Using Systems Science to Optimize Health Security Coalitions & Networks

Applications with the National Health Security Preparedness Index

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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
Networks as Force Multipliers

- Enhance coordination
- Accelerate information flow
- Acquire new ideas
- Spread innovations
- Build resilience

- Density
- Centralization
Key questions to explore with the Index

- How do health security levels vary across states and change over time?

- What roles do networks and coalitions play in shaping the dynamics of health security?
  - Healthcare Coalitions
  - Other community networks

- How can we strengthen coalitions & networks to improve overall health security?
Measurement: National Health Security Index

- 139 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 2013-2016

- 19 subdomains
  - Weighted average

- 6 domains
  - Weighted average

- State overall values
  - Weighted average

- National overall values
  - Unweighted average

### Reliability by Domain

<table>
<thead>
<tr>
<th>Domain</th>
<th>Alpha</th>
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</thead>
<tbody>
<tr>
<td>Health security surveillance</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>
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<tr>
<td>Countermeasure management</td>
<td>0.654</td>
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<tr>
<td>Environmental/occupational health</td>
<td>0.749</td>
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</tbody>
</table>
Methods & Data

Index measurement domains & subdomains

- Health Security Surveillance
  - Health Surveillance & Epidemiological Investigation
  - Biological Monitoring & Laboratory Testing
- Community Planning & Engagement
  - Cross-Sector / Community Collaboration
- Incident & Information Management
  - Incident Management & Multi-Agency Coordination
  - Emergency Public Information & Warning
- Healthcare Delivery
  - Prehospital Care
  - Inpatient Care
  - Long-Term Care
- Countermeasure Management
  - Medical Materiel Management, Distribution, & Dispensing
  - Countermeasure Utilization & Effectiveness
  - Non-Pharmaceutical Intervention
- Environmental & Occupational Health
  - Food & Water Security
  - Environmental Monitoring

Social Capital & Cohesion
Mental & Behavioral Healthcare
Home Care
Two Index measures capture network attributes

- **Healthcare Coalition Membership Penetration**
  - Local public health agencies
  - Local emergency management agencies
  - Hospitals
  - EMS agencies

- **Comprehensiveness of Local Public Health Networks (Public Health System Capital)**
  - Density
  - Centrality
Steady but slow progress

*statistically significant change
The U.S. improved in most domains during 2013-16, except healthcare delivery and environmental health.
Geographic disparities in health security are large and persistent.
## Changes vary widely across states and domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>Lowest State</th>
<th>US Average</th>
<th>Highest State</th>
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<tbody>
<tr>
<td>Health Security Surveillance</td>
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<td>US +9.7%</td>
<td>VT +11.1%</td>
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<td>Community Planning &amp; Engagement</td>
<td></td>
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<td>Incident &amp; Information Management</td>
<td></td>
<td>US +2.5%</td>
<td>VA +7.9%</td>
</tr>
<tr>
<td>Healthcare Delivery</td>
<td>LA –2.9%</td>
<td>US +3.9%</td>
<td>NH +0.0%</td>
</tr>
<tr>
<td>Countermeasure Management</td>
<td></td>
<td>US +7.7%</td>
<td>CO +8.0%</td>
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<tr>
<td>Environmental &amp; Occupational Health</td>
<td></td>
<td>US –1.4%</td>
<td>VA +1.1%</td>
</tr>
</tbody>
</table>

**Index Values in 2013 and 2016**

PREPARED NATIONAL HEALTH SECURITY PREPAREDNESS INDEX
Network drivers: density & penetration
Participation in Healthcare Preparedness Coalitions

- Hospitals
- EMS
- Emergency management
- Public health
Network drivers: density & centrality

Communities with Strong Multi-Sector Networks (Comprehensive Public Health System Capital)

*statistically significant difference
Unpacking public health system capital
One of RWJF’s Culture of Health National Metrics

- **Broad scope** of public health activities
- **Dense network** of multi-sector relationships
- **Central actors** to coordinate actions

### Access to public health

Overall, 47.2 percent of the population is covered by a comprehensive public health system. Individuals are more likely to have access if they are non-White (51.5 percent vs. 45.5 percent White) or live in a metropolitan area (48.7 percent vs. 34.1 percent in nonmetropolitan areas).

