Public Health Services & Systems Research and the Reforming U.S. Health System

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CDC Forum on Public Health Services & Systems Research • Atlanta GA • 19 May 2014
Overview

- How can PHSSR inform transformation?
- Examples of recession-relevant research
  - Delivery system organization & structure
  - Finance and economics
- Resources for advancing the field
- Opportunities and challenges for the future
 Failures in population health

Figure 1. There are large differences in life expectancy and health care spending across OECD countries 2008

1. Or latest year available.
Source: OECD Health Data 2010.
Failures in population health

Premature Deaths per 100,000 Residents
Drivers of population health failures

Proportional Contribution to Premature Death

- Genetic predisposition: 30%
- Behavioral patterns: 40%
- Environmental exposure: 5%
- Social circumstances: 15%
- Health care: 10%

A field of inquiry examining the organization, financing, and delivery of public health services at local, state and national levels, and the impact of these activities on population health.

Strategies to promote health and prevent disease & injury on a population-wide basis: programs, policies, administrative practices.
A Key PHSSR Goal: Optimization

How to optimally deploy a diverse collection of responsibilities, resources, actors & expectations?

- Epidemiologic surveillance & investigation
- Community health assessment & planning
- Communicable disease control
- Chronic disease and injury prevention
- Health education and communication
- Environmental health monitoring and assessment
- Enforcement of health laws and regulations
- Inspection and licensing
- Inform, advise, and assist school-based, worksite-based, and community-based health programming

…and roles in assuring access to medical care
**PHSSR’s place in the continuum**

**Intervention Research**
- What works – proof of efficacy
- Controlled trials
- *Guide to Community Preventive Services*

**Services/Systems Research**
- How to organize, implement and sustain in the real-world
  - Reach
  - Enforcement/Compliance
  - Quality/Effectiveness
  - Cost/Efficiency
  - Equity/Disparities
- Impact on population health
- Comparative effectiveness & efficiency
Complexity in public health delivery systems

Health & Social Systems
- Scale of operations
- Scope of activity
- Divison of responsibility
- Compatibility of missions
- Distribution of effort
- Nature & intensity of relationships
- Participation incentives
- Leadership
- Funding levels & mix
- Intergovernmental relationships
- Governance structure
- Decision Support
  - Accreditation
  - Performance measures
  - Practice guidelines
  - Quality improvement
- Outputs and Outcomes
  - Reach
  - Effectiveness
  - Efficiency
  - Adherence to EBPs
  - Timeliness
  - Equity
- Populations & Environment
- Needs
- Preferences
- Risks
- Threats
- Resources
- Perceptions

Mays et al. 2009
Standardization vs. Customization in public health delivery systems

**Standardization**

- Harmful variation
- Wasteful variation
- Inequitable variation
- Race to the bottom
- Network externalities: interoperability/cooperation

**Customization**

- Target resources to greatest needs/risks
- Tailor approaches to values & preferences of stakeholders
- Deploy unique resources & skills to their best purposes

Effectiveness  
Efficiency  
Equity
PHSSR and policy relevance

Subtitle D—Support for Prevention and Public Health Innovation

Patient Protection and Affordable Care Act of 2010

SEC. 4301. RESEARCH ON OPTIMIZING THE DELIVERY OF PUBLIC HEALTH SERVICES.

(a) IN GENERAL.—The Secretary of Health and Human Services (referred to in this section as the “Secretary”), acting through the Director of the Centers for Disease Control and Prevention, shall provide funding for research in the area of public health services and systems.

(b) REQUIREMENTS OF RESEARCH.—Research supported under this section shall include—

(1) examining evidence-based practices relating to prevention, with a particular focus on high priority areas as identified by the Secretary in the National Prevention Strategy or Healthy People 2020, and including comparing community-based public health interventions in terms of effectiveness and cost;

(2) analyzing the translation of interventions from academic settings to real world settings; and

(3) identifying effective strategies for organizing, financing, or delivering public health services in real world community settings, including comparing State and local health department structures and systems in terms of effectiveness and cost.
Learning how to succeed with population health 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
  - Usual and unusual suspects
  - Infrastructure requirements

Overcoming collective action problems

- Incentive compatibility → public goods
- Concentrated costs & diffuse benefits
- Time lags: costs vs. improvements
- Uncertainties about what works
- Asymmetry in information
- Difficulties measuring progress
- Weak and variable institutions & infrastructure
- Imbalance: resources vs. needs
- Stability & sustainability of funding

