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## Measuring Comprehensive Public Health Delivery Systems and their Contributions to Population Health

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# Measuring Comprehensive Public Health Delivery Systems and their Contributions to Population Health

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[www.systemsforaction.org](http://www.systemsforaction.org)

Public Health National Center for Innovations • Alexandria VA • 1 March 2016



**Systems for Action**  
**National Coordinating Center**  
*Systems and Services Research to Build a Culture of Health*

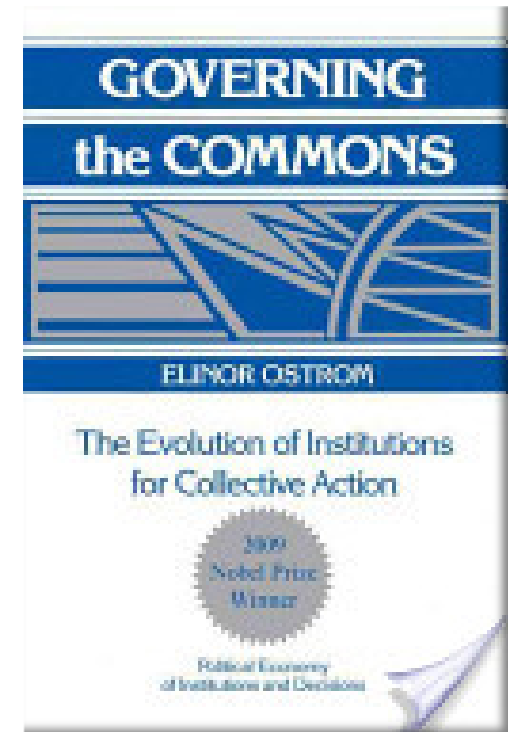
# How do we support effective population health improvement strategies?

- 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

# 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, results, ROI



**What do we call a system that  
has the necessary array of  
foundational services  
supporting a dense network of  
multi-sector relationships?**

**COMPREHENSIVE**

# One of RWJF's 40 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%

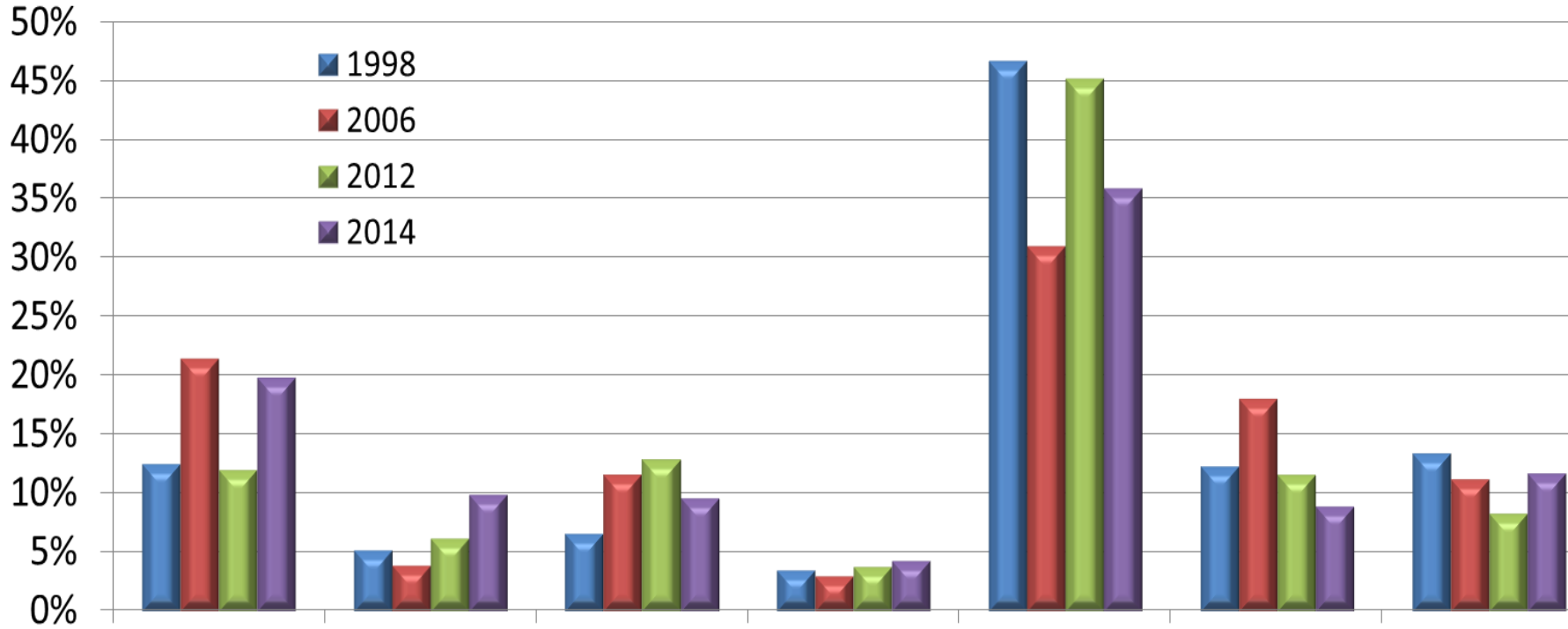
of population served by a  
comprehensive public  
health system