Mapping public health system capital

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

## Organizational contributions to system capital, 1998-2016

<table>
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<tr>
<th>Type of Organization</th>
<th>1998 %</th>
<th>2016 %</th>
<th>Percent Change</th>
</tr>
</thead>
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<tr>
<td>Local public health agencies</td>
<td>60.7%</td>
<td>67.5%</td>
<td>11.1%</td>
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<tr>
<td>Other local government agencies</td>
<td>31.8%</td>
<td>33.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>State public health agencies</td>
<td>46.0%</td>
<td>34.3%</td>
<td>-25.4%</td>
</tr>
<tr>
<td>Other state government agencies</td>
<td>17.2%</td>
<td>12.3%</td>
<td>-28.8%</td>
</tr>
<tr>
<td>Federal government agencies</td>
<td>7.0%</td>
<td>7.2%</td>
<td>3.7%</td>
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<tr>
<td>Hospitals</td>
<td>37.3%</td>
<td>46.6%</td>
<td>24.7%</td>
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<td>Physician practices</td>
<td>20.2%</td>
<td>18.0%</td>
<td>-10.6%</td>
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<td>Community health centers</td>
<td>12.4%</td>
<td>29.0%</td>
<td>134.6%</td>
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<tr>
<td>Health insurers</td>
<td>8.6%</td>
<td>10.6%</td>
<td>23.0%</td>
</tr>
<tr>
<td>Employers/businesses</td>
<td>16.9%</td>
<td>15.3%</td>
<td>-9.6%</td>
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<td>Schools</td>
<td>30.7%</td>
<td>25.2%</td>
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<td>Universities/colleges</td>
<td>15.6%</td>
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<td>Faith-based organizations</td>
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<td>17.5%</td>
<td>-9.1%</td>
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<td>Other nonprofit organizations</td>
<td>31.9%</td>
<td>32.5%</td>
<td>2.0%</td>
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<tr>
<td>Other</td>
<td>8.5%</td>
<td>5.2%</td>
<td>-38.4%</td>
</tr>
</tbody>
</table>
Health effects attributable to system capital

Impact of Comprehensive Systems on Mortality, 1998-2014

Fixed-effects instrumental variables estimates controlling for racial composition, unemployment, health insurance coverage, educational attainment, age composition, and state and year fixed effects. N=1019 community-years

Mays GP et al. Health Affairs 2016
Economic effects attributable to system capital

Impact of Comprehensive Systems on Medical Spending (Medicare) 1998-2014

Models also control for racial composition, unemployment, health insurance coverage, educational attainment, age composition, and state and year fixed effects. N=1019 community-years. Vertical lines are 95% confidence intervals

Mays GP et al. Health Services Research 2017
Economic effects attributable to system capital

Impact of Comprehensive Systems on Life Expectancy by Income (Chetty), 2001-2014

Models also control for racial composition, unemployment, health insurance coverage, educational attainment, age composition, and state and year fixed effects. N=1019 community-years. Vertical lines are 95% confidence intervals.
Conclusions & Implications

- Health security driven in part by the strength of networks:
  - Healthcare Coalitions
  - Multi-sector public health systems
- Network strength varies widely across communities & changes over time
- Networks have large health & economic implications for their communities
Conclusions and implications

- Large health gains in places with strong system capital
- Larger gains for low-income populations
- Comprehensive systems do more than just plan: prioritize, invest, evaluate, repeat (crowd-sourcing)
- Equity and opportunity: more than half of communities currently lack comprehensive system capital
- ACA incentives and resources may help:
  - Hospital community benefit
  - Value-based health care payments
  - Insurer and employer incentives
- Sustainability and resiliency are not automatic
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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Visit or join an Index workgroup at http://nhspi.org/get-involved/
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National Program Office

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To receive updates from the Health Security Index, email listserv@lsv.uky.edu with “Subscribe NHSPIndex” in the body
Using Systems Science to Optimize Health Security Coalitions and Networks: Being Strategic with the Index

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The 2017 Release of the Index

KEY

- ABOVE NATIONAL AVERAGE
- MEETS NATIONAL AVERAGE
- BELOW NATIONAL AVERAGE
What the Index measures

Health Security Surveillance
- Health Surveillance & Epidemiological Investigation
- Biological Monitoring & Laboratory Testing

Community Planning & Engagement
- Cross-Sector / Community Collaboration
- Children & Other At-Risk Populations
- Management of Volunteers during Emergencies
- Social Capital & Cohesion

Incident & Information Management
- Incident Management & Multi-Agency Coordination
- Emergency Public Information & Warning
- Legal & Administrative

Healthcare Delivery
- Prehospital Care
- Inpatient Care
- Long-Term Care
- Mental & Behavioral Healthcare
- Home Care

Countermeasure Management
- Medical Material Management, Distribution, & Dispensing
- Countermeasure Utilization & Effectiveness
- Non-Pharmaceutical Intervention

