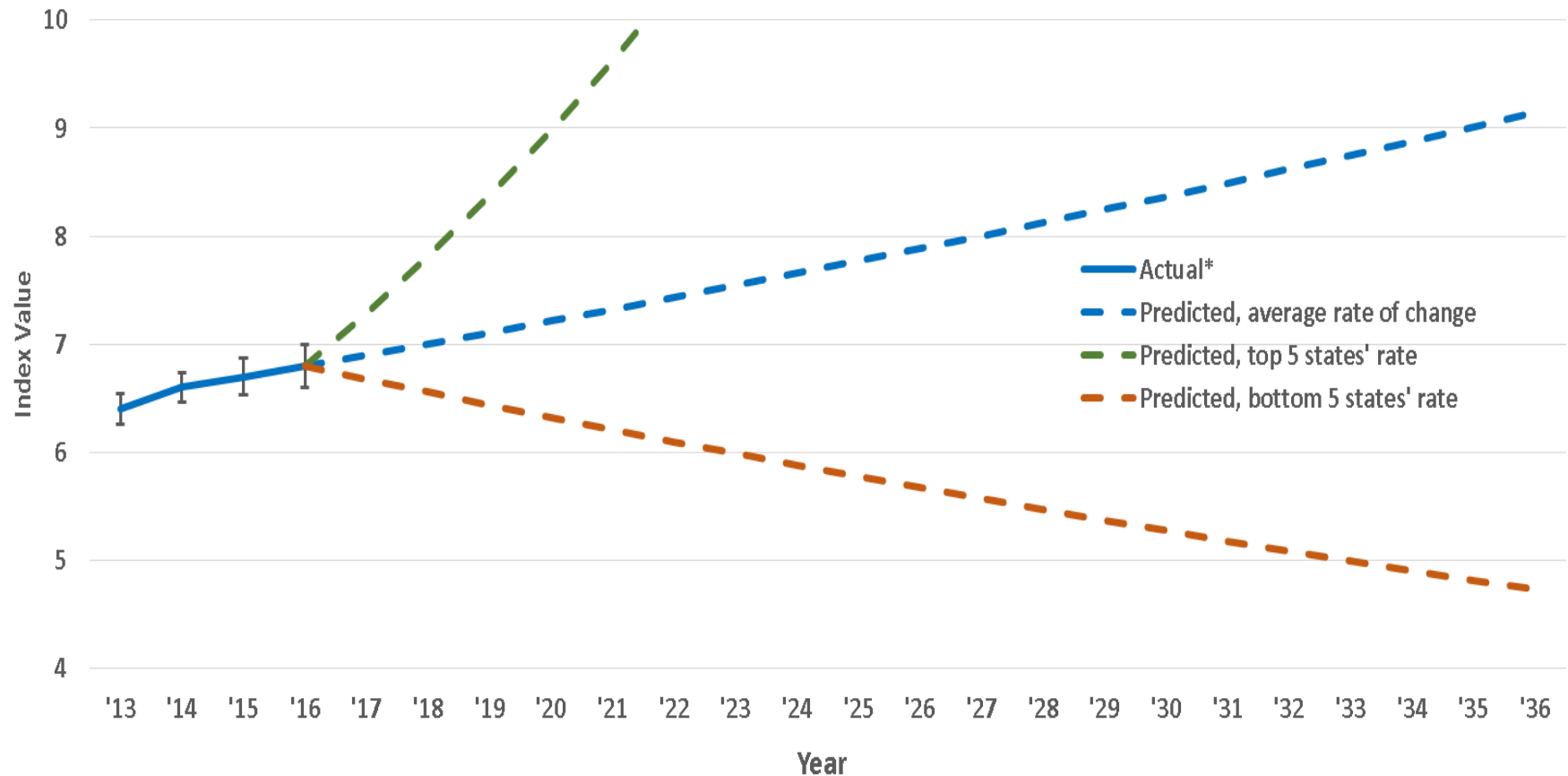
Analytic methods

- 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:

