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Measuring Progress to Comprehensive Public Health Systems, National Preparedness, and a Culture of Health

Glen P. Mays
University of Kentucky, glen.mays@cuanschutz.edu

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Glen Mays, PhD, MPH
Scutchfield Professor of Health Services & Systems Research
University of Kentucky

America's Health Rankings Scientific Advisory Committee Meeting • Chapel Hill, NC • 22 April 2016

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see blue.

Updates on 2 RWJF National Measurement Initiatives

- National Health Security Preparedness Index
- National Longitudinal Survey of Public Health Systems

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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**

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A Brief History

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

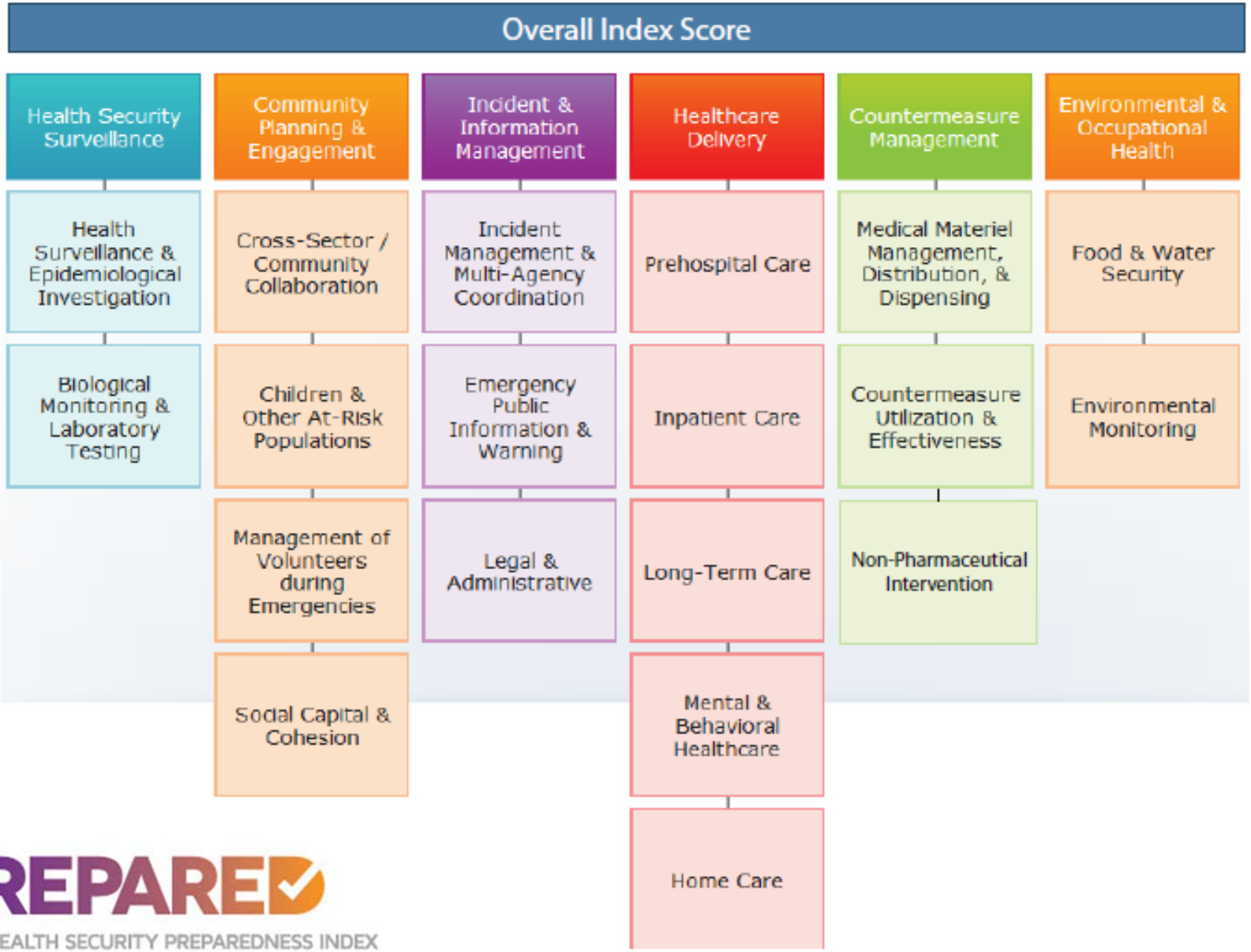
12/2013
- **1st Release:** Initial model structure and results
  - 5 domains and 14 subdomains
  - 128 measures

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



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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

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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

Domain	2014 Alpha	2016 Alpha
Health security surveillance	0.377	0.712
Community planning & engagement	0.382	0.631
Incident & information management	0.455	0.734
Healthcare delivery	0.354	0.596
Countermeasure management	0.231	0.654
Environmental/occupational health	0.546	0.749

Staiger D, Dimick JB, Baser O, Fan Z and Birkmeyer JD. Empirically derived composite measures of surgical performance. Medical Care 2009;47: 226- 233. Hays RD, Hayashi T. Beyond internal consistency reliability: rationale and user's guide for multitrait analysis program on the microcomputer. Behavioral Research Methods 1990;22(2):167-75.

Current Index Structure and Methodology

- **134 individual measures**

  Weighted average

- **19 subdomains**

  Weighted average

- **6 domains**

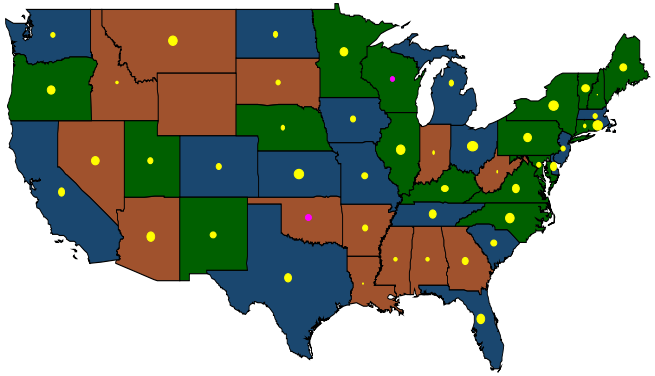
  Weighted average

- **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
- Bayesian credible intervals reflect sampling and measurement error
- Annual estimates for 2013, 2014 and 2015



