The Political Economy of Health Security: Geographic Variation in Financing, Capabilities & Networks

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The Political Economy of Health Security: Geographic Variation in Financing, Capabilities & Networks

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Rising burden of health consequences associated with emergency events

- 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

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 policy mechanisms contribute to geographic & inter-temporal variation in health security?
  - Federal preparedness financing
  - ACA-related health insurance coverage gains

- Do inter-organizational networks contribute to variation in health security levels?
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
Measurement: National Health Security Index

- **120 individual measures**
  - 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 2013-2018

- **19 subdomains**
  - Weighted average

- **6 domains**
  - Weighted average

- **State overall values**
  - Unweighted average

- **National overall values**
  - Weighted average

<table>
<thead>
<tr>
<th>Reliability by Domain</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health security surveillance</td>
<td>0.712</td>
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<tr>
<td>Community planning &amp; engagement</td>
<td>0.631</td>
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<tr>
<td>Incident &amp; information management</td>
<td>0.734</td>
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<tr>
<td>Healthcare delivery</td>
<td>0.596</td>
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<tr>
<td>Countermeasure management</td>
<td>0.654</td>
</tr>
<tr>
<td>Environmental/occupational health</td>
<td>0.749</td>
</tr>
</tbody>
</table>
Measuring capacities & capabilities
Index domains & subdomains

Overall Index Score

- Health Security Surveillance
  - Health Surveillance & Epidemiological Investigation
  - Biological Monitoring & Laboratory Testing
    - Management of Volunteers during Emergencies
    - Social Capital & Cohesion

- Community Planning & Engagement
  - Cross-Sector Community Collaboration

- Incident & Information Management
  - Incident Management
  - Information Management

- Healthcare Delivery
  - Prehospital Care
  - Hospital & Physician Services
  - Long-Term Care
  - Mental & Behavioral Care
  - Home Care

- Countermeasure Management
  - Medical Material Management, Distribution, & Dispensing
  - Countermeasure Utilization & Effectiveness

- Environmental & Occupational Health
  - Food & Water Security
  - Environmental Monitoring
  - Physical Environment & Infrastructure
  - Workforce Resiliency
Index data for each state and year 2013-18
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)
Network measures from National Longitudinal Survey of Public Health Systems
We estimate GEE panel regression models:

$$E(\text{Index}_{i,t}) = B_0 + B_1 \text{Preparedness}_{i,t} + B_2 \text{Coverage}_{i,t} + B_3 \text{Network} + B_4 \text{Population}_{i,t} + e_i + e_t + e_{i,t}$$

$$E(\text{Recovery}_{i,t}) = B_0 + B_1 \text{Index}_{i,t} + B_2 \text{Coverage}_{i,t} + B_3 \text{Network} + B_4 \text{Population}_{i,t} + e_i + e_t + e_{i,t}$$
Results

Steady but slow progress

*statistically significant change
The U.S. improved in most domains during 2013-18, except healthcare delivery and environmental health
Geographic disparities in health security are large and persistent

Results

<table>
<thead>
<tr>
<th>Year</th>
<th>Below U.S. average</th>
<th>Within U.S. average</th>
<th>Above U.S. average</th>
<th>% Decline from prior year</th>
<th>% Increase from prior year</th>
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<tbody>
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<td>2018</td>
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</tbody>
</table>

Legend:
- Below U.S. average
- Within U.S. average
- Above U.S. average
- % Decline from prior year
- % Increase from prior year
Results

Gains in health security far surpassed losses between 2017-18

- National Average: +3.1%
- Lowest state (AK): +3.5%
- Highest state (MA): +1.4%
- Largest gain (DC): +7.3%
- Largest loss (WV): -3.2%

Index Values in 2017 and 2018
Changes in health security varied widely across states and domains.
Determinants of State Health Security: Federal Preparedness Spending and Coverage Gains

Results

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.
Results

Network measures

National Longitudinal Survey of Public Health Systems

- Nationally representative cohort of 600 U.S. communities
- Followed over time: 1998-2018
- Local public health officials report:
  - **Scope**: availability of 20 recommended population health activities
  - **Network density**: organizations contributing to each activity
  - **Network centrality**: strongest central actor
  - **Quality**: perceived effectiveness of each activity
Network measures

Node size = degree centrality
Line size = % activities jointly contributed (tie strength)

Network density and scope of activities

Comprehensive Networks

Conventional Networks

Limited Networks

Mays GP et al. Health Affairs 2016
Results

Network Effects on Health Security

Reference: Limited Networks. 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
  - Network density
- Stronger state preparedness levels associated with lower 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
- Lagged effects
- Observational, not causal, estimates
Thomas Inglesby, MD (Chair), Johns Hopkins University
Robert Burhans, Health Emergency Management Consultant
Anita Chandra, DrPH, RAND
Mark DeCourcey, U.S. Chamber of Commerce Foundation
Eric Holdeman, Emergency Management Consultant
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Visit or join an Index workgroup at http://nhspi.org/get-involved/
For More Information

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