

University of Kentucky

From the Selected Works of Glen Mays

Summer June 21, 2017

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

Glen P. Mays, *University of Kentucky*



Available at: https://works.bepress.com/glen_mays/311/

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

Glen Mays, PhD; Michael Childress, MA;
Dominique Zephyr, MS; Anna Hoover, PhD
University of Kentucky



glen.mays@uky.edu
[@GlenMays](#)
www.nhspi.org



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

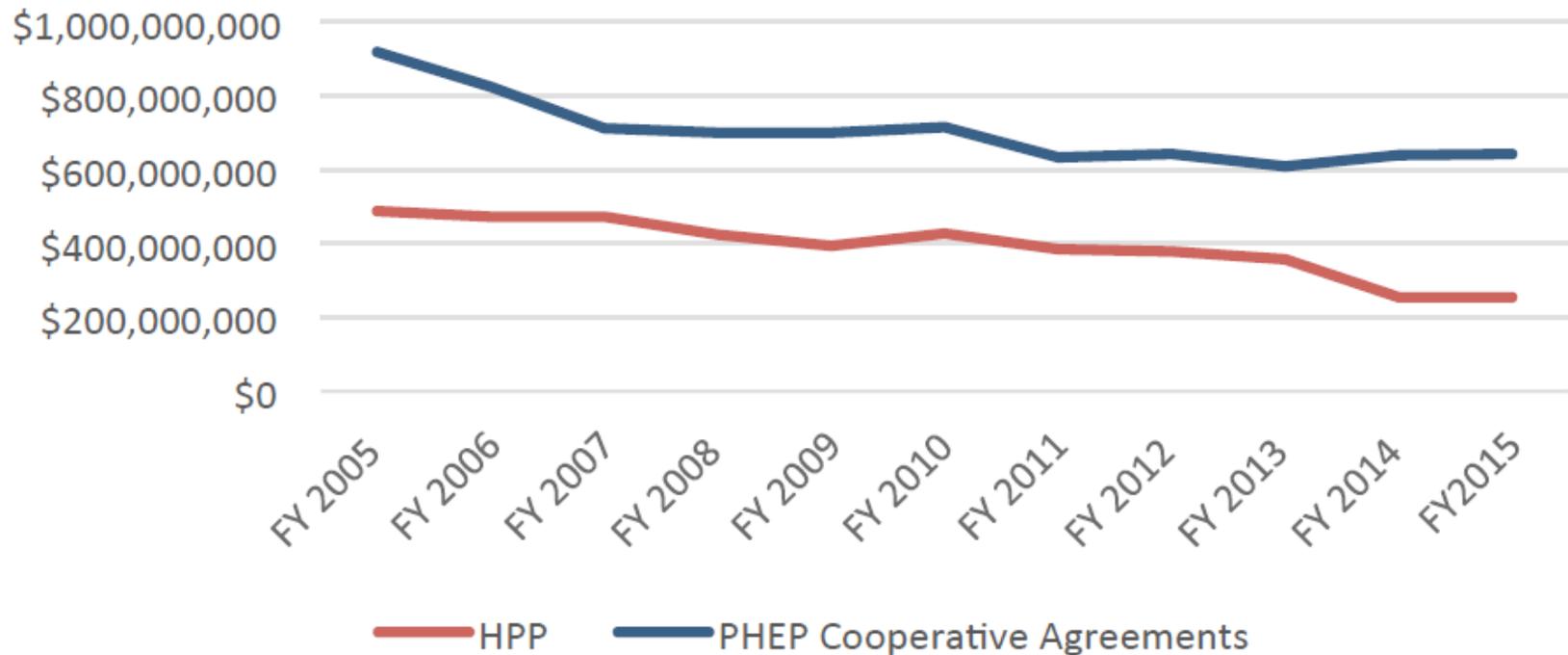


Health security requires collective actions across many activities and sectors

- 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