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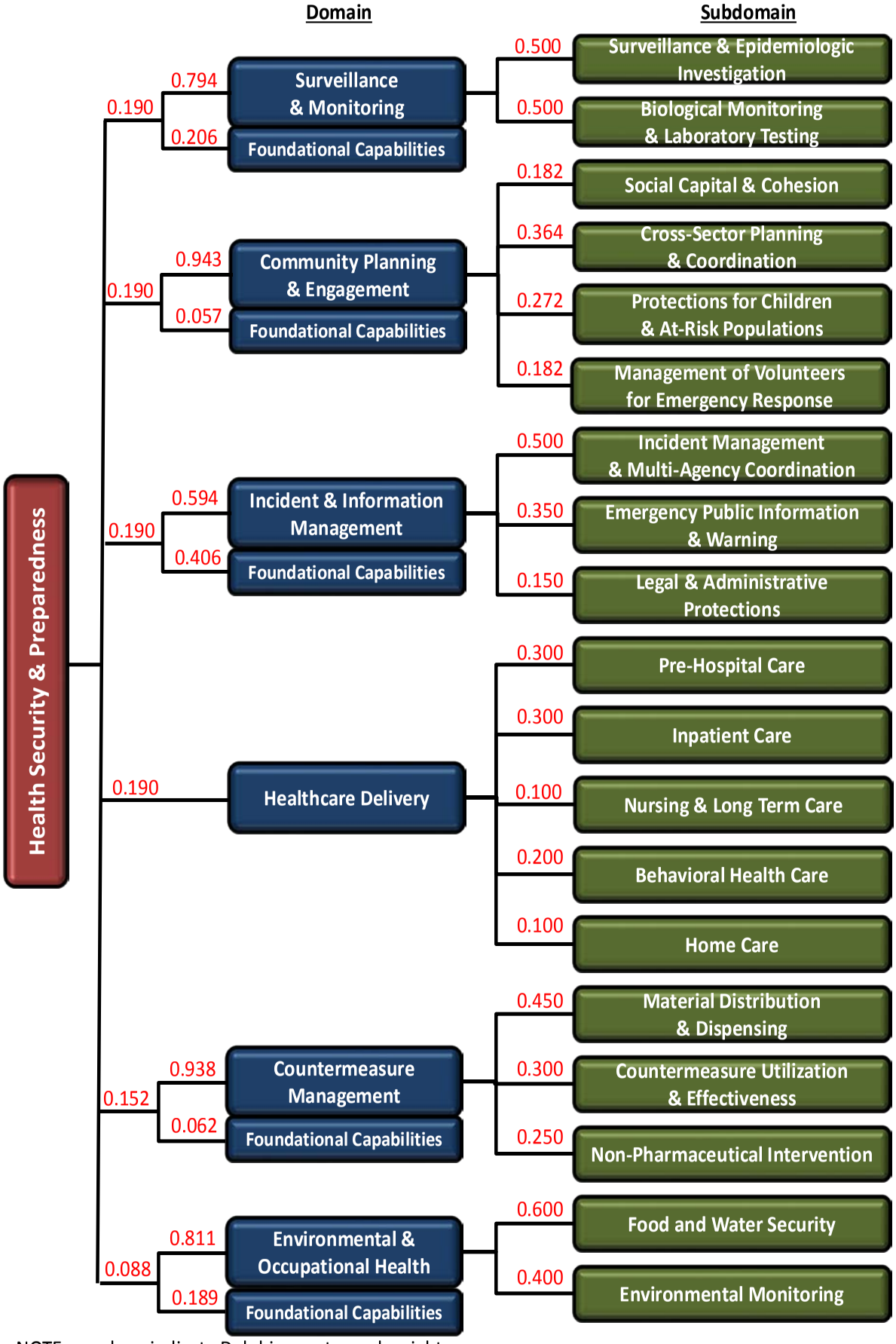
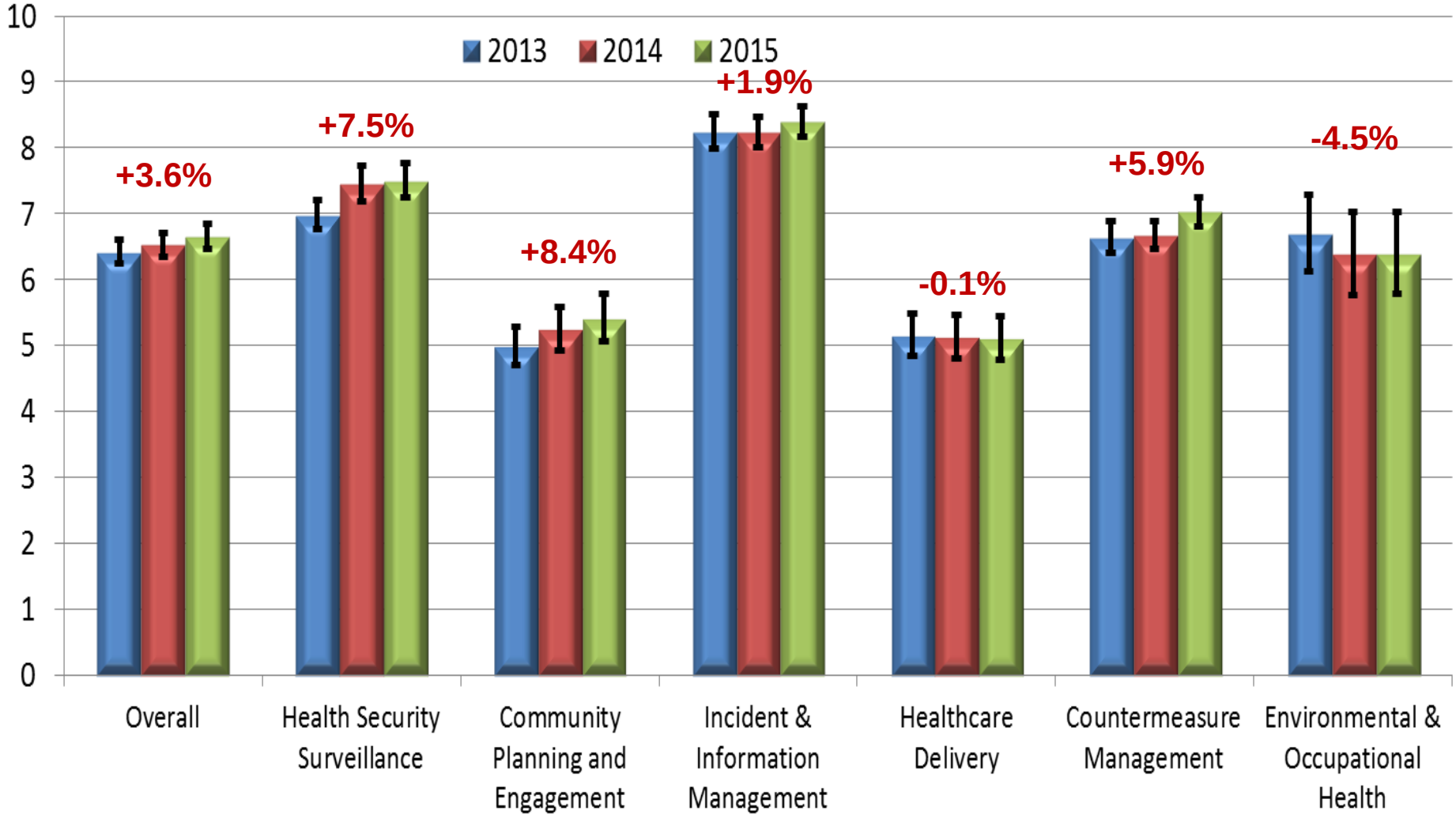
Index Delphi Weights & Foundational Capabilities