<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



**Scope**  
**Centrality**  
**Density**

Cluster	1	2	3	4	5	6	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

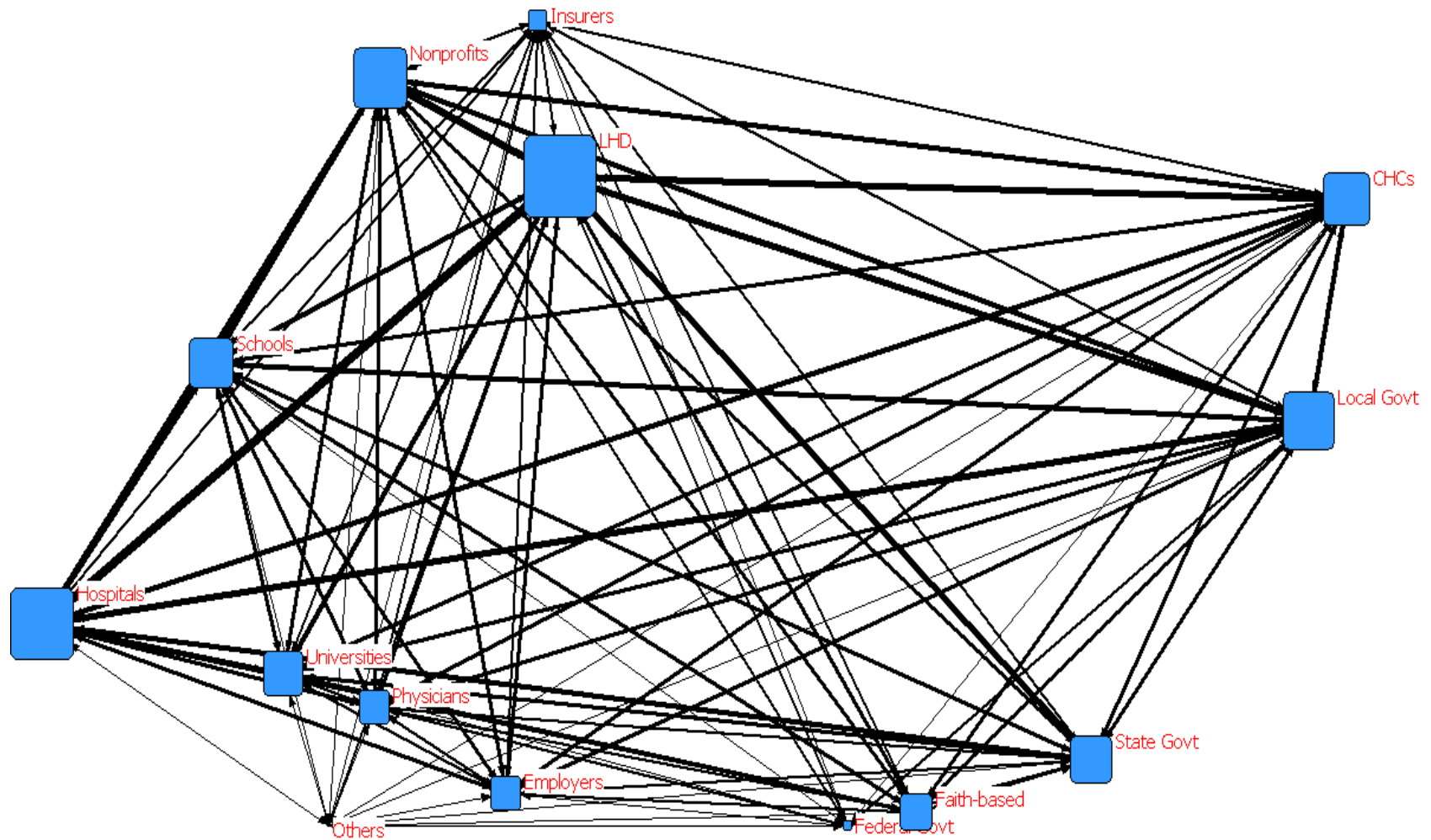
# Cluster and network analysis to identify “system capital”