- 19 subdomains



- 6 domains



- State overall values

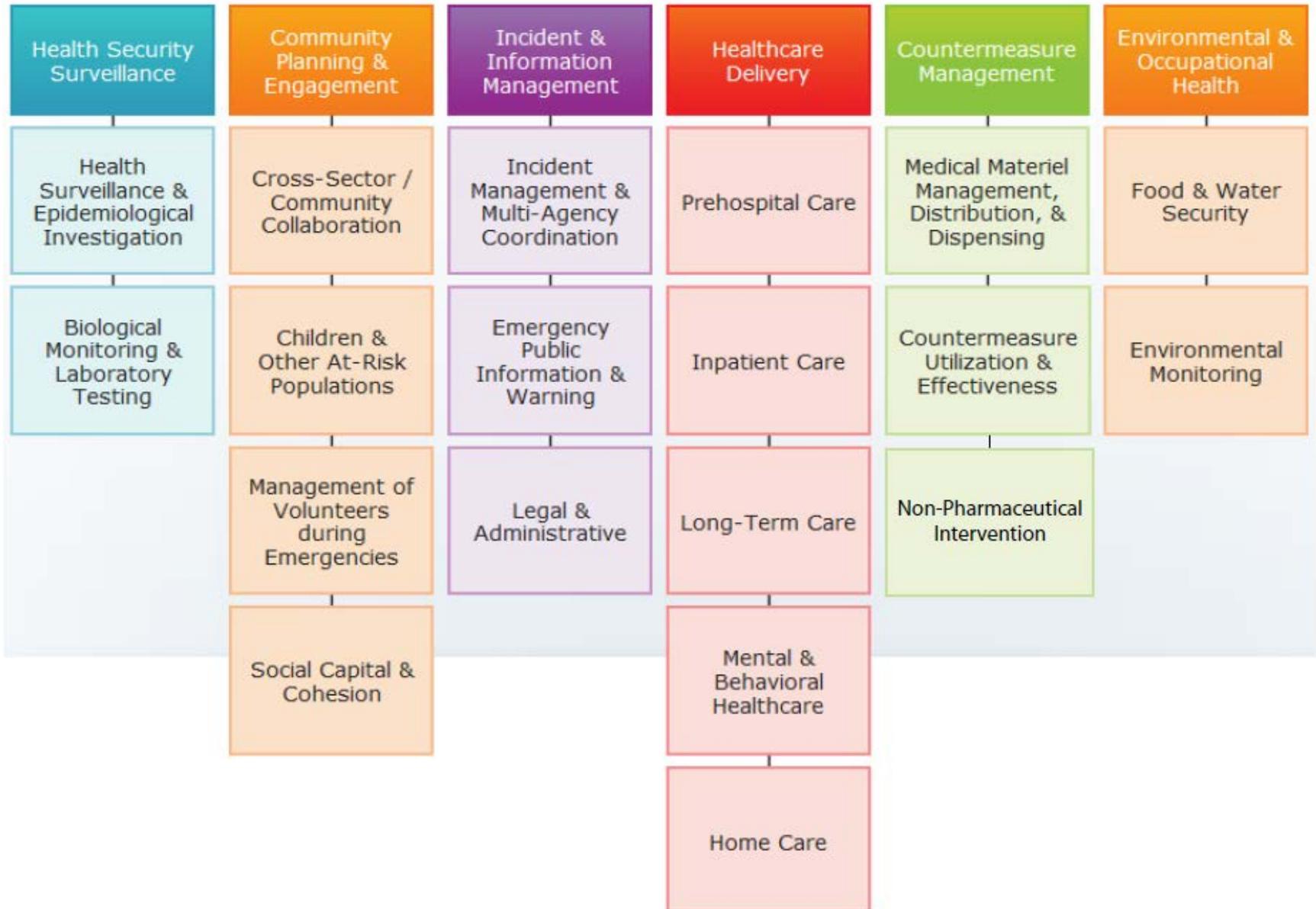


- National overall values

- 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



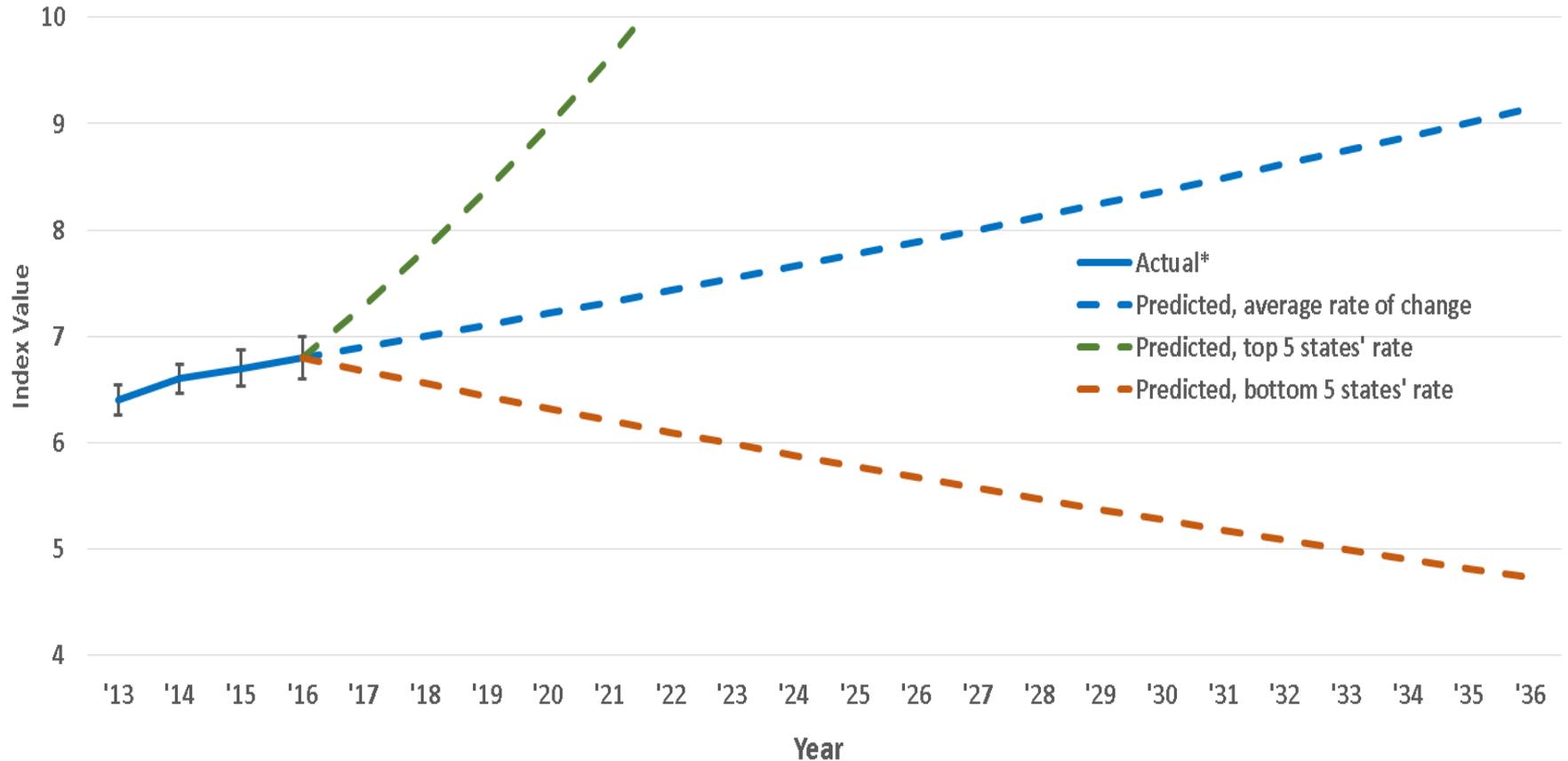
Analytic methods

- 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:

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

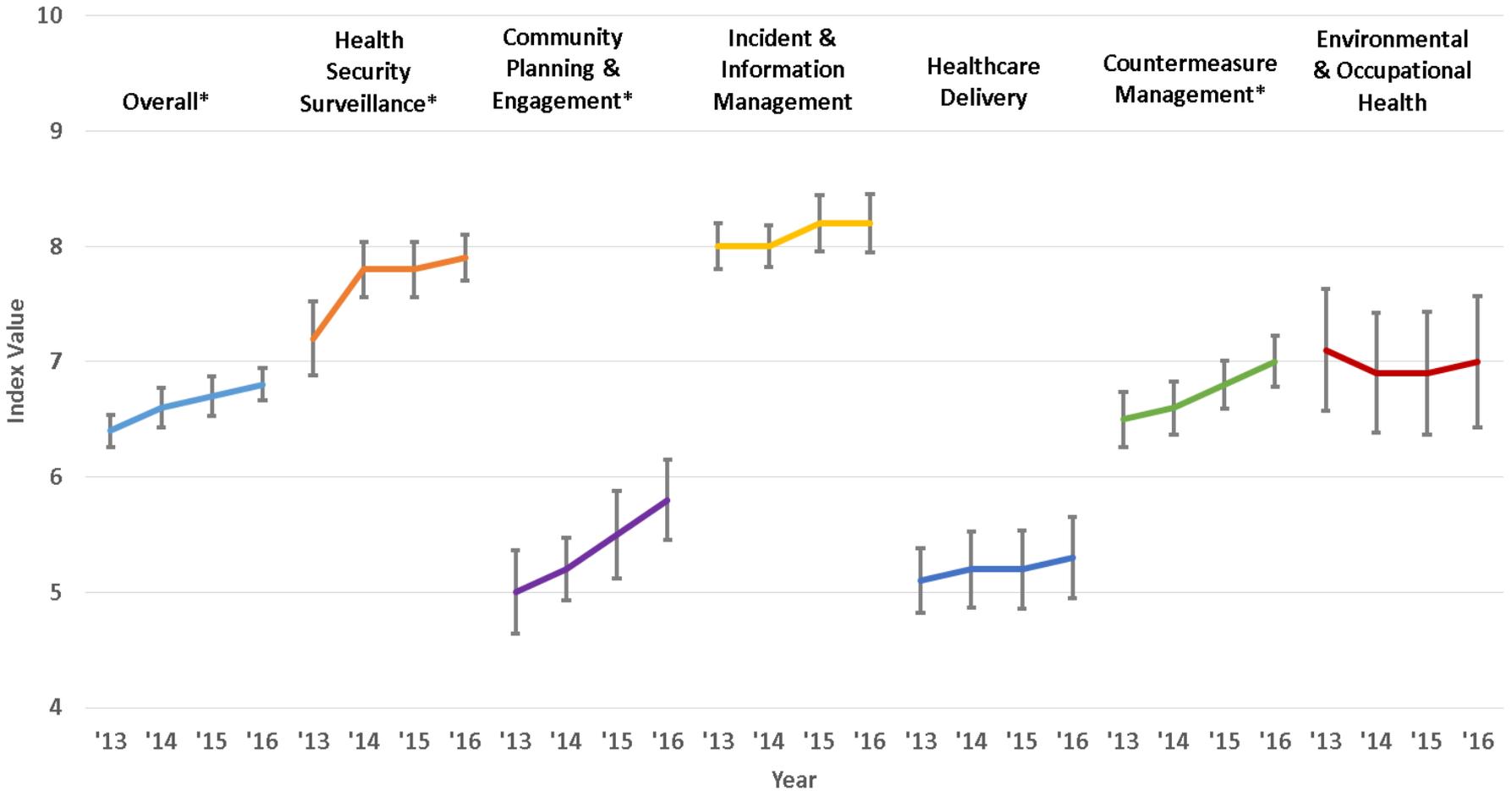
$$E(\$ \text{Recovery}_{i,t}) = B_0 + B_1 \text{Index}_{i,t} + B_2 \text{Coverage}_{i,t} + B_3 \text{Population}_{i,t} + e_i + e_t + e_{i,t}$$