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

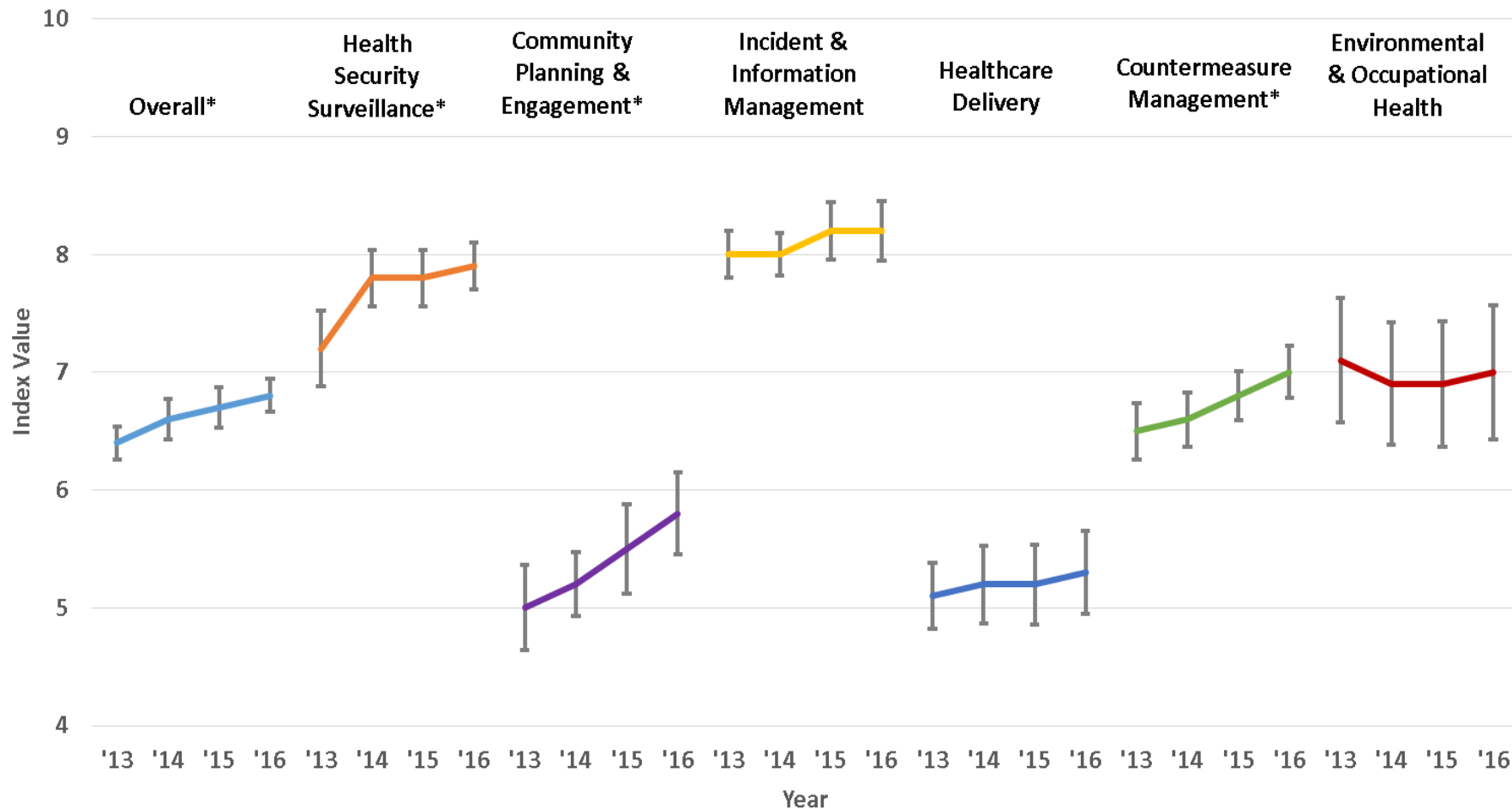
$$E(\$Recovery_{i,t}) = B_0 + B_1 \text{Index}_{i,t} + B_2 \text{Coverage}_{i,t} + B_3 \text{Population}_{i,t} + e_i + e_t + e_{i,t}$$