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



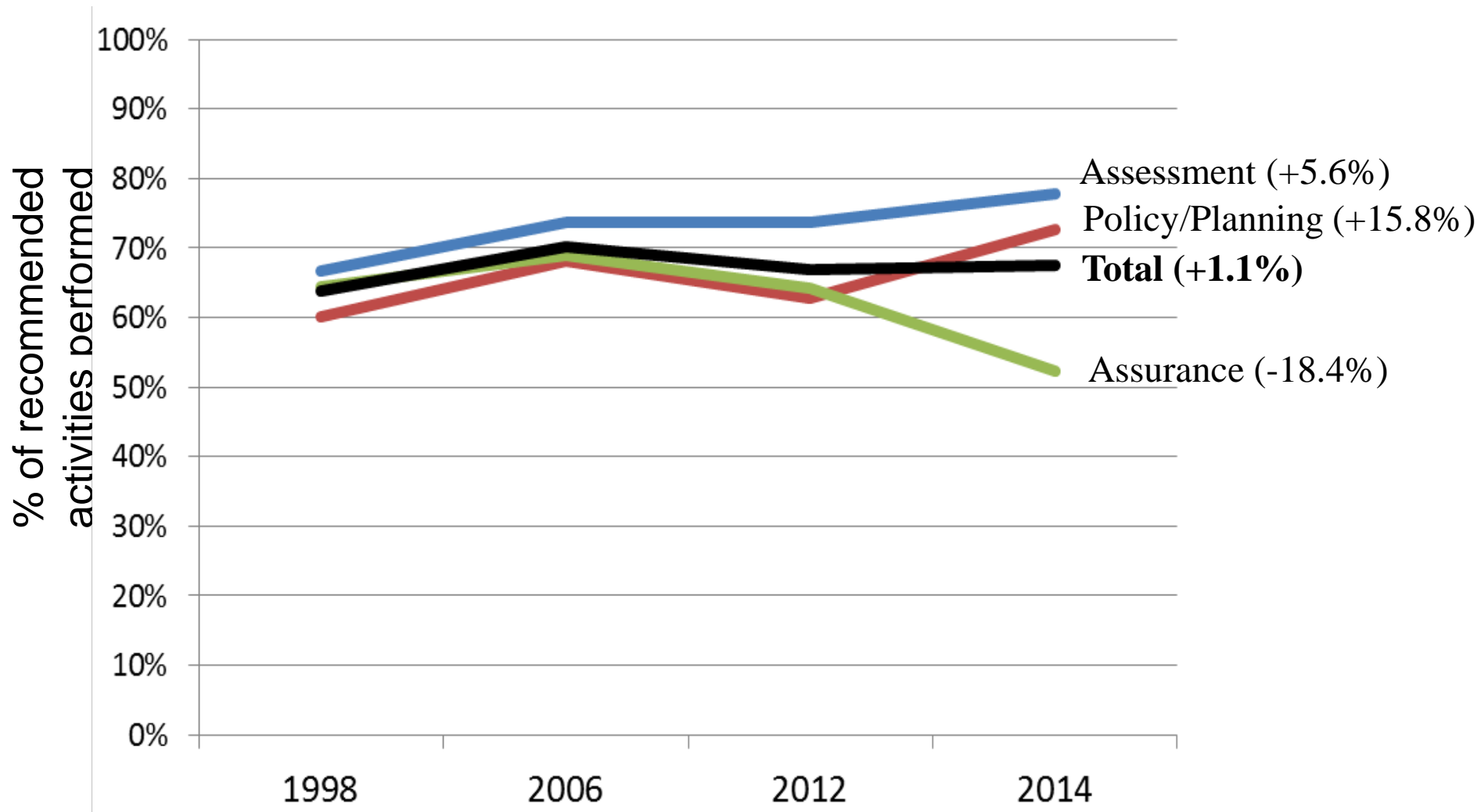
**Node size = degree centrality**

**Line size = % activities jointly contributed (tie strength)**

# Changes in system prevalence and coverage

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

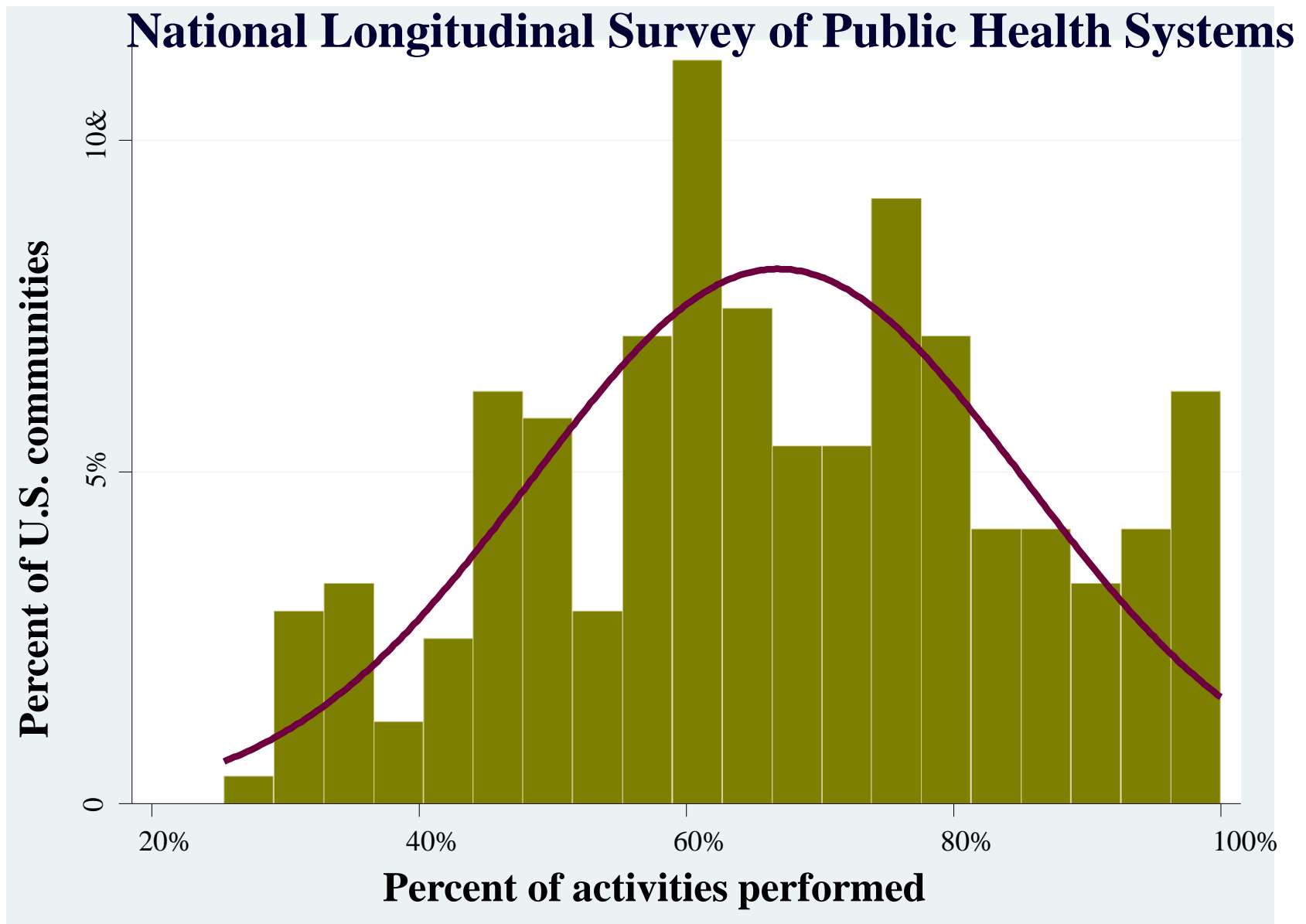
# Delivery of recommended public health activities 1998-2014