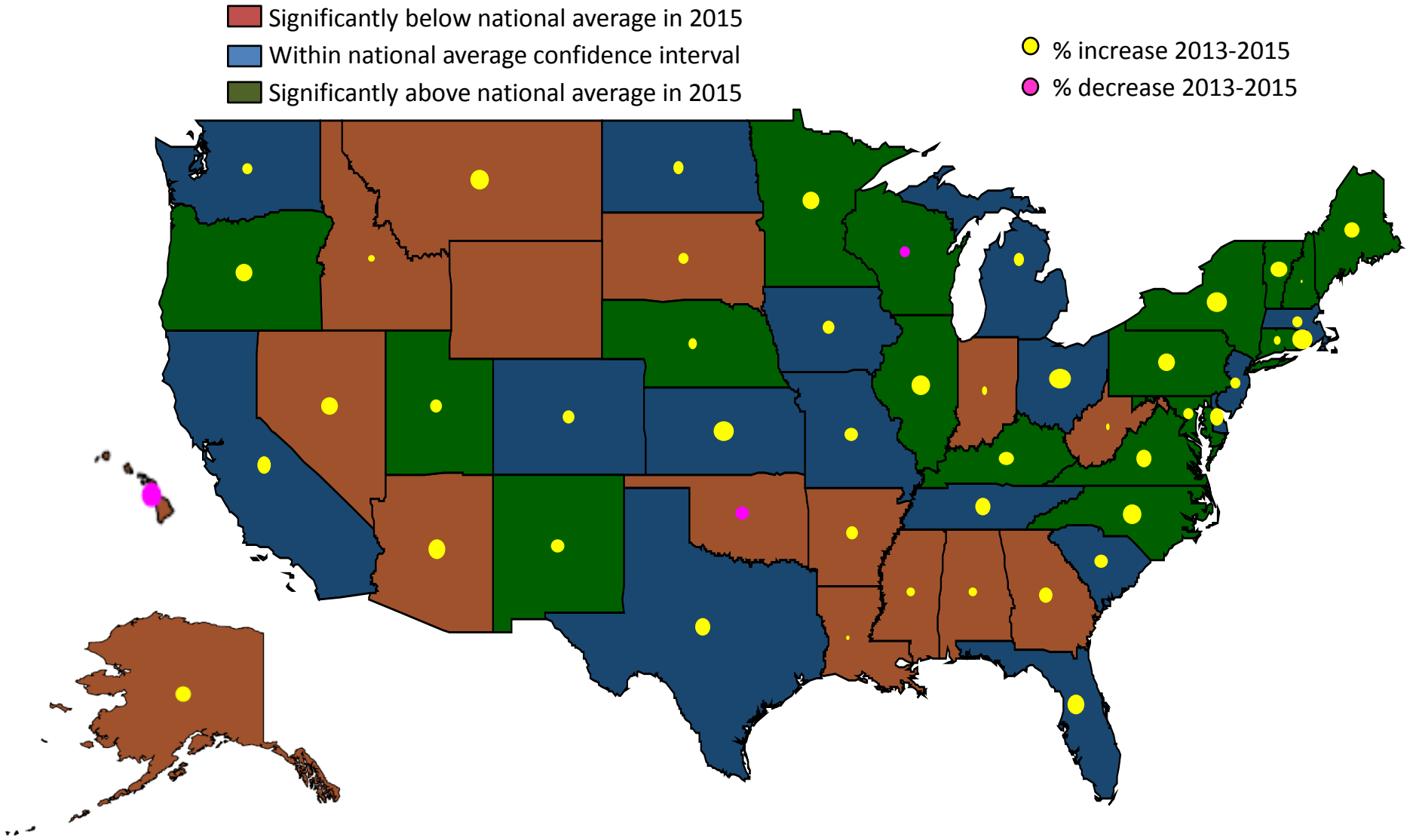


NOTE: numbers indicate Delphi expert panel weights

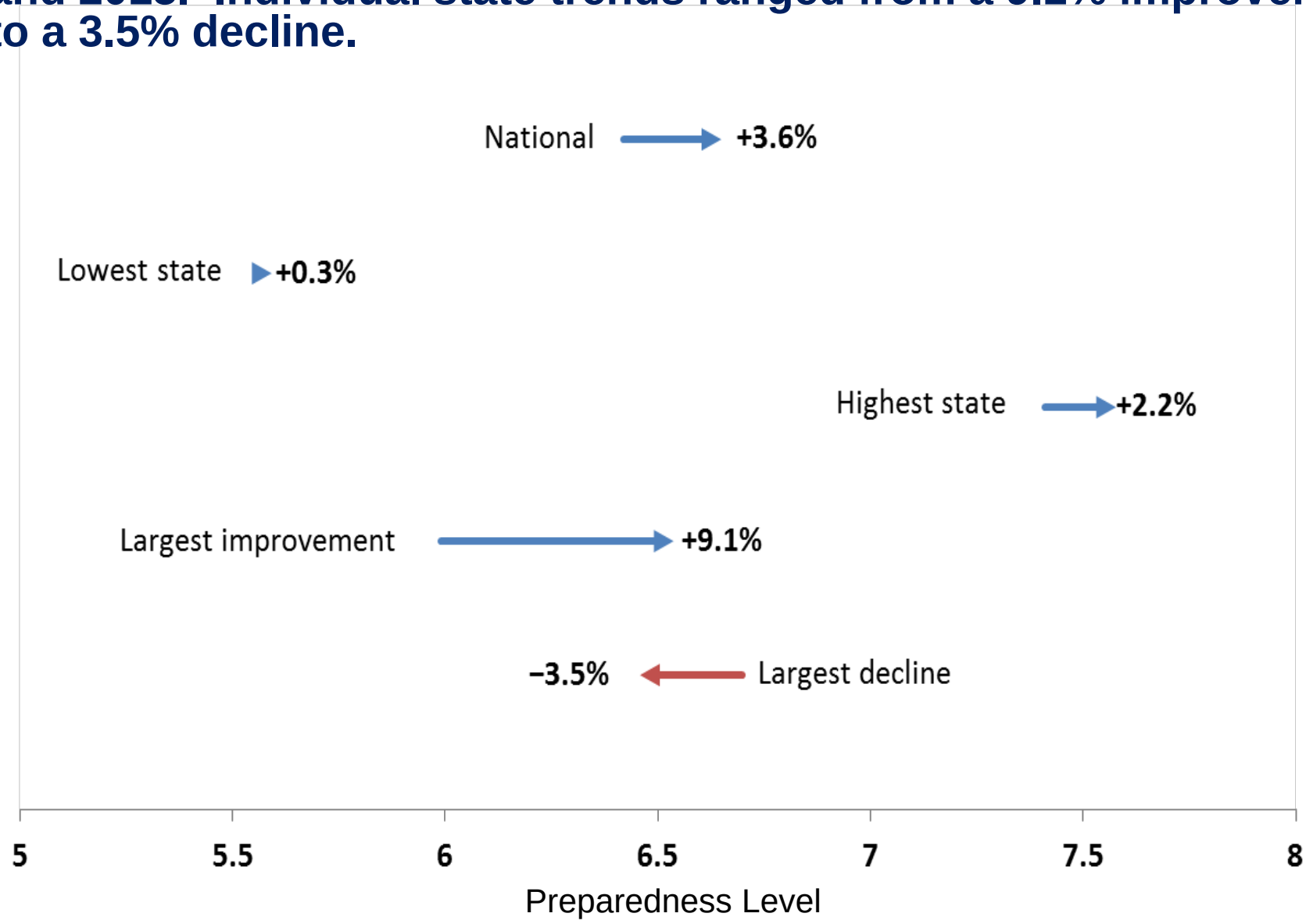
1. National preparedness trended upward in most functional areas during 2013-15, except in environmental health and healthcare delivery



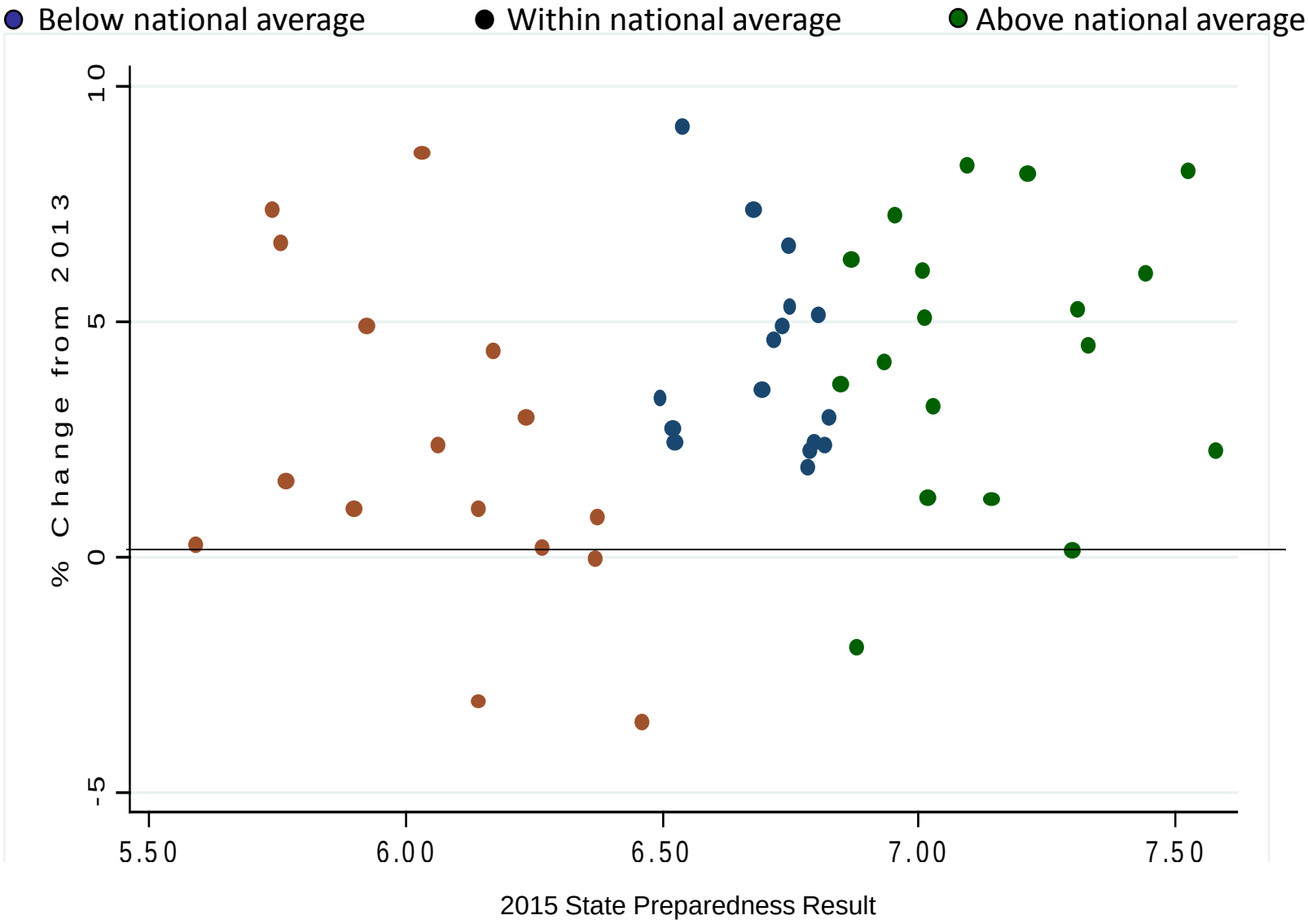
2. Preparedness improved in most states during 2013-15, but significant geographic differences remain.



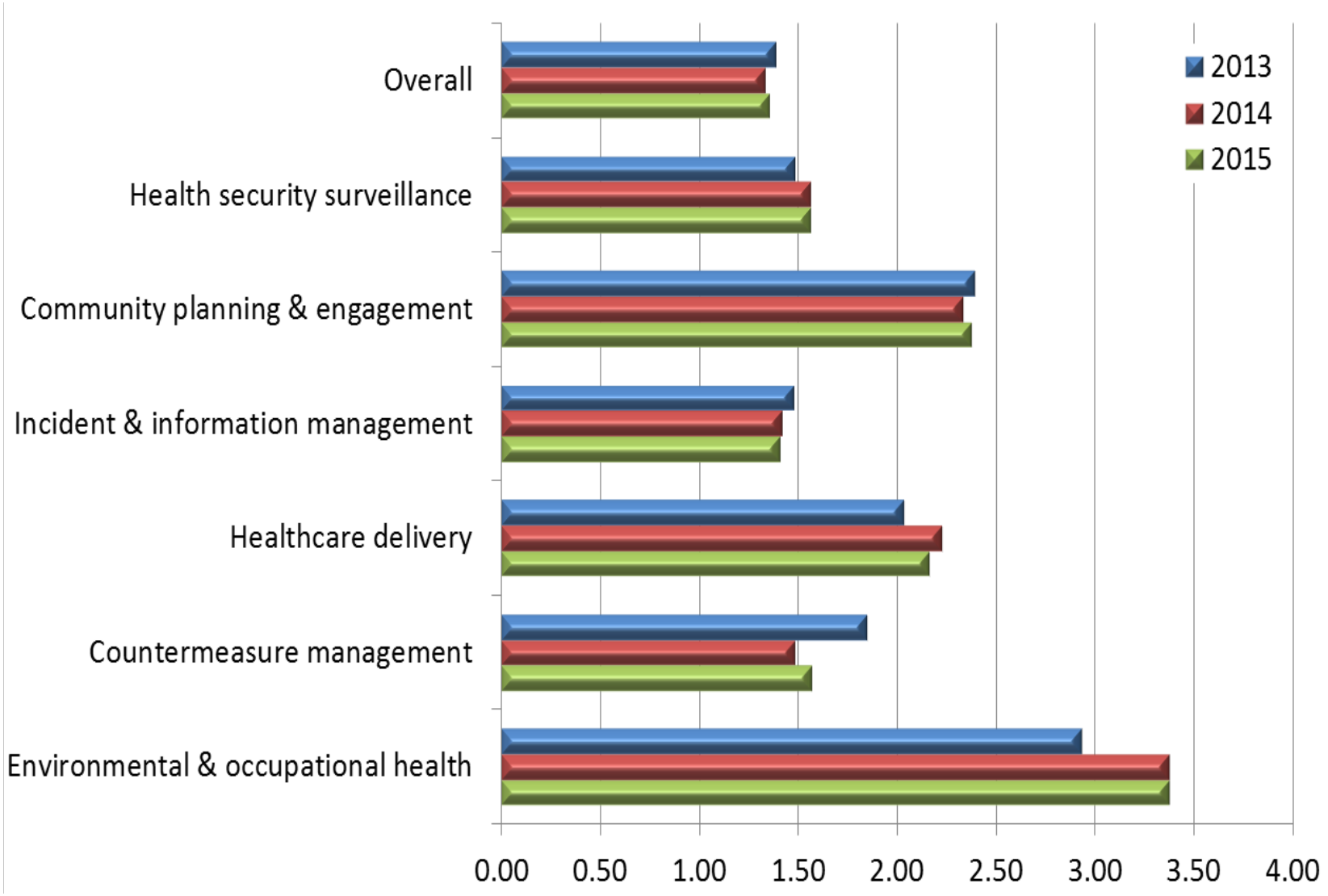
3. Preparedness levels improved by an average of 3.6% between 2013 and 2015. Individual state trends ranged from a 9.1% improvement to a 3.5% decline.