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

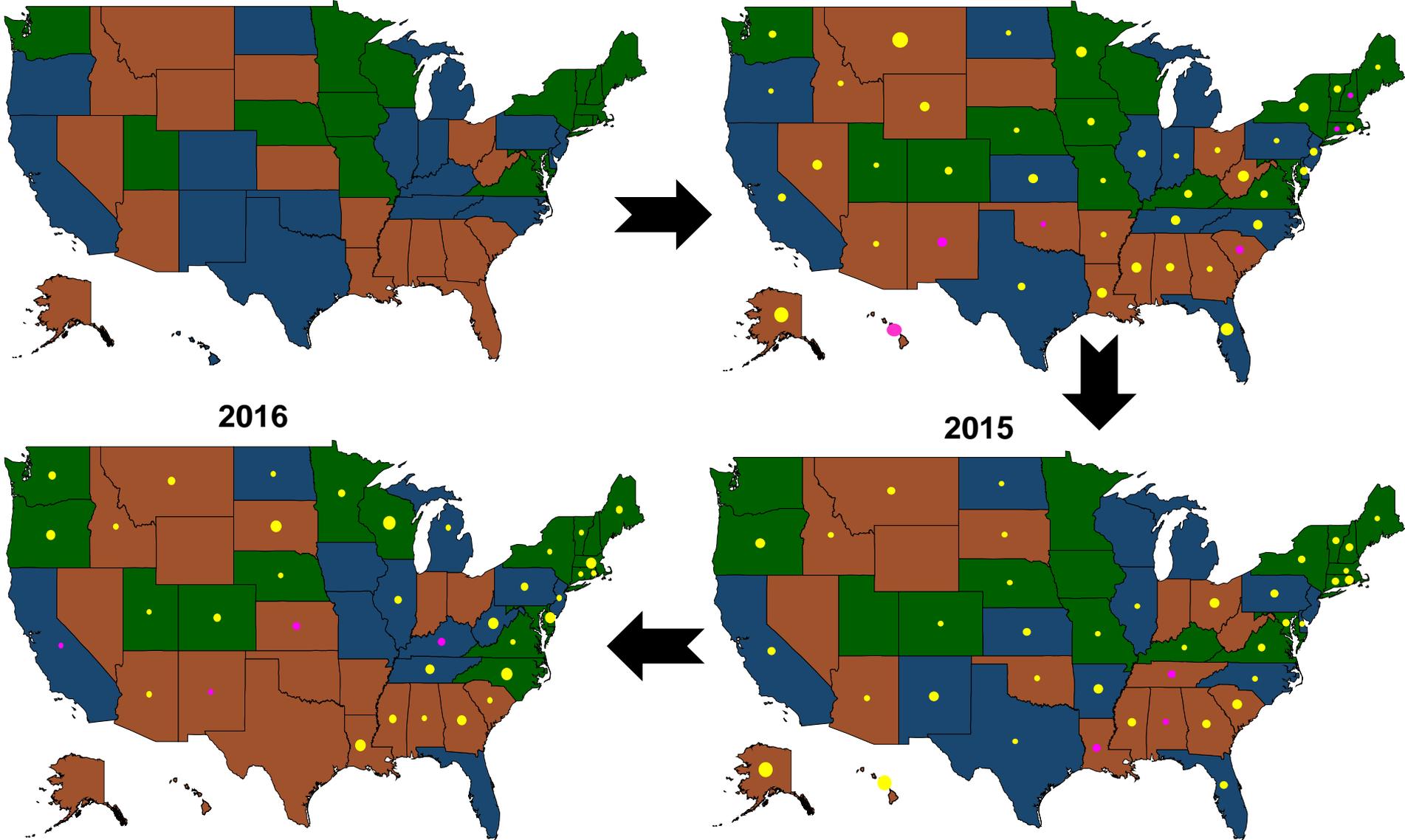
2013

2014

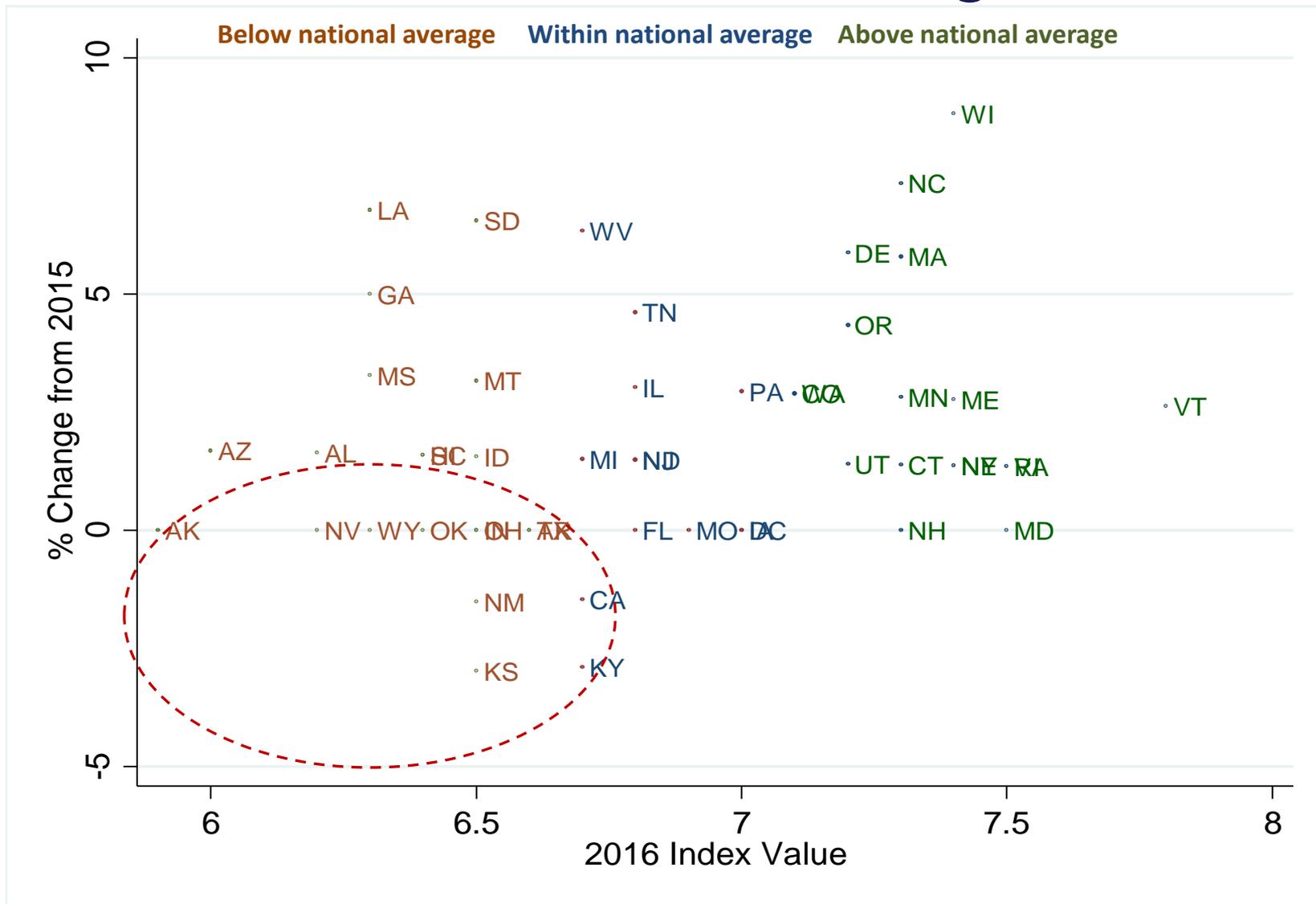