# Delivery of recommended public health activities 1998-2014

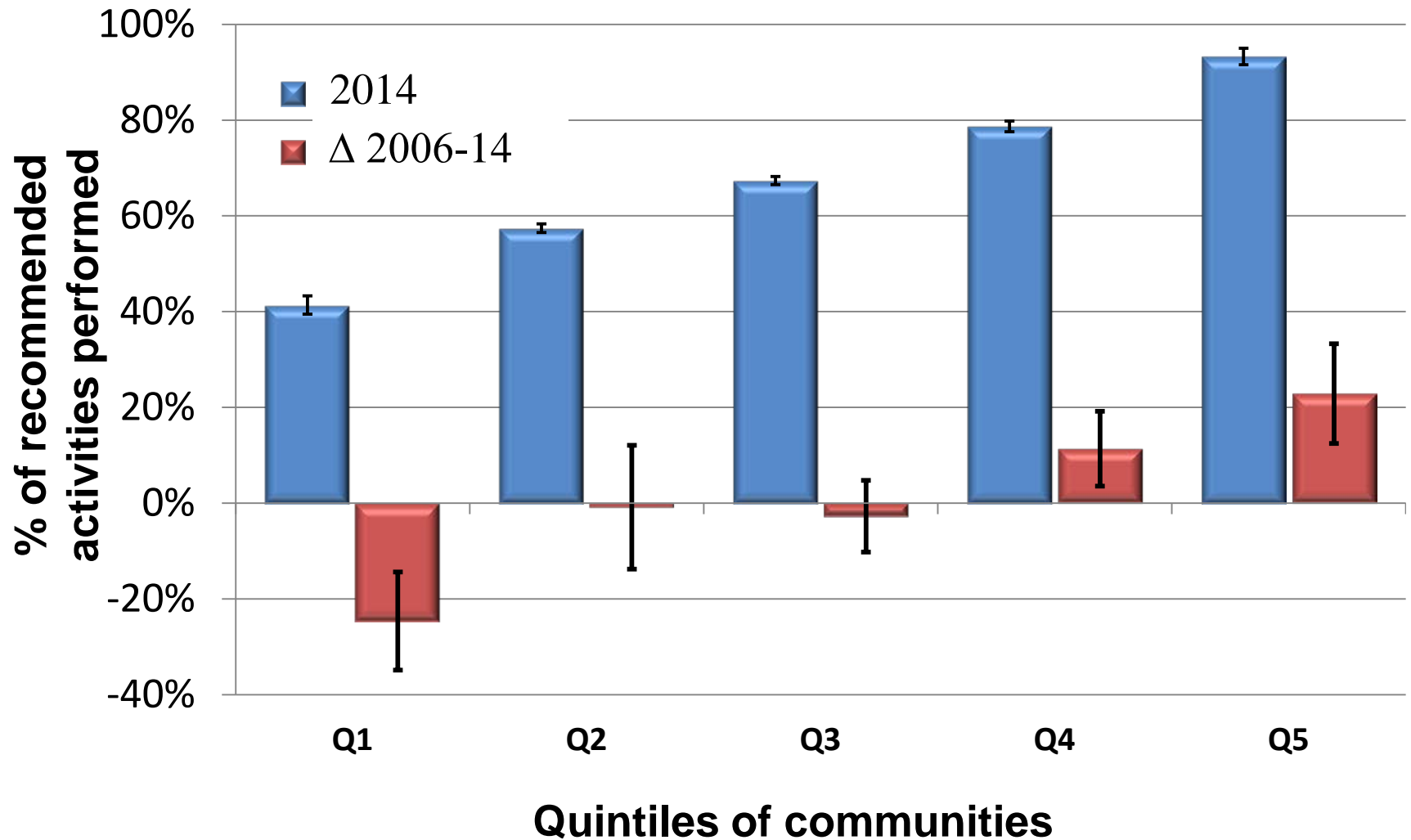
Public Health Activity	1998	2014	% Change
1 Community health needs assessment	71.5%	86.0%	20.2%**
2 Behavioral risk factor surveillance	45.8%	70.2%	53.2%**
3 Adverse health events investigation	98.6%	100.0%	1.4%