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. Gaps in preparedness between the highest and lowest states are large and persistent, and they have increased in environmental health and in healthcare delivery.



Caveats and cautions

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

Next Steps

- Now: state preview period
- 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

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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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National Program Office

Supported by The Robert Wood Johnson Foundation

Glen P. Mays, Ph.D., M.P.H. glen.mays@uky.edu

Email: NHSPI@uky.edu
Web: www.nhspi.org
www.systemsforaction.org
Journal: www.FrontiersinPHSSR.org
Archive: works.bepress.com/glen_mays
Blog: publichealtheconomics.org

Systems for Action
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How do we support effective population health improvement strategies?

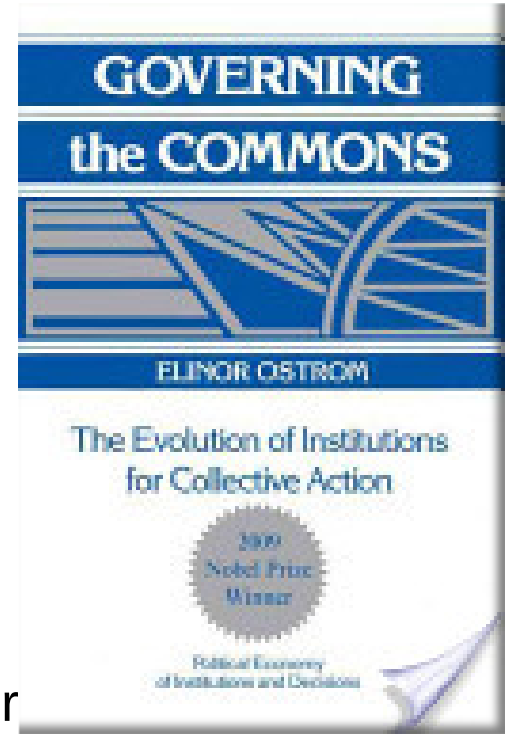
- Designed to achieve large-scale health improvement: neighborhood, city/county, region
- Target fundamental and often multiple determinants of health
- Mobilize the collective actions of multiple stakeholders in government & private sector

Mays GP. Governmental public health and the economics of adaptation to population health strategies. National Academy of Medicine Discussion Paper. 2014. http://nam.edu/wp-content/uploads/2015/06/EconomicsOfAdaptation.pdf

What foundational services are needed to support collective actions in health?

Public health agency as chief health strategist for the system:

- Articulate population health needs & priorities
- Engage community stakeholders
- Plan with clear roles & responsibilities
- Recruit & leverage resources
- Develop and enforce policies
- Ensure coordination across sectors
- Promote equity and target disparities
- Support evidence-based practices
- Monitor and feed back results
- Ensure transparency & accountability: resources, r



What do we call a system that delivers a broad scope of foundational public health services through a dense network of multi-sector relationships?

COMPREHENSIVE

One of RWJF's 41 Culture of Health National Metrics

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).

47.2%

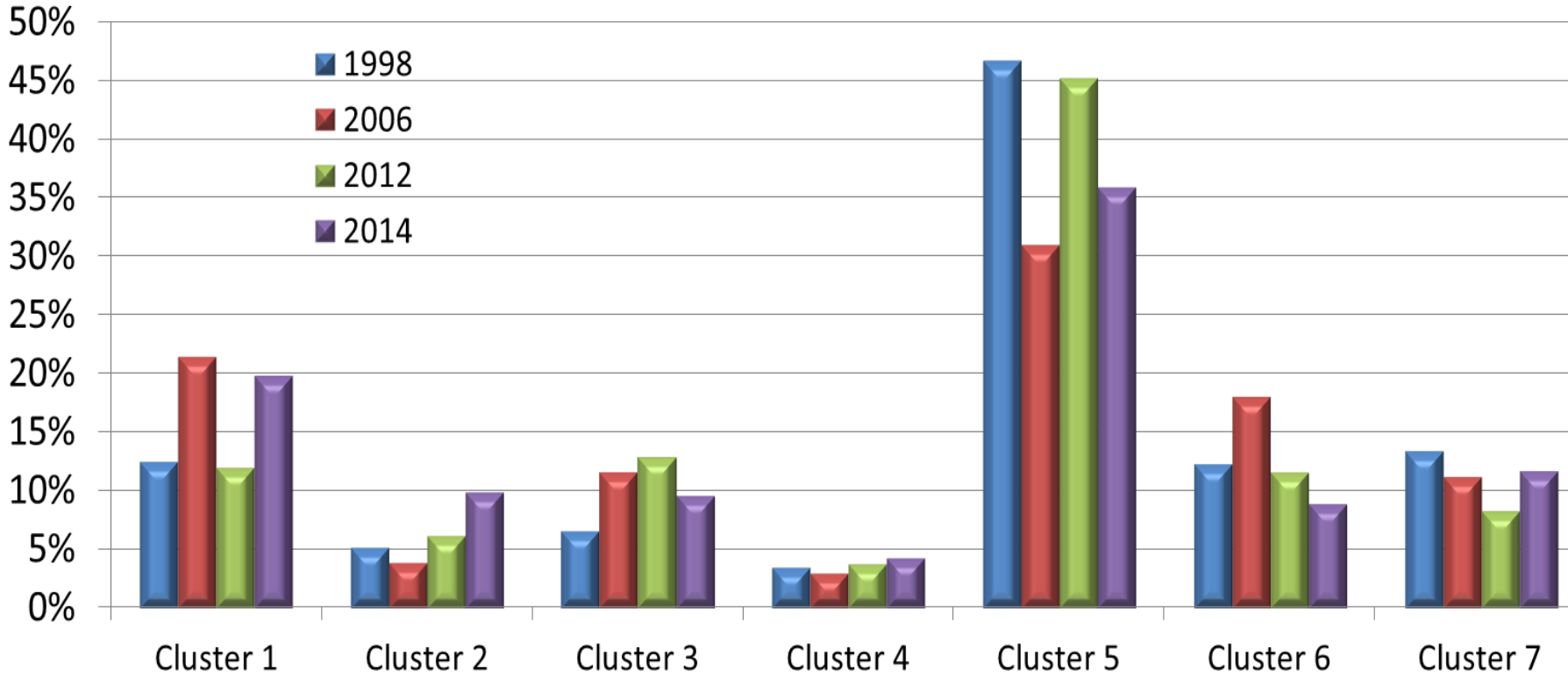
of population served by a comprehensive public health system

http://www.cultureofhealth.org/en/integrated-systems/access.html

What do we know about the benefits of Comprehensive Public Health Systems?

- Greater concordance with national recommendations
  - IOM Core Functions
  - Essential Public Health Services
  - PHAB national accreditation standards
  - Foundational Public Health Services
- Fewer governmental resources per capita: more for less
- Over time, larger gains in population health

Prevalence of Public Health System Configurations 1998-2014



	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
Scope	High	High	High	Mod	Mod	Low	Low
Centrality	Mod	Low	High	High	Low	High	Low
Density	High	High	Mod	Mod	Mod	Low	Mod

Comprehensive
(High System Capital)

Conventional

Limited

Data: public health delivery systems

National Longitudinal Survey of Public Health Systems

- Cohort of 360 communities with at least 100,000 residents
- Followed over time: 1998, 2006, 2012, 2014**, 2016
- Local public health officials report:
  - ***Scope***: availability of 20 recommended public health activities
  - ***Network density***: types of organizations contributing to each activity
  - ***Centrality of effort***: contributed by designated local public health agency
  - ***Quality***: perceived effectiveness of each activity