Steady but slow progress



*statistically significant change

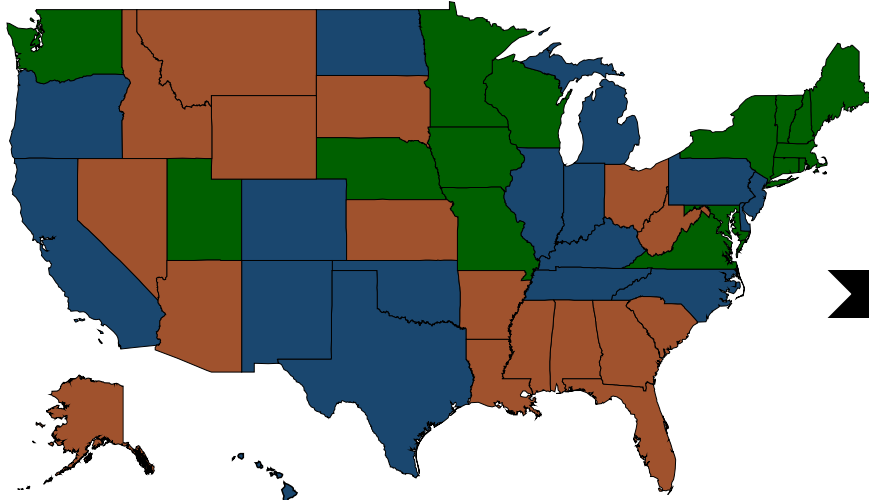
The U.S. improved in most domains during 2013-16, except healthcare delivery and environmental health