Environmental & Occupational Health
- Food & Water Security
- Environmental Monitoring
Cross Sector Community Collaboration

- The coordination necessary to engage community-based organizations and social networks through collaboration among agencies primarily responsible for providing direct health-related services; partners include public health, healthcare, business, education, and emergency management in addition to federal and nonfederal entities necessary to facilitate an effective and efficient return to routine delivery of services.
6 Measures in this Subdomain

- **M87** - Is the state-level health department accredited by the Public Health Accreditation Board (PHAB)?
- **M501** - Percent of population served by a comprehensive public health system (scope of services and inter-organizational connectedness)
6 Measures, continued

- **M9031** - Percentage of hospitals that participate in Health Care Coalitions
- **M9032** - Percentage of emergency medical service agencies that participate in Health Care Coalitions
- **M9033** - Percentage of emergency management agencies that participate in Health Care Coalitions
- **M9034** - Percentage of local health departments that participate in Health Care Coalitions
## Distribution of State (and DC) Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Label</th>
<th>Minimum</th>
<th>Mean</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>M9031</td>
<td>Hospitals</td>
<td>47%</td>
<td>90%</td>
<td>100%</td>
</tr>
<tr>
<td>M9032</td>
<td>EMS</td>
<td>0%</td>
<td>37%</td>
<td>100%</td>
</tr>
<tr>
<td>M9033</td>
<td>EM</td>
<td>0%</td>
<td>66%</td>
<td>100%</td>
</tr>
<tr>
<td>M9034</td>
<td>LHD</td>
<td>0%</td>
<td>83%</td>
<td>100%</td>
</tr>
<tr>
<td>Grand Mean</td>
<td>Overall</td>
<td>26%</td>
<td>69%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Coalitions

Healthcare Coalitions
(Average of Hospitals, EMS, EM, LHD)
CSCC Subdomain Index Results

Cross Sector Community Collaboration

[Map of the United States showing states colored in shades of blue and orange to indicate performance levels.]
Which states are low on the Index & low on the CSCC Subdomain?

States Below the US Average: NHSPI & CSCC
Being Efficient & Strategic

• Should we focus our efforts on these 12 states?
• Maybe, but we can be more strategic by combining these results with other factors that affect health preparedness, such as…
  – Culture of evidence-based planning
  – CDC Social Vulnerability Index
  – Level of Social Capital
Evidence-Based Planning

• *How States Engage in Evidence-Based Policymaking: A National Assessment*
Figure 2
Assessing Evidence-Based Policymaking in the States

Define levels of evidence
Inventory existing programs

Require action through state law
Compare program costs and benefits

Target funds to evidence-based programs
Report outcomes in the budget

Six actions of evidence-based policymaking

assessed in four policy areas

Behavioral Health
Programs to improve mental health and decrease substance abuse
Child Welfare
Programs to reduce the incidence of child maltreatment
Criminal Justice
Programs to reduce recidivism of convicted offenders
Juvenile Justice
Programs to reduce recidivism of adjudicated youth

to categorize 50 states and DC as

Leading
Established
Modest
Trailing

© 2017 The Pew Charitable Trusts
Map 1
Most States Show Modest Levels of Evidence-Based Policymaking

Source: Pew analysis of statutes, administrative codes, executive orders, and state documents
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PREPARED
NATIONAL HEALTH SECURITY PREPAREDNESS INDEX
CPE Domain by EBP

FIGURE 1—Health Security Index Score in the Community Planning & Engagement (CPE) Domain by the Use of Evidence-Based Policymaking in a State

Scores based on the total number of minimum and advanced actions.
Planning Matters

FIGURE 2—Estimated Health Security Index Score in the Community Planning & Engagement (CPE) Domain by the Use of Evidence-Based Policymaking in a State

Note: Statistically significant while holding per capita income, state fiscal health, and disaster experience constant
What is Social Vulnerability?