4 Public health laboratory testing services	96.3%	96.5%	0.2%
5 Analysis of health status 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





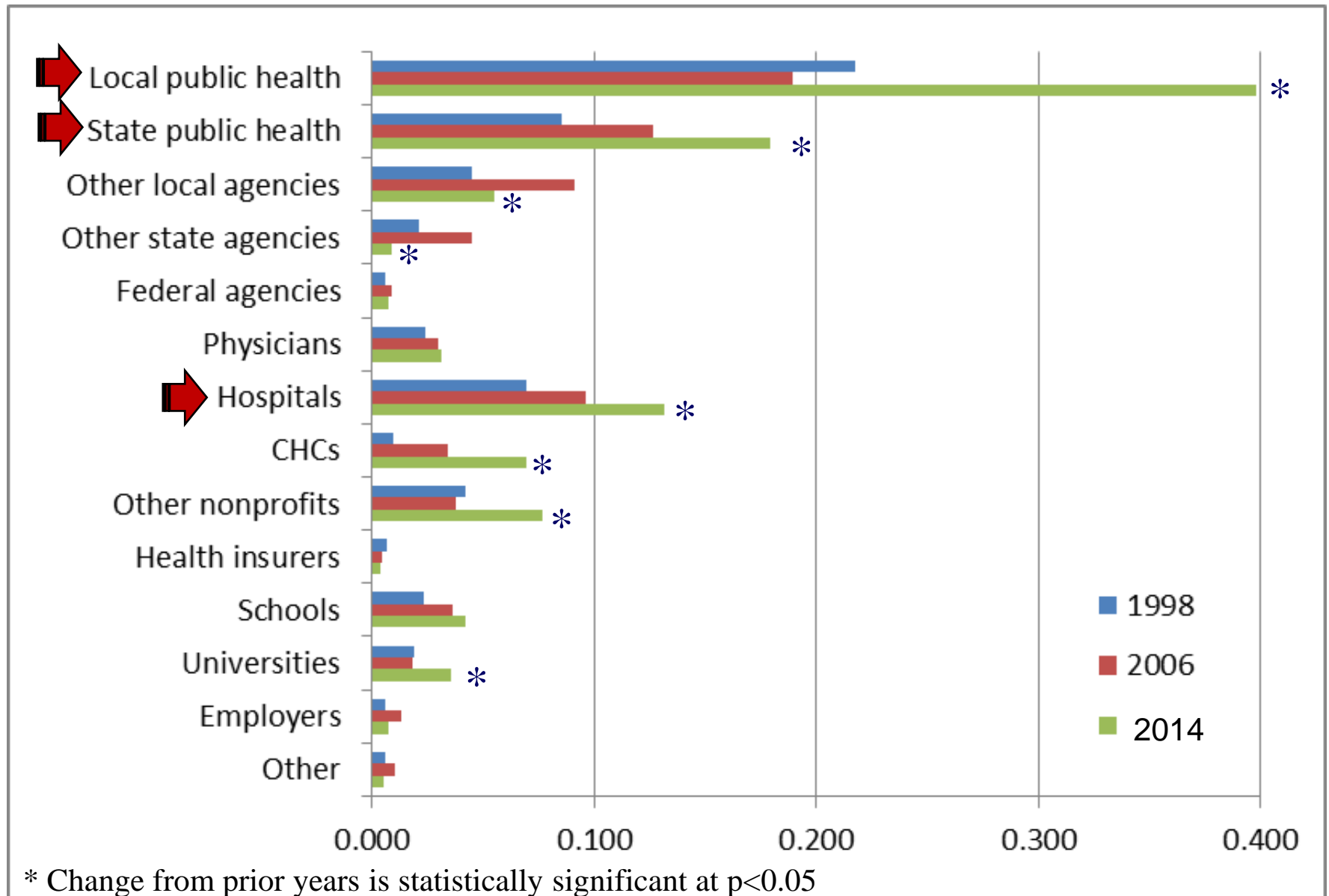
# Organizational contributions to recommended public health activities, 1998-2014