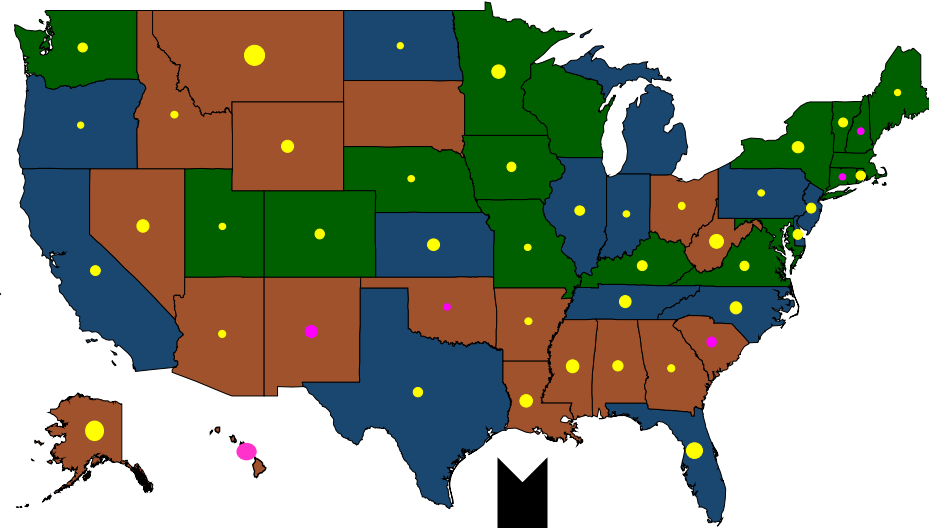
*statistically significant change

Geographic disparities in health security are large and persistent

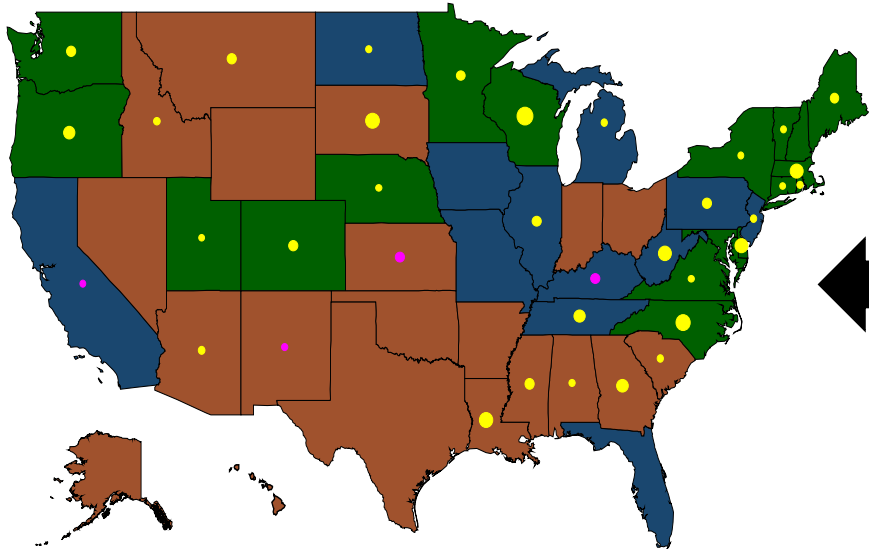
2013



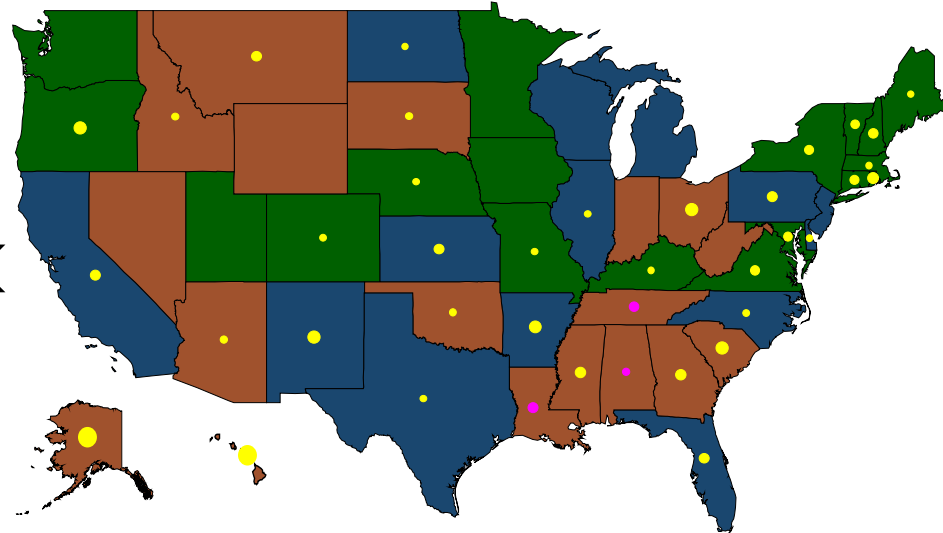