Ostrom E. 1994
Reform-relevant research: organization and structure

- Who contributes to public health delivery?
- How are roles and responsibilities divided?
- How and why do delivery systems vary and change over time?
- How do system structures affect public health delivery and outcomes?
Data: public health production

National Longitudinal Survey of Public Health Systems

- Cohort of 360 communities with at least 100,000 residents
- Measured from local public health official’s perspective:
  - **Scope**: availability of 20 recommended public health activities
  - **Network**: types of organizations contributing to each activity
  - **Effort**: contributed by designated local public health agency
  - **Quality**: perceived effectiveness of each activity
Constructs reflected in the measures

- Changes in scope and scale of activities performed
- *Intensive margin*: effort exerted by governmental public health
- *Extensive margin*: other organizations contributing to public health
- *Quality/effectiveness*: degree to which services meet community needs
Links to other data sources

- **Area Resource File**: community and market characteristics, health resources
- **NACCHO Profile data**: local public health agency characteristics
- **ASTHO Profile data**: state public health agency characteristics
- **U.S. Census of Governments**: other state & local spending
- **Consolidated Federal Funds Report**: Other federal spending
- **Medicare Cost Report** data files: hospital ownership, market share, uncompensated care
Delivery of recommended public health activities

Delivery of recommended public health activities

Variation in Scope of Public Health Delivery
Delivery of recommended public health activities, 2012

Organizations contributing to local public health production

% Change 2006-2012
-50% -30% -10% 10% 30% 50%

Local health agency
Other local government
State health agency
Other state government
Hospitals
Physician practices
Community health centers
Health insurers
Employers/business
Schools
CBOs

Scope of Production 2012

Inter-organizational relationships in public health delivery systems

Bridging capital in public health delivery systems
Trends in betweenness centrality

* Change from prior years is statistically significant at p<0.05
Do other organizations complement or substitute for local public health agency effort?

Results from Multivariate GLLAMM Models

Note: GLLAMM estimates, holding all other variables constant in the model
How do other organizations affect the total supply of public health activities?

Results from Multivariate GLLAMM Models

Note: GLLAMM estimates, holding all other variables constant in the model
Estimated crowd-out in hospital contributions to public health activities

Note: GLLAMM estimates, holding all other variables constant in the model
A typology of public health delivery systems

<table>
<thead>
<tr>
<th>Scope</th>
<th>Centralization</th>
<th>Integration</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Mod</td>
<td>High</td>
<td>1998</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>2006</td>
</tr>
<tr>
<td>High</td>
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</tr>
<tr>
<td>Low</td>
<td>Low</td>
<td>Mod</td>
<td>2012</td>
</tr>
</tbody>
</table>

% of communities across different typologies:

- Comprehensive
- Conventional
- Limited

Source: Mays et al. 2010; 2012
Population health and delivery system change

Percent Changes in Preventable Mortality Rates Attributable to Delivery System Type

Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply.
Reform-relevant research: finance and economics

- How does public health spending vary across communities and change over time?
- What are the health effects attributable to changes in public health spending?
- What are the medical cost effects attributable to changes in public health spending?
- What are the opportunities for improving efficiency in public health delivery?
What we know, sort of…

Governmental Expenditures for Public Health Activity,
USDHHS National Health Expenditure Accounts

- Percent of NHE (x100)
- Percent of GDP (x1000)
- Per capita ($100s nominal)
- Per capita ($100s constant)

U.S. Centers for Medicare and Medicaid Services, Office of the Chief Actuary
Variation in Local Public Health Spending

Gini = 0.485
Changes in Local Public Health Spending
1993-2010

- 62% growth
- 38% decline
Determinants of Local Public Health Spending Levels

- Delivery system size & structure
- Service mix
- Population needs and risks
- Efficiency & uncertainty

Mays et al. 2009
Mortality reductions attributable to local public health spending, 1993-2008

Hierarchical regression estimates with instrumental variables to correct for selection and unmeasured confounding

Mays et al. 2011
Medical cost offsets attributable to investments in public health delivery, 1993-2008

For every $10 of public health spending, ≈$9 are recovered in lower medical care spending over 15 years

Community-specific estimates of public health spending on heart disease mortality

Impact of 10% Increase in Public Health Spending/Capita
Based on Income Per Capita in Communities

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

Mays et al. forthcoming 2014
Community-specific estimates of public health spending on heart disease mortality