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%

% of recommended activities performed

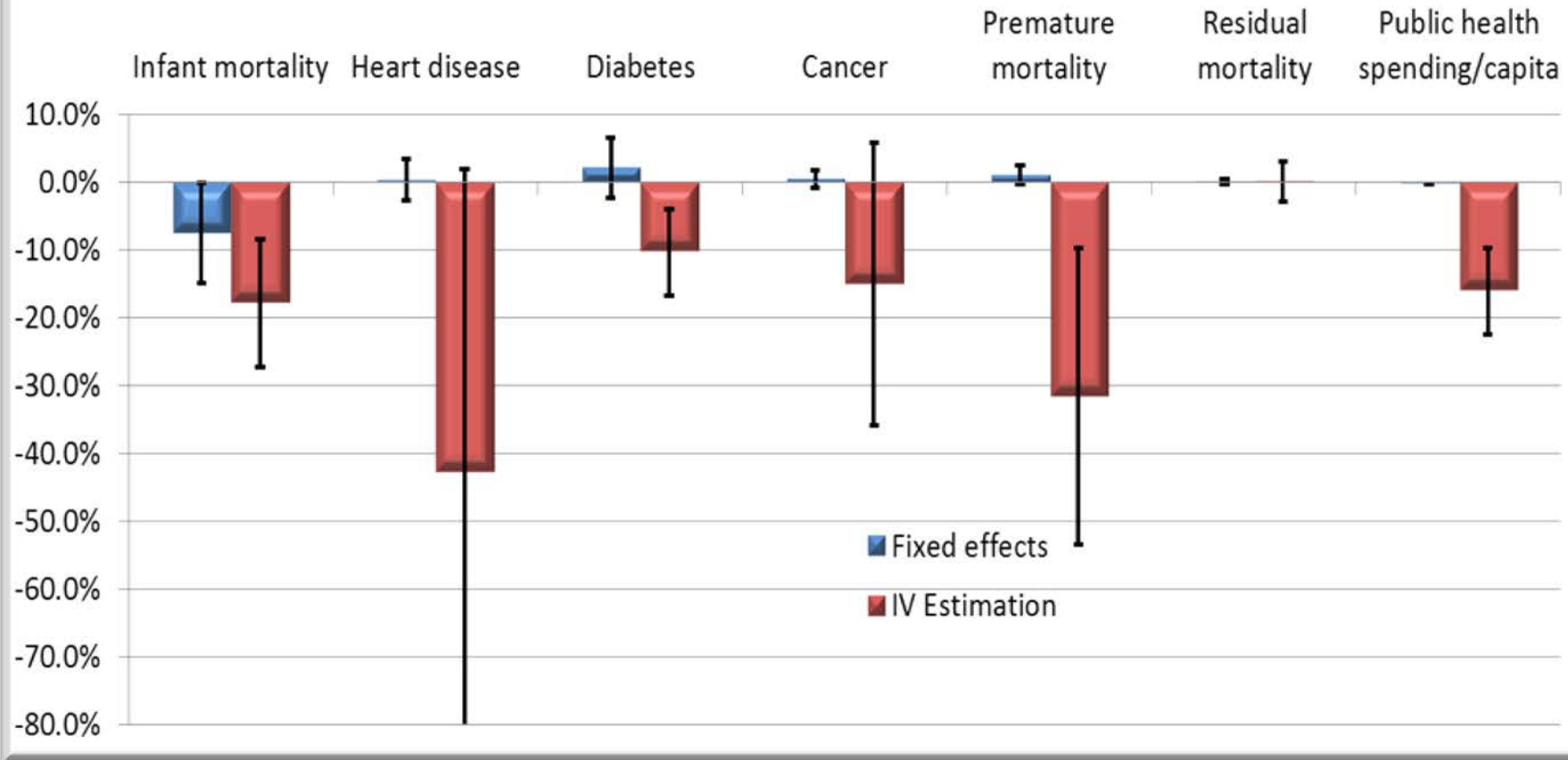
# Bridging capital in public health delivery systems