2014



2016

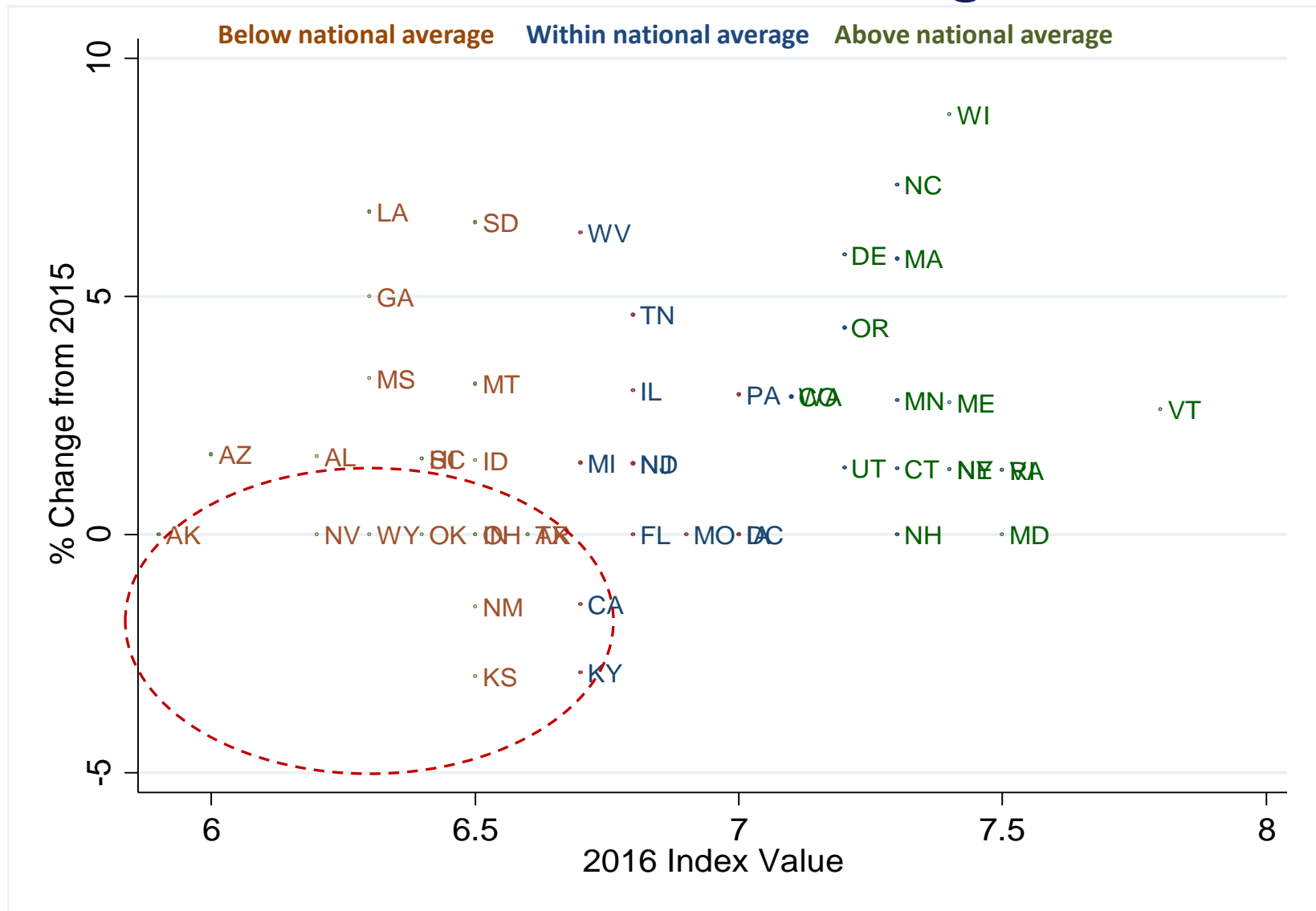


2015

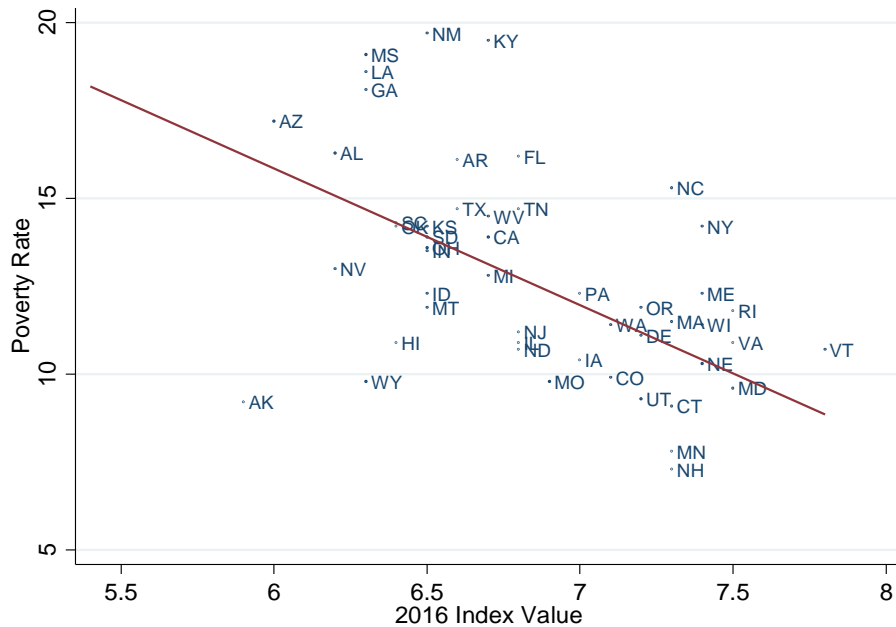


■ Above average
 ■ Within average
 ■ Below average
 ● %Increase in year
 ● %Decrease in year