Impact of 10% Increase in Public Health Spending/Capita Based on Scope of Public Health Services Delivered

Mays et al. forthcoming 2014

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

Mays et al. forthcoming 2014
How long does it take: Cumulative effects of public health spending

Changes in Mortality and Medical Care Spending Attributable to 10% Increase in Public Health Spending /Capita

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

Mays et al. forthcoming 2014
Effects of economic conditions on public health spending

GEE regression estimates with logarithmic link function, controlling for population size, age composition, racial composition, physician and hospital supply, and governance structure
GEE regression estimates with logarithmic link function, controlling for population size, age composition, racial composition, physician and hospital supply, and governance structure.

Effects of economic conditions on public health delivery.

- 10% decline in local public health spending/capita
- 10% increase in unemployment rate
- 10% decline in household income/capita
- 10% decline in housing price index
Economies of scale and scope in public health delivery systems

Source: 2010 NACCHO National Profile of Local Health Departments Survey
Empirical estimates of scale and scope economies

Scale (Population in 1000s) 

Quality (Perceived Effectiveness) 

Scope (% of Activities) 

Empirical estimates of scale and scope economies.
Simulated Effects of Regionalization

Per Capita Cost
Scope
Quality

Regionalization Thresholds

Percent Change

<25,000
<50,000
<100,000
<150,000
On the Horizon:

Advancing Reform-relevant Research
Diffusion of Public Health PBRNs

- First cohort (December 2008 start-up)
- Second cohort (January 2010 start-up)
- Affiliate/Emerging PBRNs (2011-14)
  (New in 2013)
## PBRNs and Research Translation

### Local Health Departments Engaged in Research Implementation & Translation Activities During Past 12 months

<table>
<thead>
<tr>
<th>Activity</th>
<th>PBRN Agencies Percent/Mean</th>
<th>National Sample Percent/Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying research topics</td>
<td>94.1% (27.5%)</td>
<td>27.5% (31.38%)</td>
</tr>
<tr>
<td>Planning/designing studies</td>
<td>81.6% (15.8%)</td>
<td>15.8% (31.38%)</td>
</tr>
<tr>
<td>Recruitment, data collection &amp; analysis</td>
<td>79.6% (50.3%)</td>
<td>50.3% (31.38%)</td>
</tr>
<tr>
<td>Disseminating study results</td>
<td>84.5% (36.6%)</td>
<td>36.6% (31.38%)</td>
</tr>
<tr>
<td>Applying findings in own organization</td>
<td>87.4% (32.1%)</td>
<td>32.1% (31.38%)</td>
</tr>
<tr>
<td>Helping others apply findings</td>
<td>76.5% (18.0%)</td>
<td>18.0% (31.38%)</td>
</tr>
<tr>
<td>Research implementation composite</td>
<td>84.04 (27.38)</td>
<td>30.20 (31.38)</td>
</tr>
<tr>
<td>N</td>
<td>209</td>
<td>505</td>
</tr>
</tbody>
</table>

Measures of Interest

- **Availability/Scope:** specific activities produced
- **Volume/Intensity:** Frequency of producing activity over period of time
- **Capacity:** Labor and capital inputs assigned to an activity
- **Reach:** Proportion of target population reached by activity
- **Quality:** effectiveness, timeliness, equity of activity
- **Efficiency:** resources required to produce given volume of activity
MPROVE Example: Implementation of community-wide health education campaigns to promote physical activity
MPROVE Example: Implementation of educational interventions to reduce tobacco use and/or exposure
Ongoing Cost and Value Research

Foundational Public Health Capabilities

- 3 state-specific studies to estimate current spending on FCs
- 1 national study to estimate FC resource requirements and cost function parameters

Public Health Delivery and Cost Studies

- 11 state-specific studies on cost variation
- 3 multi-state studies examining connections between spending, service delivery, and outcomes
Toward a "rapid-learning system" in public health

In a learning health care system, research influences practice and practice influences research.

**Evaluate**
Collect data and analyze results to show what does and does not work.

**Implement**
Apply the plan in pilot and control settings.

**Design**
Design care and evaluation based on evidence generated here and elsewhere.

**Adjust**
Use evidence to influence continual improvement.

**Disseminate**
Share results to improve care for everyone.

Internal and External Scan
Identify problems and potentially innovative solutions.

Always Open

Supported by The Robert Wood Johnson Foundation

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