2016

2015

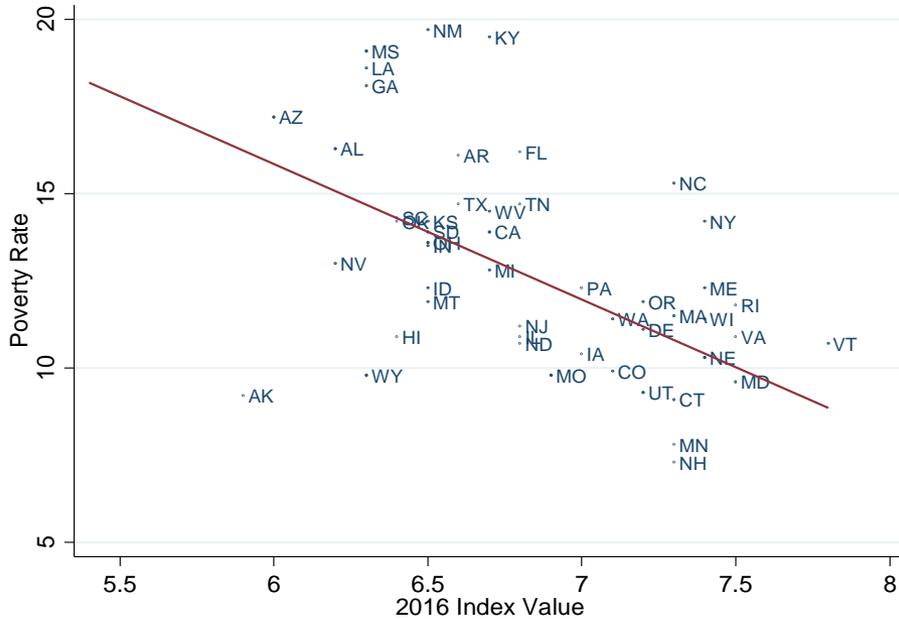
■ Above average ■ Within average ■ Below average ● %Increase in year ● %Decrease in year