** Expanded sample of 500 communities<100,000 added in 2014 wave

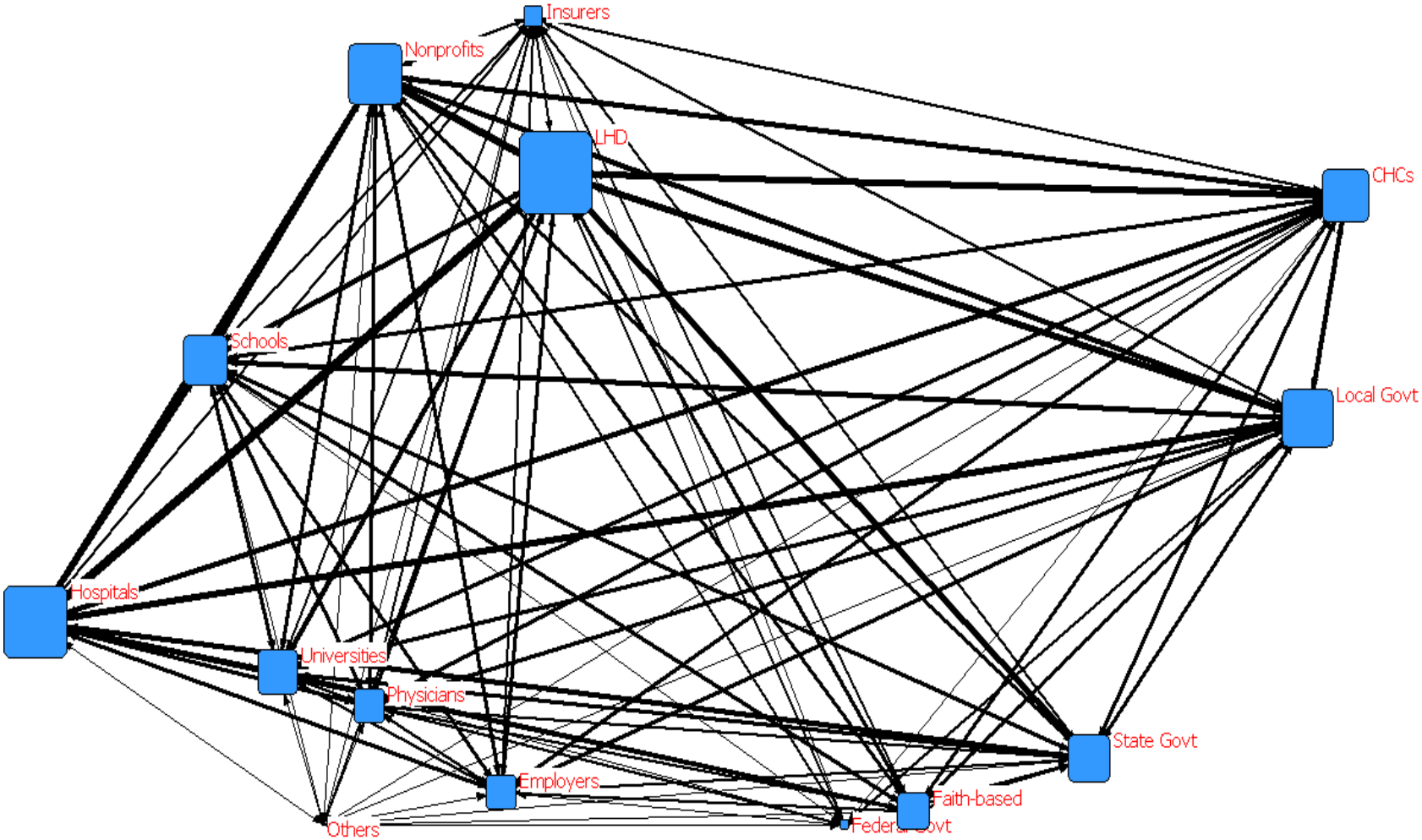
Cluster and network analysis to identify "system capital"

Cluster analysis is used to classify communities into one of 7 categories of ***public health system capital*** based on:

- ***Scope of activities*** contributed by each type of organization
- ***Density of connections*** among organizations jointly producing public health activities
- ***Degree centrality*** of the local public health agency

Mays GP et al. Understanding the organization of public health delivery systems: an empirical typology. *Milbank Q.* 2010;88(1):81–111.

Average public health system structure in 2014

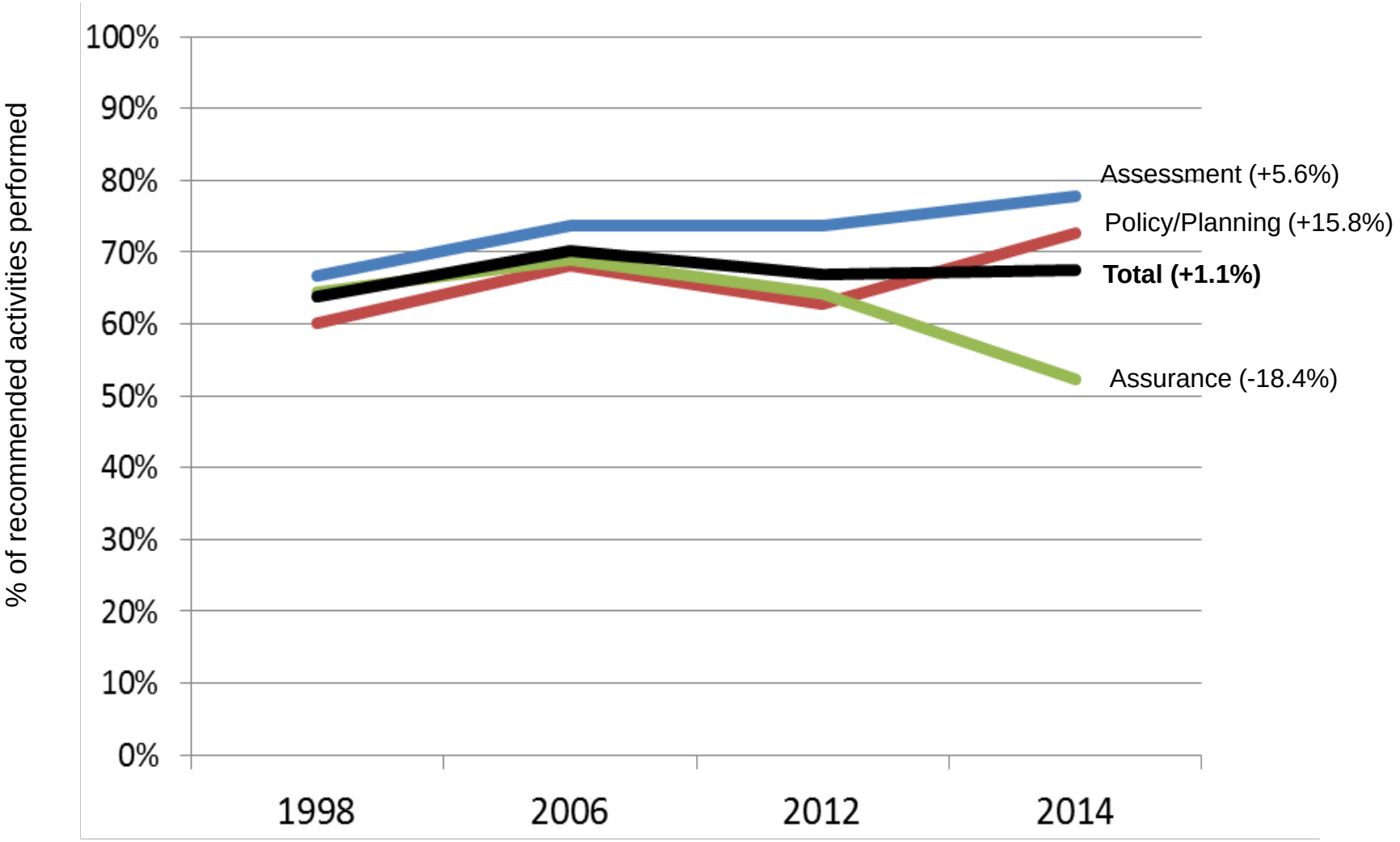


Node size = degree centrality
Line size = % activities jointly contributed (tie strength)

Changes in system prevalence and coverage

System Capital Measures	1998	2006	2012	2014	2014 (<100k)
Comprehensive systems					
% of communities	**24.2%**	**36.9%**	**31.1%**	**32.7%**	**25.7%**
% of population	**25.0%**	**50.8%**	**47.7%**	**47.2%**	**36.6%**
Conventional systems					
% of communities	50.1%	33.9%	49.0%	40.1%	57.6%
% of population	46.9%	25.8%	36.3%	32.5%	47.3%
Limited systems					
% of communities	25.6%	29.2%	19.9%	20.6%	16.7%
% of population	28.1%	23.4%	16.0%	19.6%	16.1%