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

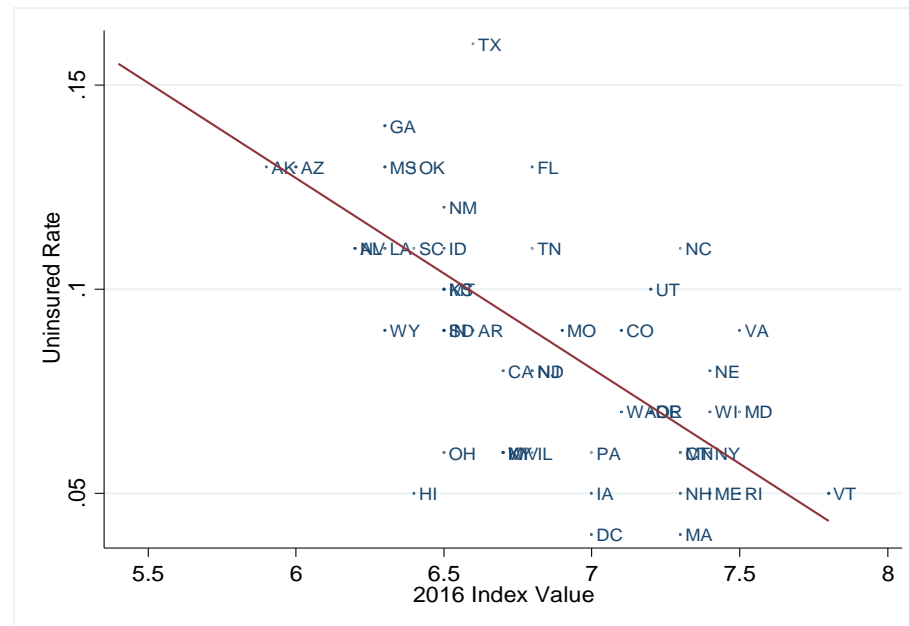


Health security tracks closely with social & economic determinants of health

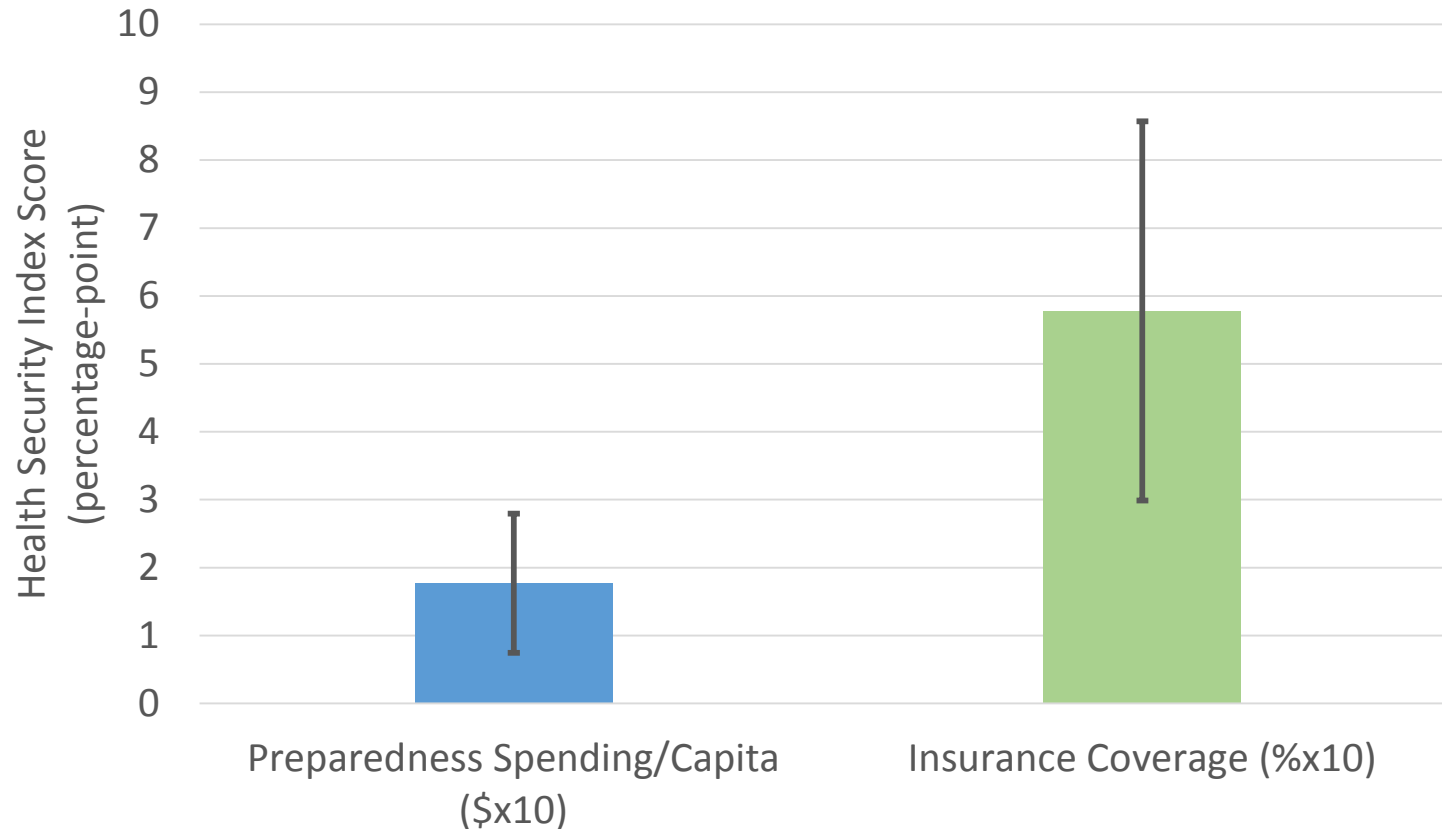


Percent of population below federal poverty threshold

Percent of population without health insurance coverage

