7-25-2016

National Health Security Preparedness Index Joint Workgroup Meeting on Model Design and Analytic Methodology

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National Health Security Preparedness Index

Joint Workgroup Meeting on Model Design and Analytic Methodology

Santa Monica, CA  ●  25 July 2016
Agenda

- Introductions
- Review of 2016 Index release
- New or revised constructs & measures for 2017
- Methods to account for uncertainty
- Generating estimates for territories
- Generating estimates for local areas
- Aligning with national frameworks
- New approaches for data visualization and display
- Next steps: workgroup structure and process
A Brief History

2012
- **Collaborative Development**: Partnership led by CDC, ASTHO and >25 collaborating organizations

12/2013
- **1st Release**: Initial model structure and results
  - 5 domains and 14 subdomains
  - 128 measures

12/2014
- **2nd Release**: Revised model and results
  - 6 domains and 18 active subdomains
  - 119 retained + 75 new = 194 measures
  - 75% of retained measures have updated data

1/2015
- **Transition to Robert Wood Johnson Foundation**
  - Validation studies and revision to methodology & measures

4/2016
- **3rd Release**: Revised model and results
  - 6 domains & 19 subdomains
  - 65% measures retained, 12% respecified, 8 new additions =134
  - 90% of retained measures have updated data from 2nd release
2016 Index Release

- >19,000 pageviews from >7000 website visits
- Average duration of 3 minutes
- >200 earned media hits, including 30 national and over 170 state and local media
## Current Index Structure

<table>
<thead>
<tr>
<th>Health Security Surveillance</th>
<th>Community Planning &amp; Engagement</th>
<th>Incident &amp; Information Management</th>
<th>Healthcare Delivery</th>
<th>Countermeasure Management</th>
<th>Environmental &amp; Occupational Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Surveillance &amp; Epidemiological Investigation</td>
<td>Cross-Sector / Community Collaboration</td>
<td>Incident Management &amp; Multi-Agency Coordination</td>
<td>Prehospital Care</td>
<td>Medical Materiel Management, Distribution, &amp; Dispensing</td>
<td>Food &amp; Water Security</td>
</tr>
<tr>
<td>Biological Monitoring &amp; Laboratory Testing</td>
<td>Children &amp; Other At-Risk Populations</td>
<td>Emergency Public Information &amp; Warning</td>
<td>Inpatient Care</td>
<td>Countermeasure Utilization &amp; Effectiveness</td>
<td>Environmental Monitoring</td>
</tr>
<tr>
<td>Management of Volunteers during Emergencies</td>
<td>Legal &amp; Administrative</td>
<td>Long-Term Care</td>
<td></td>
<td>Non-Pharmaceutical Intervention</td>
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<tr>
<td>Social Capital &amp; Cohesion</td>
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</tbody>
</table>

**Overall Index Score**

**PREPARED**

**NATIONAL HEALTH SECURITY PREPAREDNESS INDEX**
2016 Methodological Enhancements

- **Consolidation**: reduce correlated, redundant & noisy measures
- **Composition**: expand social, environmental economic indicators of preparedness & resiliency
- **Grouping & weighting**: use empirical methods for internal consistency, discriminant power
- **Scaling**: reflect distributional properties
- **Comparisons**: address accuracy and uncertainty
- **Trending**: apply new methods/measures retrospectively
2016 Changes in Measure Set

- 42 measures eliminated due to data periodicity >3 years
- 29 measures eliminated due to poor construct validity
- 22 measures respecified to improve construct validity
- 8 newly added measures

Construct Validity

<table>
<thead>
<tr>
<th>Domain</th>
<th>2014 Alpha</th>
<th>2016 Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health security surveillance</td>
<td>0.377</td>
<td>0.712</td>
</tr>
<tr>
<td>Community planning &amp; engagement</td>
<td>0.382</td>
<td>0.631</td>
</tr>
<tr>
<td>Incident &amp; information management</td>
<td>0.455</td>
<td>0.734</td>
</tr>
<tr>
<td>Healthcare delivery</td>
<td>0.354</td>
<td>0.596</td>
</tr>
<tr>
<td>Countermeasure management</td>
<td>0.231</td>
<td>0.654</td>
</tr>
<tr>
<td>Environmental/occupational health</td>
<td>0.546</td>
<td>0.749</td>
</tr>
</tbody>
</table>

Current Index Structure and Methodology

- 134 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
- Confidence intervals reflect sampling and measurement error
- Annual estimates for 2013, 2014 and 2015
1. National preparedness trended upward in most functional areas during 2013-15, except in environmental health and healthcare delivery.
2. Preparedness improved in most states during 2013-15, but significant geographic differences remain.

Results

- Significantly below national average in 2015
- Within national average confidence interval
- Significantly above national average in 2015
- % increase 2013-2015
- % decrease 2013-2015
3. Preparedness levels improved by an average of 3.6% between 2013 and 2015. Individual state trends ranged from a 9.1% improvement to a 3.5% decline.