“Every community must prepare for and respond to hazardous events, whether a natural disaster like a tornado or a disease outbreak, or an anthropogenic event such as a harmful chemical spill. The degree to which a community exhibits certain social conditions, including high poverty, low percentage of vehicle access, or crowded households, may affect that community’s ability to prevent human suffering and financial loss in the event of disaster. These factors describe a community’s social vulnerability.” (Source: CDC)
CDC Social Vulnerability Index

Methods
Variables Used
American Community Survey (ACS), 2010-2014 (5-year) data for the following estimates:

Overall Vulnerability

- Socioeconomic Status
  - Below Poverty
  - Unemployed
  - Income
  - No High School Diploma

- Household Composition & Disability
  - Aged 65 or Older
  - Aged 17 or Younger
  - Civilian with a Disability
  - Single-Parent Households

- Minority Status & Language
  - Minority
  - Speak English "Less than Well"

- Housing & Transportation
  - Multi-Unit Structures
  - Mobile Homes
  - Crowding
  - No Vehicle
  - Group Quarters
Note: The CDC Social Vulnerability Index is estimated at the county level. The author has "population-weighted" these county-level estimates to generate state-level values.
Social Capital Index

• *The Production of Social Capital in US counties*

• Factors include voter turnout, community-based organizations (10), Census response rates, number of nonprofits
Estimated State-Level Social Capital

Social Capital Index, 2010 to 2017

Quartiles
-3 to -1 (Low)
-1 to 0 (Medium-Low)
0 to 1 (Medium-High)
1 to 7 (High)
Being Efficient & Strategic

• Should we focus our efforts on these 12 states?
• Maybe, but we can be more strategic by combining these results with other factors that affect health preparedness, such as…
  – Culture of evidence-based planning
  – CDC Social Vulnerability Index
  – Level of Social Capital
## Low-Low by EBP

<table>
<thead>
<tr>
<th>NHSP &amp; CSCC subdomain</th>
<th>Trailing or Modest</th>
<th>Established</th>
<th>Leading</th>
<th>Total</th>
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<tbody>
<tr>
<td>Not Low-Low</td>
<td>25</td>
<td>9</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>Low on Both</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>11</td>
<td>5</td>
<td>51</td>
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</table>
Evidence-Based Planning

States Below the US Average: NHSPI & CSCC and Trailing/Modest on EBP
Low-Low by Social Vulnerability

<table>
<thead>
<tr>
<th>NHSPI &amp; CSCC subdomain</th>
<th>CDC Social Vulnerability Index</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Above US</td>
<td>Below US</td>
<td>Within US</td>
<td>Total</td>
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<tr>
<td>Not Low-Low</td>
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<tr>
<td>Low on Both</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>12</td>
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<tr>
<td>Total</td>
<td>19</td>
<td>19</td>
<td>13</td>
<td>51</td>
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</table>
Social Vulnerability

States Below the US Average: NHSPI & CSCC and Above Average on CDC SVI
## Low-Low by Social Capital

<table>
<thead>
<tr>
<th>NHSPI &amp; CSCC subdomain</th>
<th>Social Capital Index</th>
<th>Above US</th>
<th>Below US</th>
<th>Within US</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Low-Low</td>
<td></td>
<td>11</td>
<td>14</td>
<td>14</td>
<td>39</td>
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<tr>
<td>Low on Both</td>
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<td>14</td>
<td>19</td>
<td>18</td>
<td>51</td>
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</table>
High Social Capital

States Below the US Average: NHSPI & CSCC
and Above Average on Social Capital
### Overview

<table>
<thead>
<tr>
<th>Coalitions (low %)</th>
<th>Low NHSPI, Low CSCC (low-low)</th>
<th>LowLow + EBP (T/M)</th>
<th>LowLow + SVI (high)</th>
<th>LowLow + Social Capital (high)</th>
</tr>
</thead>
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<td>WY</td>
<td>WY</td>
<td>WY</td>
<td>WY</td>
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</tbody>
</table>

| 18                | 12                            | 10                 | 6                   | 3                             |
Conclusions

• The Index can be used as a tool to plan strategically
  – Where is planning capacity lower?
  – Which states are socially vulnerable?
  – Where is fertile ground for success?

• User can introduce additional dimensions

• Can be used at all levels of government
For more information

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Using the Index to Assess and Address
Climate-Related Vulnerabilities and Resources

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National Healthcare Coalition Preparedness Conference
San Diego, CA
30 November 2017
The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose.
Healthy People 2020 Environmental Health Focus Areas

- Outdoor air quality
- Surface and ground water quality
- Toxic substances and hazardous wastes
- Homes and communities
- Infrastructure and surveillance
- Global environmental health
Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Heat-related illness and death, cardiovascular failure
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Forced migration, civil conflict, mental health impacts
- Respiratory allergies, asthma
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms

Image Courtesy: CDC: https://www.cdc.gov/climateandhealth/effects/default.htm
MEASURING PREPAREDNESS

ENVIRONMENTAL & OCCUPATIONAL HEALTH

WHAT IT MEANS

Actions to maintain the security and safety of water and food supplies, to test for hazards and contaminants in the environment, and to protect workers and emergency responders from health hazards while on the job.
• 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
Trends in EOH Protections: Geographic Disparities