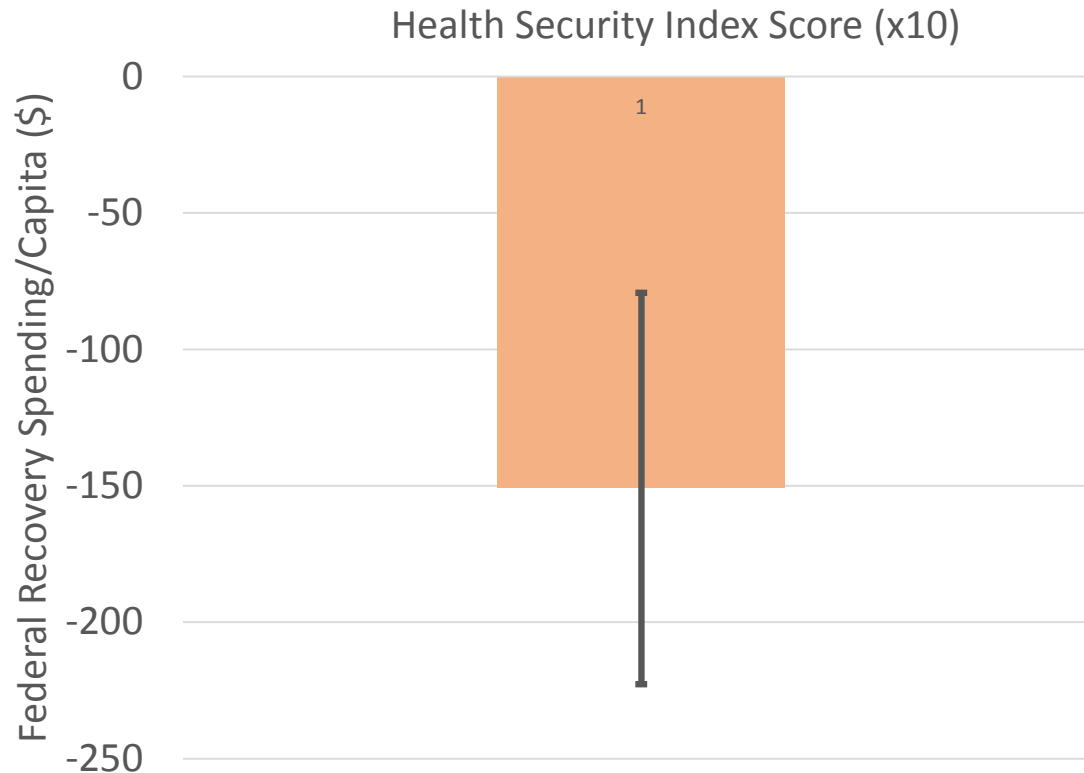


Determinants of State Health Security: Federal Preparedness Spending and Coverage Gains



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.

Determinants of Federal Disaster Spending



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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