- National: +3.6%
- Lowest state: +0.3%
- Highest state: +2.2%
- Largest improvement: +9.1%
- Largest decline: -3.5%
4. Improvements in preparedness occurred across the U.S. in both above-average and below-average states. However, some below-average states continued to lose ground.
5. An increasing number of states score above the national average preparedness level.

2016 National Health Security Preparedness Index Results

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK</td>
<td>AL</td>
<td>AR</td>
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<tr>
<td>AZ</td>
<td>CA</td>
<td>CO</td>
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<td>DE</td>
<td>FL</td>
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<td>GA</td>
<td>HI</td>
<td>IA</td>
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<tr>
<td>ID</td>
<td>IL</td>
<td>IN</td>
</tr>
<tr>
<td>KS</td>
<td>KY</td>
<td>LA</td>
</tr>
<tr>
<td>MA</td>
<td>MD</td>
<td>MA</td>
</tr>
<tr>
<td>ME</td>
<td>MI</td>
<td>MN</td>
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<tr>
<td>MO</td>
<td>MS</td>
<td>MT</td>
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<tr>
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<td>NE</td>
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<tr>
<td>NJ</td>
<td>NM</td>
<td>NV</td>
</tr>
<tr>
<td>NY</td>
<td>OH</td>
<td>OK</td>
</tr>
<tr>
<td>OR</td>
<td>PA</td>
<td>RI</td>
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<tr>
<td>SC</td>
<td>SD</td>
<td>TN</td>
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<td>VA</td>
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<tr>
<td>VT</td>
<td>WI</td>
<td>WV</td>
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<tr>
<td>WY</td>
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</tbody>
</table>

NOTE: Dotted lines represent statistical confidence intervals for the national average Index score.
6. Changes in preparedness levels varied widely across states and domains.

- **Surveillance**
  - LA: -9.0%
  - MS: +3.1%
  - US: +7.4%
  - KY: +11.1%
- **Community planning & engagement**
  - MT: +0.0%
  - US: +8.4%
  - IL: +47.3%
- **Incident & information management**
  - LA: -9.0%
  - WV: +6.3%
  - US: +1.9%
  - MD: +1.6%
- **Healthcare delivery**
  - AK: -13.2%
  - RI: +5.3%
  - WI: -24.8%
- **Countermeasure management**
  - US: -4.5%
  - VT: 4.6%
  - MN: +0.0%

Preparedness Levels 2013 and 2015
7. Gaps in preparedness between the highest and lowest states are large and persistent, and they have increased in environmental health and in healthcare delivery.
8. 20-23% of the variation in state preparedness levels can be explained by differences in infectious disease protections.
9. Health system performance measures track closely with state preparedness levels, indicating complementary relationships.

![Diagram showing correlation between National Health Security Preparedness Index Overall Level and America's Health Rankings Overall Score.](image)

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Behaviors</th>
<th>Policy</th>
<th>Outcomes</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.365</td>
<td>0.255</td>
<td>0.268</td>
<td>0.093</td>
<td>0.280</td>
</tr>
</tbody>
</table>
11. Preparedness levels track closely with Cutter’s community disaster resiliency index.

\[ R^2 = 0.188 \]
Discussion Item #1: Ideas for new and revised constructs and measures for 2017

- Infrastructure resilience: power, water, transportation, communication, housing, public facilities, cybersecurity
- Preparedness spending/funding
- Direct federal contributions to preparedness
- Responder safety and health
- Healthcare preparedness coalitions: size, composition, effectiveness
Discussion Item #2: Addressing uncertainty in measures

- Use of Bayesian shrinkage estimator to generate composite measures and confidence intervals
Discussion Item #3-4: Calculating Index values for other geographies

- Territories
- Metropolitan areas
- All counties
- Other
Discussion Item #5: Aligning with other national preparedness frameworks

- Healthy People 2030
- National Health Security Strategy
- PHEP and HPP capabilities
- RWJF Culture of Health Action Framework
- Other?
Discussion Item #6: Data visualization and display

- Comparisons across domains/subdomains
- Comparisons across geographies
- Comparisons over time
- Comparisons with other metrics
- Other?
Discussion Item #7: Next steps in Workgroup discussions

- Workgroup composition
- Process for workgroup virtual meetings
National Advisory Committee Members | 2015-16

1. Tom Inglesby, (Chair) UPMC Center for Health Security
2. Robert Burhans, Emergency Management Consultant
3. Anita Chandra, RAND
4. Ana-Marie Jones, Collaborating Agencies Responding to Disasters
5. Eric Klinenberg, New York University
6. Jeff Levi/Dara Lieberman, Trust for America’s Health
7. Nicole Lurie, Assistant Secretary for Preparedness and Response
8. Stephanie Lynch, Caddo Parish (LA) Commissioner
9. Suzet McKinney, Chicago Department of Public Health
10. Stephen Redd, CDC Office of Public Health Preparedness & Response
11. Richard Reed, American Red Cross (through 2/2016)
12. Martin Jose Sepulveda, IBM Corporation
13. Claudia Thompson, NIH National Institute of Environmental Health Sci.
14. John Wiesman, Washington State Secretary of Health
For More Information

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