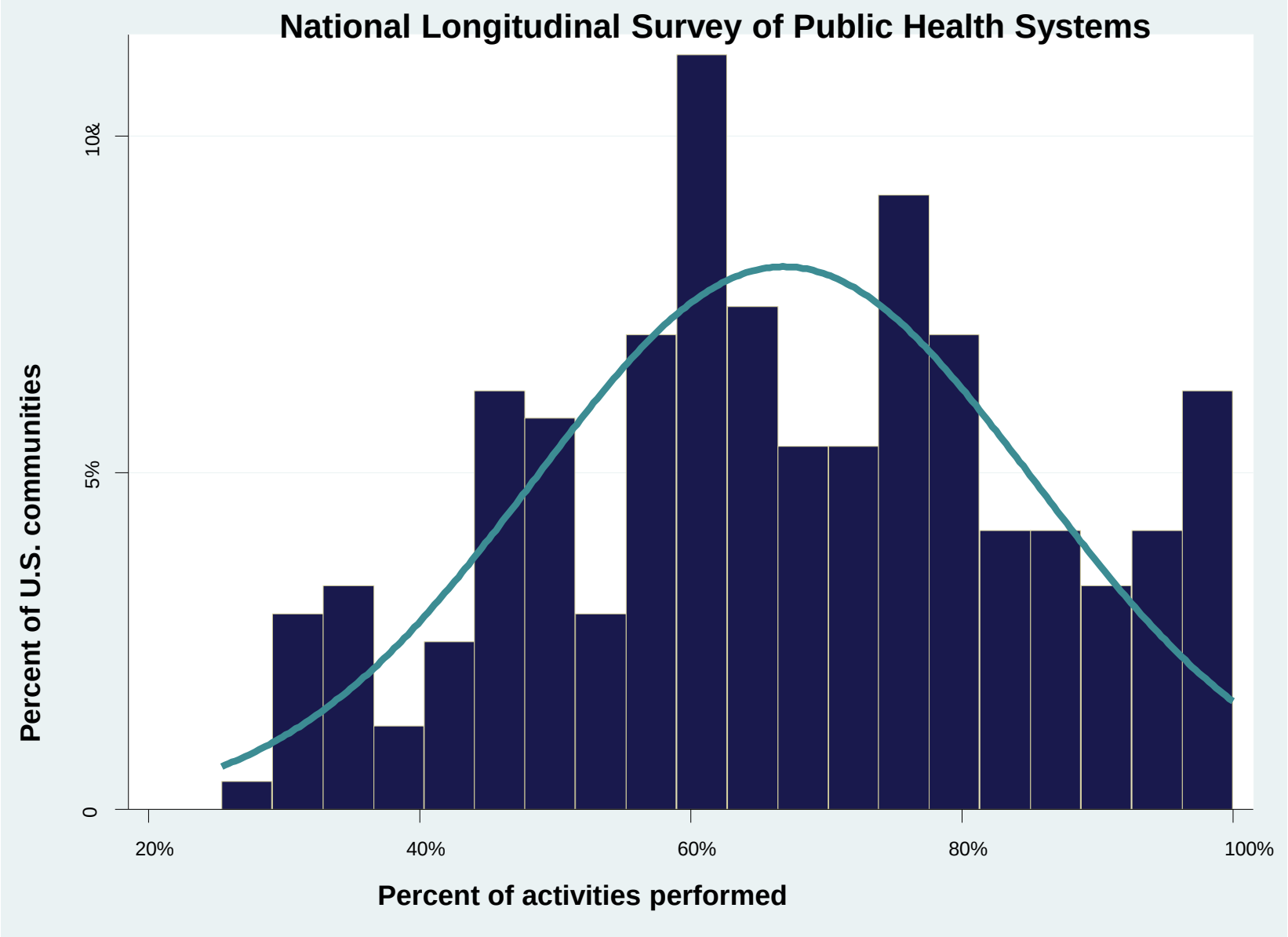
Delivery of recommended public health activities 1998-2014



Delivery of recommended public health activities 1998-2014

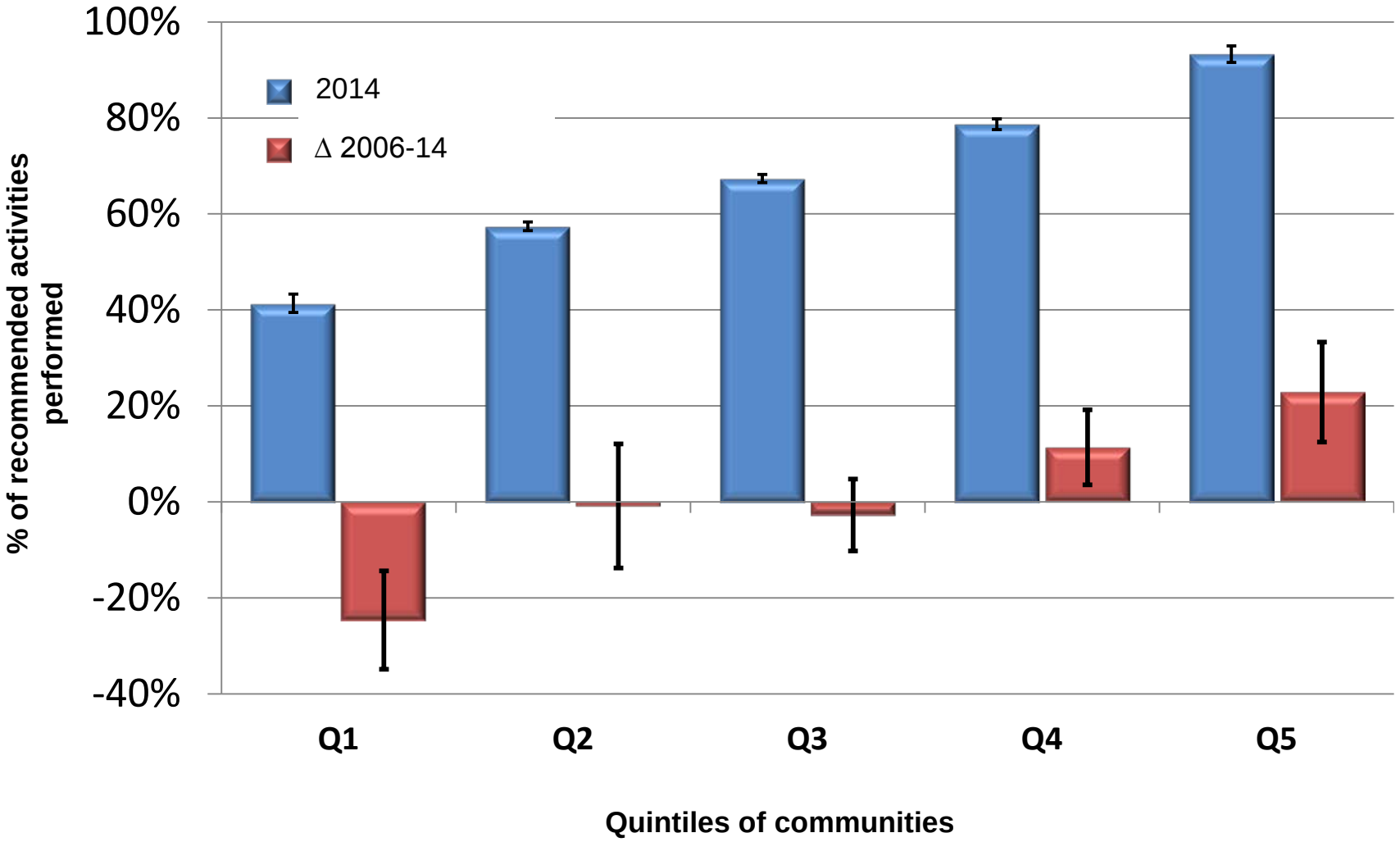
	Public Health Activity	1998	2014	% Change
1	Community health needs assessment	71.5%	86.0%	20.2%**
2	Behavioral risk factor surveillance	45.8%	70.2%	53.2%**
3	Adverse health events investigation	98.6%	100.0%	1.4%
4	Public health laboratory testing services	96.3%	96.5%	0.2%
5	Analysis of health status and health determinants	61.3%	72.8%	18.7%**
6	Analysis of preventive services utilization	28.4%	39.4%	38.8%**
7	Health information provision to elected officials	80.9%	84.8%	4.8%
8	Health information provision to the public	75.4%	83.8%	11.1%*
9	Health information provision to the media	75.2%	87.5%	16.3%**
10	Prioritization of community health needs	66.1%	82.3%	24.6%**
11	Community participation in health improvement planning	41.5%	67.7%	63.0%**
12	Development of community health improvement plan	81.9%	86.2%	5.2%
13	Resource allocation to implement community health plan	26.2%	43.2%	64.9%**
14	Policy development to implement community health plan	48.6%	57.5%	18.4%*
15	Communication network of health-related organizations	78.8%	84.8%	7.6%
16	Strategies to enhance access to needed health services	75.6%	50.2%	-33.6%**
17	Implementation of legally mandated public health activities	91.4%	92.4%	1.0%
18	Evaluation of public health programs and services	34.7%	38.4%	10.8%**
19	Evaluation of local public health agency capacity/performance	56.3%	55.0%	-2.4%
20	Implementation of quality improvement processes	47.3%	49.6%	5.0%
	Composite availability of assessment activities (1-6)	66.7%	77.6%	16.4%**
	Composite availability of policy development activities (7-15)	60.2%	72.5%	20.4%
	Composite availability of assurance activities (16-20)	64.4%	52.8%	-18.0%*
	Composite availability of all activities (1-20)	63.8%	67.6%	6.0%*