## Trends in betweenness centrality



# Health and economic impact of comprehensive systems

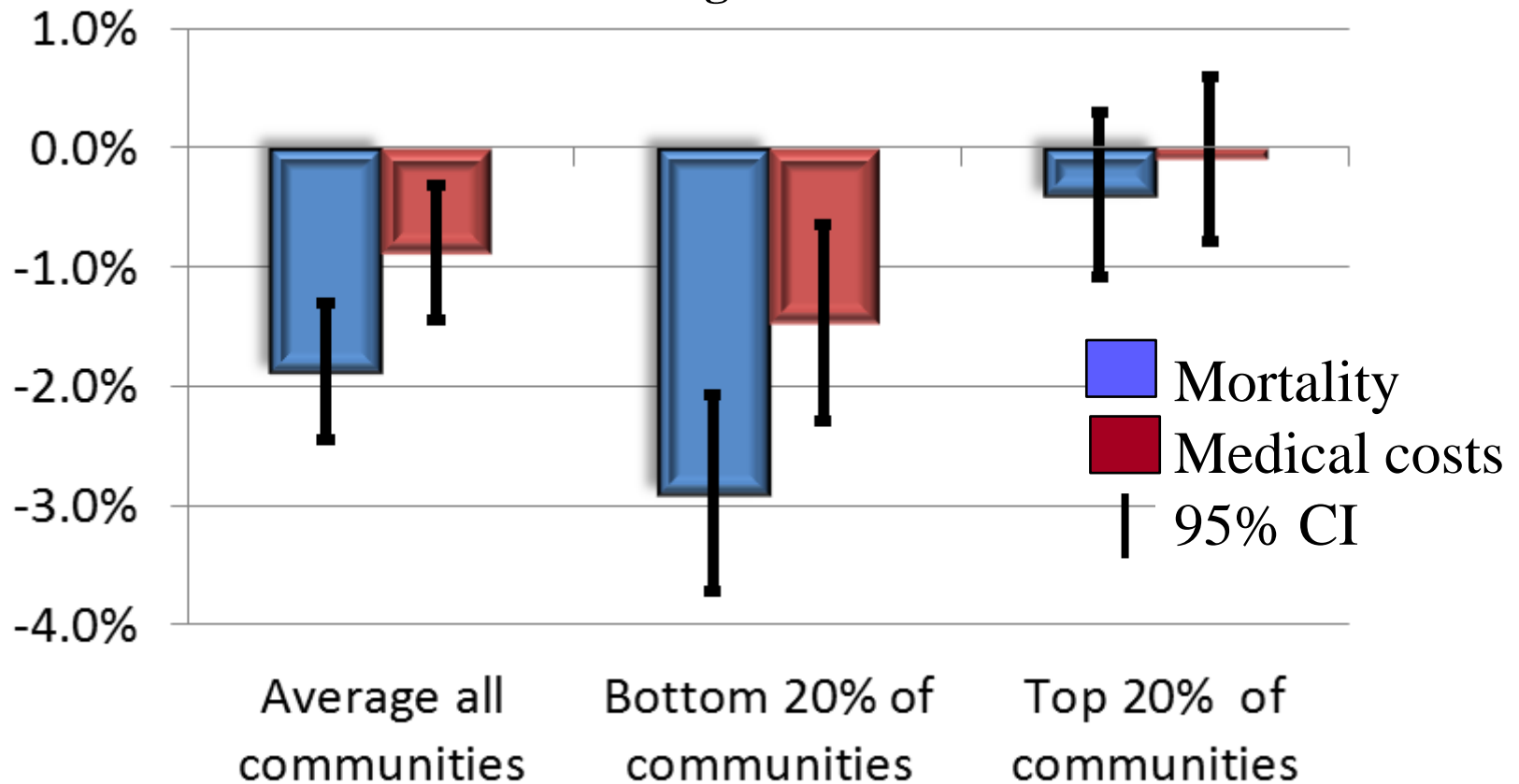
## Fixed Effects and IV Estimates: Effects of Comprehensive System Capital on Mortality and Spending