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

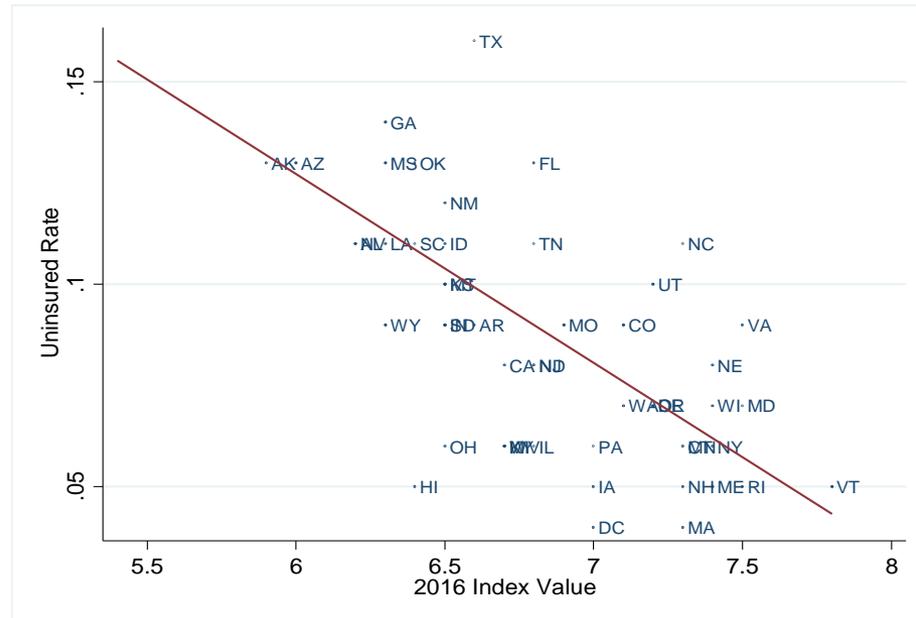


Health security tracks closely with social & economic determinants of health

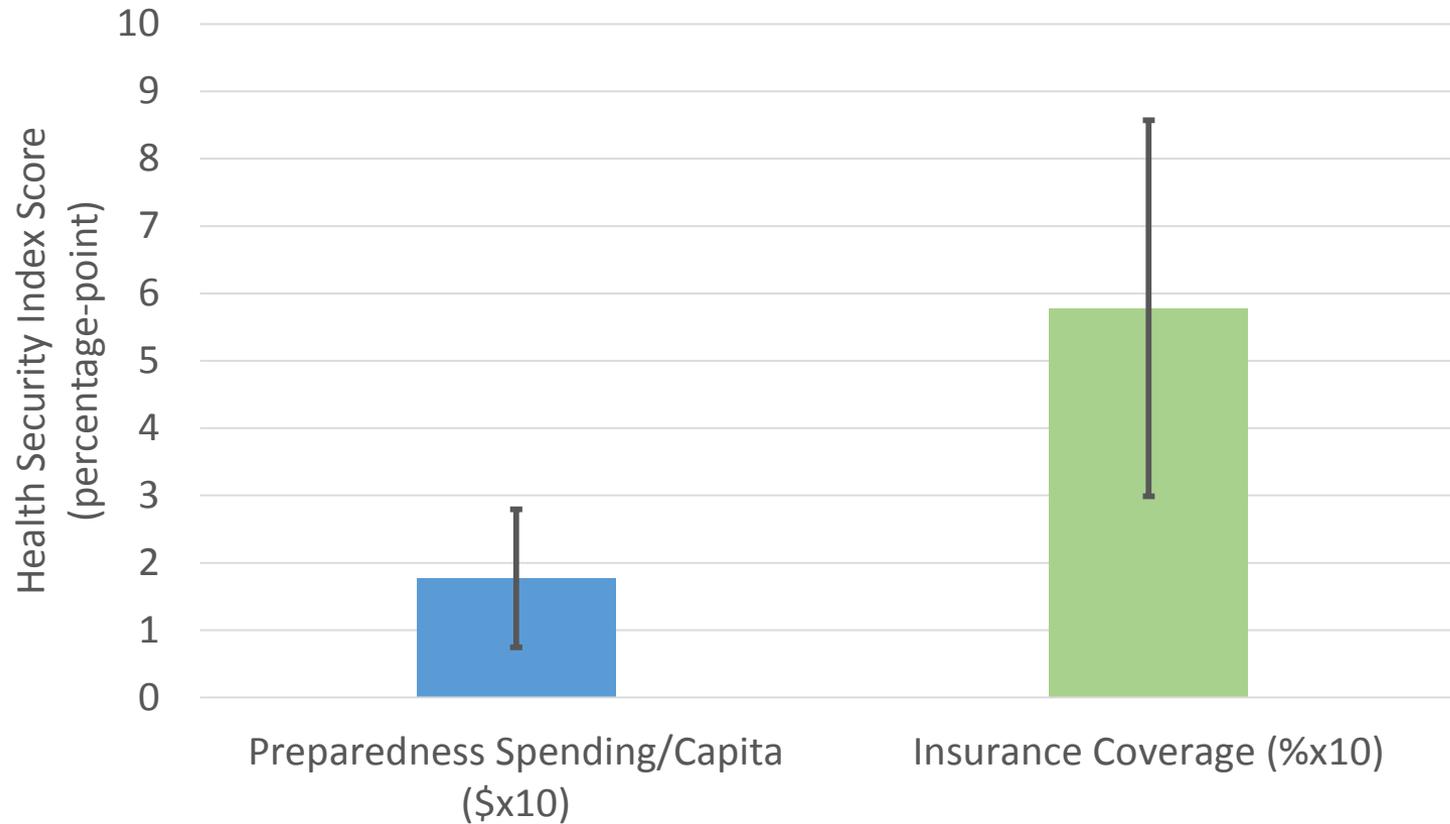


← Percent of population below federal poverty threshold

Percent of population without health insurance coverage →

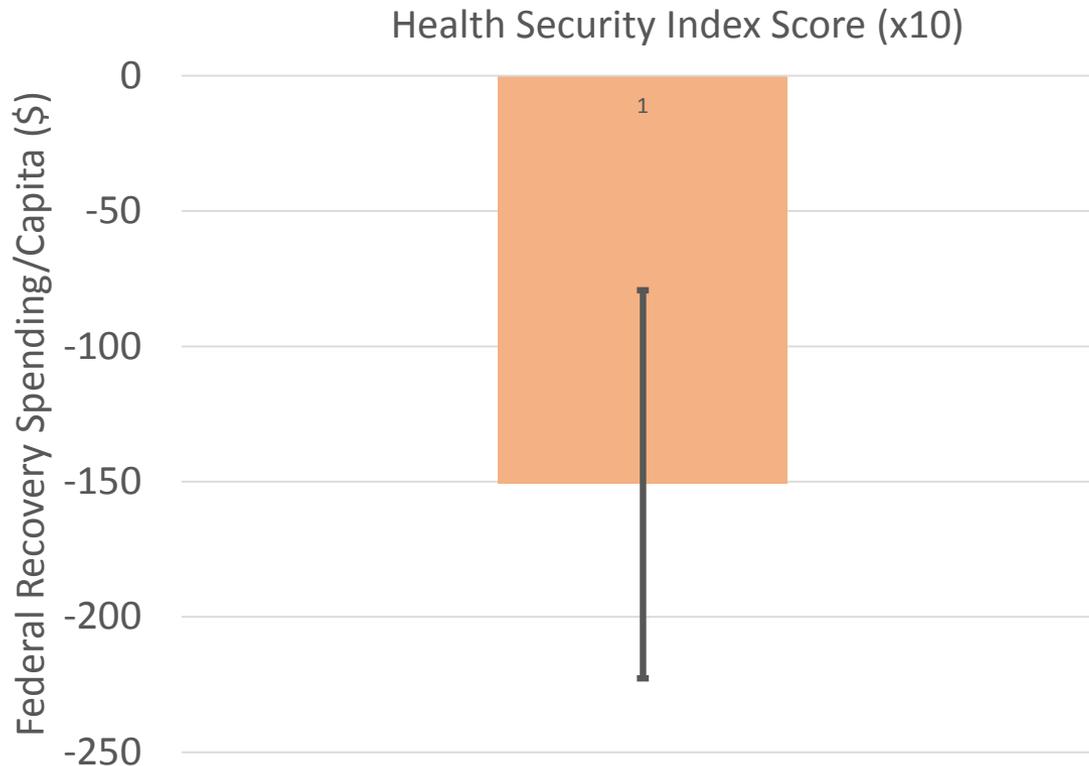


Determinants of State Health Security: Federal Preparedness Spending and Coverage Gains



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

National Advisory Committee Members | 2016-17

Thomas Inglesby, MD (Chair), Johns Hopkins University
Robert Burhans, Health Emergency Management Consultant
Anita Chandra, DrPH, RAND
Mark DeCoursey, U.S. Chamber of Commerce Foundation
Eric Holdeman, Emergency Management Consultant
Harvey E. Johnson, Jr., American Red Cross
Ana Marie Jones, Interpro
Dara Lieberman, MPP, Trust for America's Health
Nicole Lurie, MD, MSPH, ASPR (through 1/2017)
Suzet McKinney, DrPH, MPH, Illinois Medical District Commission
Stephen Redd, MD, CDC Office of Public Health Preparedness & Response
Richard Reed, MSW, American Red Cross (through 2/2016)
John Wiesman, DrPH, MPH, Washington State Secretary of Health

Special appreciation to Index collaborators at CDC, ASPR, ASTHO, APHL, NACCHO, RAND, members of the Model Design and Analytic Methodology Workgroup, and the Stakeholder Engagement and Communications Workgroup.

Visit or join an Index workgroup at <http://nhspi.org/get-involved/>

For More Information



National Program Office

Supported by The Robert Wood Johnson Foundation

Glen P. Mays, Ph.D., M.P.H.

Email: NHSPI@uky.edu

Web: www.nhspi.org
www.systemsforaction.org

Archive: works.bepress.com/glen_mays

Blog: publichealtheconomics.org

To receive updates from the Health Security Index, email listserv@lsv.uky.edu with “Subscribe NHSPIndex” in the body

Systems for Action
National Coordinating Center
Systems and Services Research to Build a Culture of Health