Variation in public health service delivery



Equity in Delivery

Delivery of recommended public health activities, 2006-14

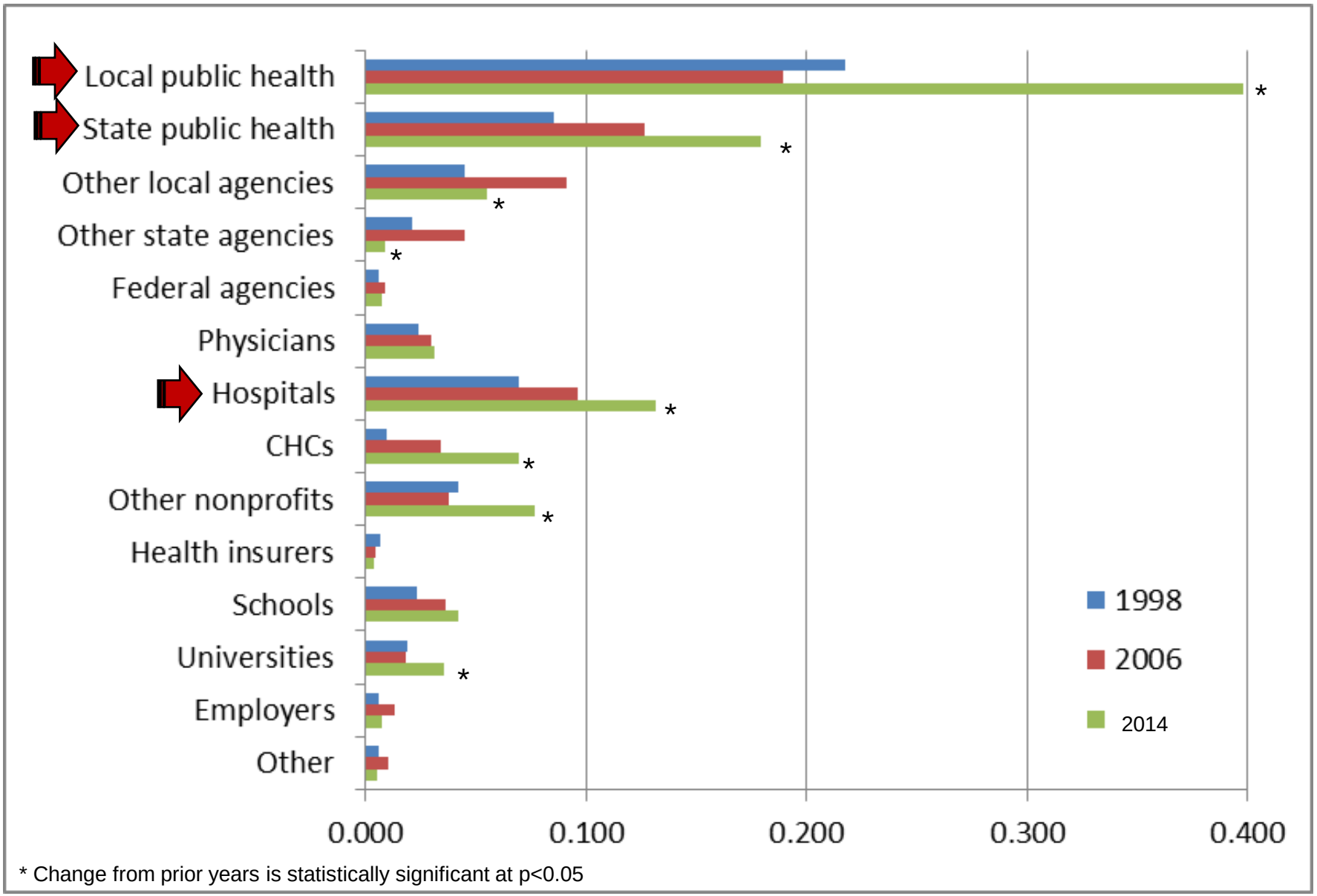


Organizational contributions to recommended public health activities, 1998-2014

% of recommended activities performed

Type of Organization	1998	2006	2012	2014
Local public health agency	60.7%	66.5%	62.0%	67.4%
Other local govt agencies	31.8%	50.8%	26.3%	32.7%
State public health agency	46.0%	45.3%	36.4%	34.0%
Other state govt agencies	17.2%	16.4%	13.0%	12.7%
Federal agencies	7.0%	12.0%	8.7%	7.1%
Hospitals	37.3%	41.1%	39.3%	47.2%
Physician practices	20.2%	24.1%	19.5%	18.0%
Community health centers	12.4%	28.6%	26.9%	28.3%
Health insurers	8.6%	10.0%	9.8%	11.1%
Employers/business	25.5%	16.9%	13.4%	15.0%
Schools	30.7%	27.6%	24.9%	24.7%
Universities/colleges	15.6%	21.6%	21.2%	22.2%
Faith-based organizations	24.0%	19.2%	15.7%	16.8%
Other nonprofits	31.9%	34.2%	31.6%	33.6%
Other organizations	8.5%	8.8%	5.4%	5.4%

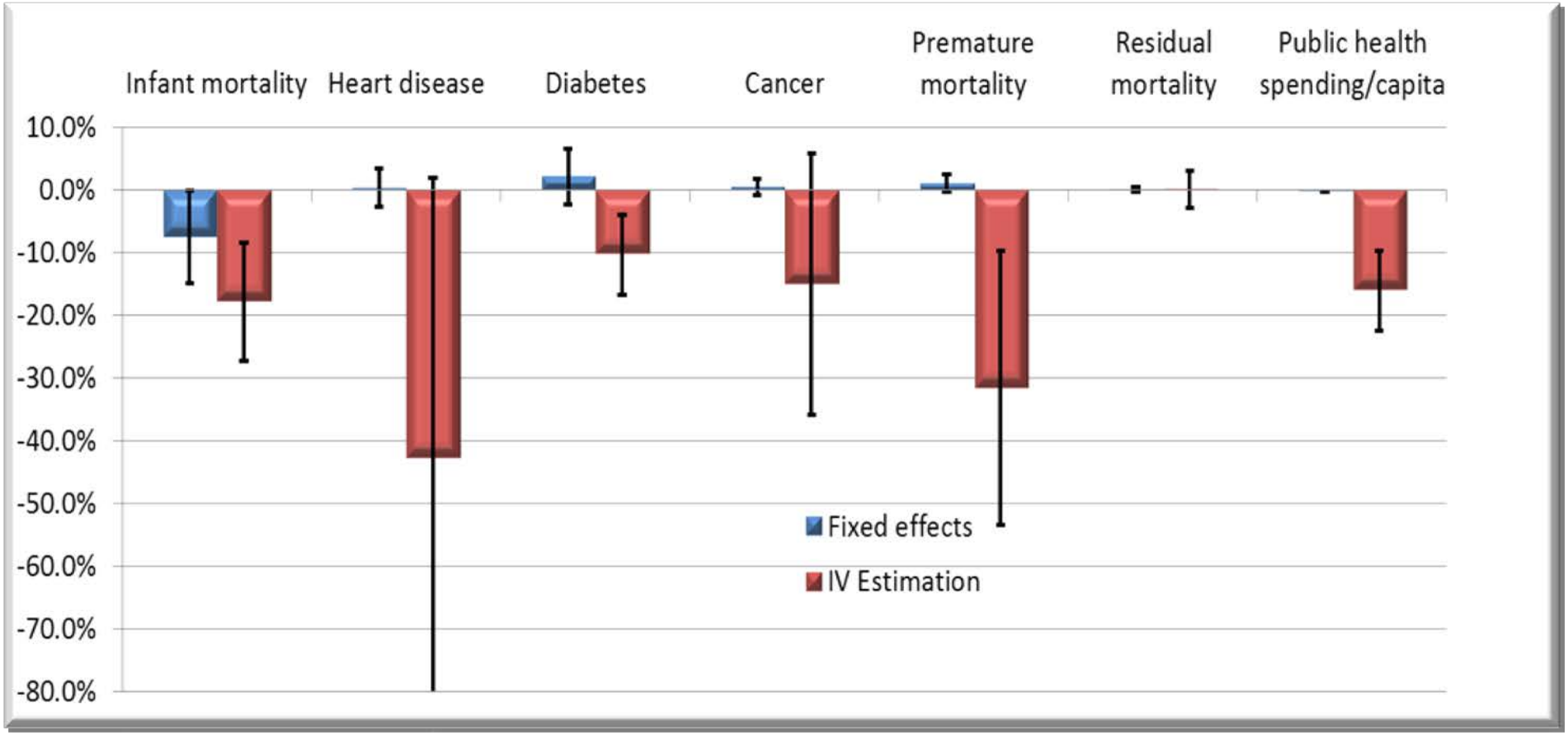
Bridging capital in public health delivery systems
Trends in betweenness centrality