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

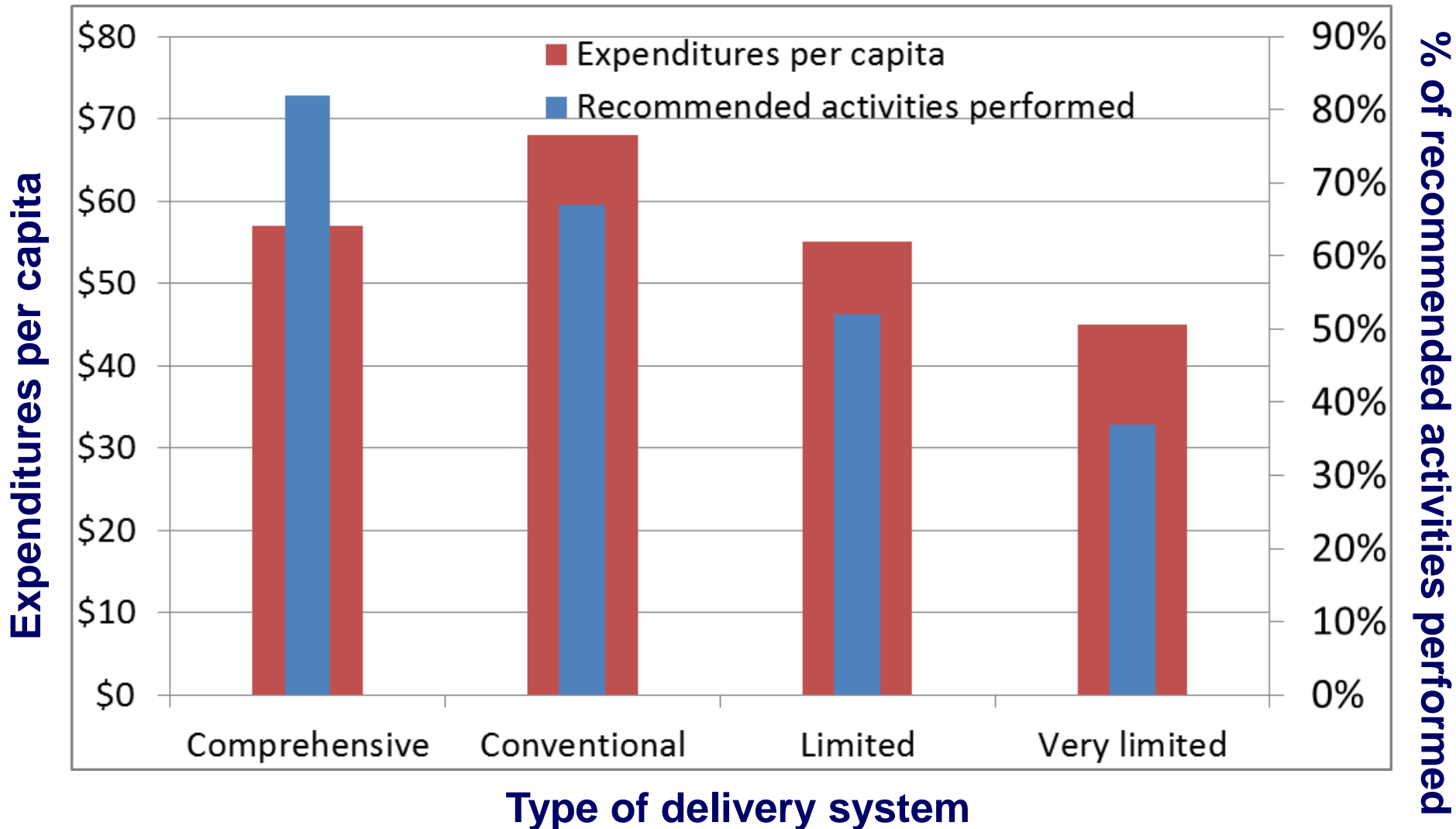
# Making the case for equity: larger gains in low-resource communities

Effects of Comprehensive Public Health Systems in Low-Income vs. High-Income 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/](http://works.bepress.com/glen_mays/38/)
- ◆ Defining Comprehensive Public Health Delivery Systems  
[https://works.bepress.com/glen\\_mays/198/](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: AJPB 2015  
<http://www.ncbi.nlm.nih.gov/pubmed/25689201>
- ◆ Example customized report  
[http://works.bepress.com/glen\\_mays/67/](http://works.bepress.com/glen_mays/67/)

# For More Information

## Systems for Action

National Coordinating Center

*Systems and Services Research to Build a Culture of Health*

**Supported by The Robert Wood Johnson Foundation**

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**Journal:** [www.FrontiersinPHSSR.org](http://www.FrontiersinPHSSR.org)

**Archive:** [works.bepress.com/glen\\_mays](http://works.bepress.com/glen_mays)

**Blog:** [publichealtheconomics.org](http://publichealtheconomics.org)





# Appendix: specifications

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

<b>Attribute</b>	<b>Specific Measures</b>	<b>Threshold Value*</b>
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**

<b>Configuration</b>	<b>Definition</b>
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