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Learning from Geographic Variation and Change in Preparedness: The 2016 National Health Security Preparedness Index

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Learning from Geographic Variation and Change in Preparedness:

The 2016 National Health Security Preparedness Index

Glen Mays, PhD, MPH
University of Kentucky

Public Health & Disasters Conference | University of Utah
Provo, Utah  •  3 May 2016
Why a Preparedness Index?

Increase awareness & understanding of preparedness as a shared responsibility of multiple sectors in government and society

- Identify strengths and vulnerabilities
- Track progress
- Encourage coordination & collaboration
- Facilitate planning & policy development
- Support benchmarking & quality improvement
- Drive research & development
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
Current Index Structure

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
  - Children & Other At-Risk Populations

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

- Environmental & Occupational Health
  - Food & Water Security
  - Environmental Monitoring

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

<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>
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<tr>
<td>Incident &amp; information management</td>
<td>0.455</td>
<td>0.734</td>
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<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>

Construct Validity

Current Index Structure and Methodology

- 134 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, 2014 and 2015

- 19 subdomains
  - Weighted average

- 6 domains
  - Weighted average

- State overall values
  - Weighted average

- National overall values
  - Unweighted average
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.
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.
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.

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>2015</th>
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</thead>
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<td>VA</td>
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<td>NV</td>
</tr>
<tr>
<td>.5</td>
<td>AZ</td>
<td>LA</td>
</tr>
</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.

<table>
<thead>
<tr>
<th>Domain</th>
<th>2013 Preparedness Level</th>
<th>2015 Preparedness Level</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveillance</td>
<td></td>
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<tr>
<td>Community planning &amp; engagement</td>
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</tr>
<tr>
<td>Environmental &amp; occupational health</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- MS: +3.1%, US: +7.4%, KY: +11.1%
- MT: +0.0%, IL: +47.3%
- LA: -9.0%, WV: +6.3%
- RI: +5.3%
- WI: -24.8%, VT: 4.6%
- AK: -13.2%, MN: +0.0%, MD: +1.6%
- US: -1.0%, US: -4.5%
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.

$R^2 = 0.20$ (2015 Index values)

$R^2 = 0.23$ (2014 Index values)

$R^2 = 0.15$ (2013 Index values)
Caveats and cautions

- Imperfect measures & latent constructs
- Missing capabilities
- Timing and accuracy of underlying data sources
Next Steps

- 2016 Public Release on April 26
  www.nhspi.org
- National convening to showcase uses: Fall 2016
- Continued work to incorporate advances in measurement: ASPR, CDC, NIH, AHRQ, HP2020
- Additional analysis to understand causes and consequences of change
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

National Program Office

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