2013 → 2014 → 2015 → 2016

KEY
- ABOVE NATIONAL AVERAGE
- MEETS NATIONAL AVERAGE
- BELOW NATIONAL AVERAGE
### Environmental & Occupational Health Domain Measures

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

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>MEASURE DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>m275.dw</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (drinking water)?</td>
</tr>
<tr>
<td>m275.pww</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (Private well water)?</td>
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<tr>
<td>m275.rec</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (Recreational water)?</td>
</tr>
<tr>
<td>m275.sur</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (Surface water)?</td>
</tr>
<tr>
<td>m275.ust</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (Underground storage tanks)?</td>
</tr>
<tr>
<td>m275.wst</td>
<td>Does your laboratory provide or assure testing for the following environmental matrices (Waste water)?</td>
</tr>
<tr>
<td>m276</td>
<td>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.</td>
</tr>
<tr>
<td>m195</td>
<td>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.</td>
</tr>
</tbody>
</table>
### Environmental & Occupational Health Domain Measures

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.

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>MEASURE DESCRIPTION</th>
<th>SOURCE</th>
</tr>
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<tbody>
<tr>
<td>m202</td>
<td>Does your state public health laboratory provide or assure testing for air?</td>
<td></td>
</tr>
<tr>
<td>m257_aia</td>
<td>Does the American Industrial Hygiene Association (AIHA) provide certification or accreditation of your state public health laboratory?</td>
<td></td>
</tr>
<tr>
<td>m257_spa</td>
<td>Does the U.S. Environmental Protection Agency (EPA) provide certification or accreditation of your state public health laboratory?</td>
<td></td>
</tr>
<tr>
<td>m257_nelac</td>
<td>Does the National Environmental Laboratory Accreditation Conference (NELAC) provide certification or accreditation of your state public health laboratory?</td>
<td></td>
</tr>
<tr>
<td>m197</td>
<td>Does your state public health laboratory provide or assure testing for radiologic agents in environmental samples?</td>
<td></td>
</tr>
<tr>
<td>m196</td>
<td>Does your state public health laboratory provide or assure testing for environmental samples in the event of suspected chemical terrorism?</td>
<td></td>
</tr>
<tr>
<td>m272</td>
<td>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, microalgal, lead, persistent organic pollutants, pesticides (including organophosphates), pharmaceuticals, radion, or volatile organic compounds? The state’s value is equal to the percentage of these tests performed.</td>
<td></td>
</tr>
<tr>
<td>m273</td>
<td>Does your state public health laboratory provide or assure testing for hazardous waste?</td>
<td></td>
</tr>
<tr>
<td>m274</td>
<td>State participates in the National Plant Diagnostic Network (NPDN)</td>
<td></td>
</tr>
<tr>
<td>m904</td>
<td>Number of Environmental Scientists and Specialists, including Health per 100,000 population</td>
<td></td>
</tr>
</tbody>
</table>
Additional EOH-Relevant Measures

- 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 & Multi-Agency Coordination
- Healthcare Delivery
  - Prehospital Care
  - Inpatient Care
  - Long-Term Care
  - Mental & Behavioral Healthcare
  - Home Care
- Countermeasure Management
  - Medical Materiel Management, Distribution, & Dispensing
  - Countermeasure Utilization & Effectiveness
- Environmental & Occupational Health
  - Food & Water Security
  - Environmental Monitoring
Finalized State Climate Adaptation Plans

Map showing states with finalized climate adaptation plans.
<table>
<thead>
<tr>
<th>Measure Name</th>
<th>M334</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure Source</td>
<td>Center for Climate and Energy Solutions (C2ES), State and Local Climate Adaptation</td>
</tr>
<tr>
<td>Data date(s)</td>
<td>2014 - 2016</td>
</tr>
<tr>
<td>Limitations</td>
<td>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.</td>
</tr>
</tbody>
</table>
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/steering committees
  – All steering committees included representation from state and/or local departments of environmental protection
Adaptation Planning Steering Committee Membership by Sector (All States)

- Public Health: 44%
- Public Health and Emergency Management: 7%
- Emergency Management: 6%
- Emergency Management and Healthcare: 6%
- Healthcare: 6%
- EMS: 0%
- None: 31%
Common Themes: Adaptation Goals

- 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 Goals
  - 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 coalition partners in collaborative planning for climate adaptation and similar long-range strategic initiatives can help identify relevant protections to strengthen preparedness and health security
• 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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