* Change from prior years is statistically significant at p<0.05

Health and economic impact of comprehensive systems

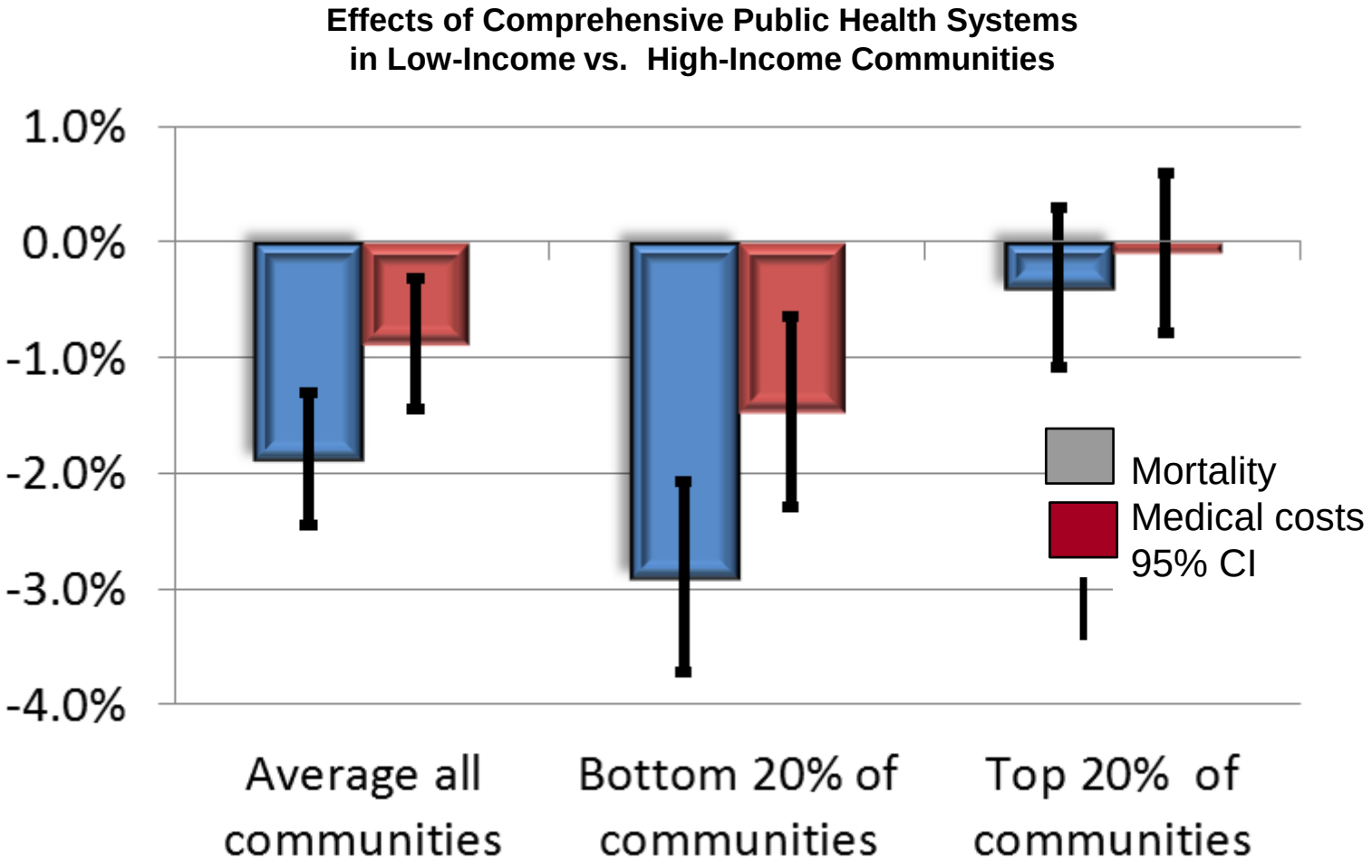
Fixed Effects and IV Estimates: Effects of Comprehensive System Capital on Mortality and Spending



Models also control for racial composition, unemployment, health insurance coverage, educational attainment, age composition, and state and year fixed effects.

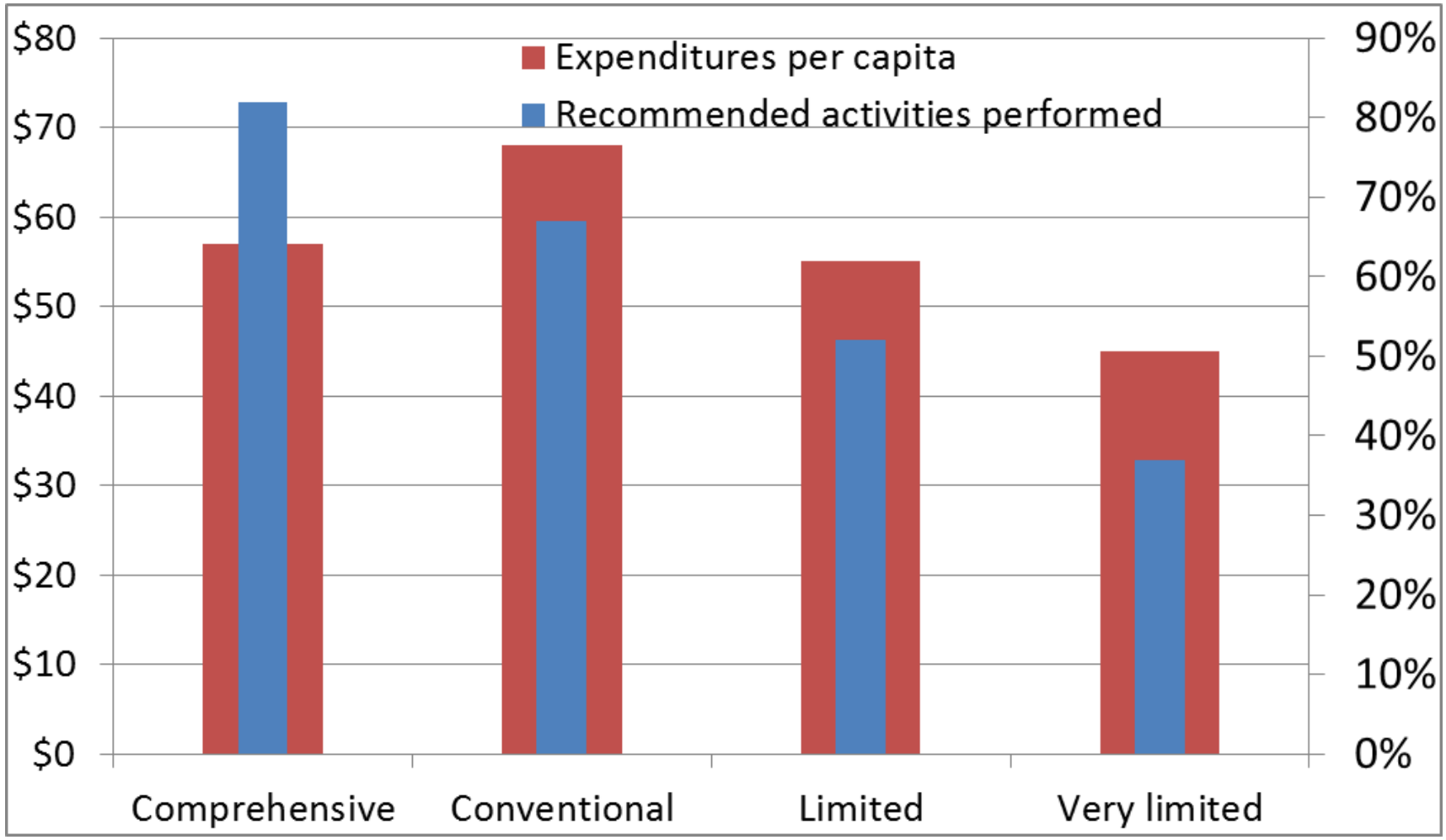
N=779 community-years **p<0.05 *p<0.10

Making the case for equity: larger gains in low-resource communities



Log IV regression estimates controlling for community-level and state-level characteristics

Comprehensive systems do more with less



Assessing public health system change under PHNCI

- Pre and Post surveys with the National Longitudinal Survey of Public Health Systems
- Comparative feedback reports of results
- Comparison of PHNCI sites with non-participating communities
- Qualitative interviews to explore more granular measures of system innovation and change

For more information

- Survey instrument
  http://works.bepress.com/glen_mays/38/
- Defining Comprehensive Public Health Delivery Systems
  https://works.bepress.com/glen_mays/198/
- Original methodology: Milbank Quarterly 2010
  http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2888010/
- Most recent analysis of health/economic benefits of comprehensive systems: AJPH 2015
  http://www.ncbi.nlm.nih.gov/pubmed/25689201
- Example customized report
  http://works.bepress.com/glen_mays/67/

Systems for Action

National Coordinating Center

Systems and Services Research to Build a Culture of Health

Supported by The Robert Wood Johnson Foundation

Glen P. Mays, Ph.D., M.P.H.
glen.mays@uky.edu
@GlenMays

Email: systems4action@uky.edu
Web: www.systemsforaction.org
www.publichealthsystems.org
Journal: www.FrontiersinPHSSR.org
Archive: works.bepress.com/glen_mays
Blog: publichealtheconomics.org

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Center for Public Health Systems and Services Research

Appendix: specifications

Table 1: Threshold Values Used in Defining Comprehensive Public Health Systems

Attribute	Specific Measures	Threshold Value*
Availability of recommended activities	Activities that are performed in the community	>75%
Organizational contributions: Government agency sector	Activities with state agency contributions	>50%
	Activities with local agency contributions (other than public health agency)	>46%
	Activities with federal agency contributions	>11%
Organizational contributions: Health care provider sector	Activities with hospital contributions	>50%
	Activities with physician organization contributions	>31%
	Activities with FQHC/CHC contributions	>15%
Organizational contributions: Community institution sector	Activities with school contributions	>21%
	Activities with university contributions	>26%
	Activities with other nonprofit contributions	>46%
Organizational contributions: Private sector	Activities with health insurer contributions	>11%
	Activities with employer contributions	>15%
Local public health agency effort	Activities in which the local public health agency contributes most or all of the effort	>50%

*Proportion of the 20 recommended activities for which the attribute is reported.

Appendix: specifications

Table 2: Definitions for Comprehensive Public Health System Configurations

Configuration	Definition
Concentrated Comprehensive	Exceeds availability threshold AND exceeds organizational contribution thresholds in at least two different organizational sectors AND exceeds local agency effort threshold
Distributed Comprehensive	Exceeds availability threshold AND exceeds organizational contribution thresholds in at least two different organizational sectors BUT does not exceed local agency effort threshold
Independent Comprehensive	Exceeds availability threshold AND exceeds local agency effort threshold BUT does not exceed organizational contribution thresholds in at least two organizational sectors