Public Health Delivery Systems and Population Health: What We Know and Need to Learn

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CDC National Center for Injury Prevention and Control • 15 February 2013
Fundamental health system performance

[Graph showing average life expectancy and per capita spending for various countries.]

WHO 2010
Geographic variation in population health

Source: Commonwealth Fund 2012
Preventable disease burden and national health spending

>75% of national health spending is attributable to conditions that are largely preventable

- Cardiovascular disease
- Diabetes
- Lung diseases
- Cancer
- Injuries
- Vaccine-preventable diseases and sexually transmitted infections

<5% of national health spending is allocated to public health and prevention

CDC 2008 and CMS 2011
Public health activities

Organized programs, policies, and laws to prevent disease and injury and promote health on a population-wide basis

- 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
Public health delivery systems

Public health services & systems research

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

Mays, Halverson, and Scutchfield. 2003
Why study public health delivery?

“The Committee had hoped to provide specific guidance elaborating on the types and levels of workforce, infrastructure, related resources, and financial investments necessary to ensure the availability of essential public health services to all of the nation’s communities. However, such evidence is limited, and there is no agenda or support for this type of research, despite the critical need for such data to promote and protect the nation’s health.”

—Institute of Medicine, 2003
Fundamental empirical questions

- Which programs, interventions, policies, strategies *(mechanisms)*…

- Work best *(outcomes)*…

- In which institutional & community settings *(contexts)*…

- For whom *(populations and subgroups)*?

Pawson and Tilley 1997
Practice-based research in public health

- Examines the adoption, implementation & impact of public health practices in real-world *public health settings*
- Addresses uncertainties and information needs of real-world public health *decision-makers*
- Evaluates the implementation and impact of *innovations in practice*
- Uses *observations generated through public health practice* to produce new knowledge (learning systems)
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
Subtitle D—Support for Prevention and Public Health Innovation

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.
Complexity in public health delivery

Public Health System
- Resources & expertise
- Participation incentives
- Scope of activity
- Compatibility of missions
- Distribution of effort
- Nature & intensity of relationships

Public Health Agency
- Legal authority
- Governing structure
- Leadership
- Scope of services
- Staffing levels & mix
- Intergovernmental relationships
- Funding levels & mix

Strategic Decisions

Needs
- Preferences
- Risks
- Threats
- Resources
- Perceptions

Population & Environment

Outputs and Outcomes
- Reach
- Effectiveness
- Timeliness
- Adherence to EBPs
- Efficiency
- Equity

Decision Support
- Accreditation
- Performance measures
- Practice guidelines

Mays et al 2009
A national research agenda

- Public health system organization and structure
- Public health financing and economics
- Public health workforce
- Public health information and technology

Cross-cutting elements
- Quality
- Law and policy
- Equity and disparities
- Metrics and data
- Analytic methods

http://www.publichealthsystems.org/research-agenda.aspx
Emerging evidence: 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?
National Longitudinal Survey of Public Health Systems

Delivery of recommended public health activities

- **Assurance**
- **Policy**
- **Assessment**

% of activities

- 0%
- 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

Years:
- 1998
- 2006
- 2012

↑ 10%

↓ 5%
Organizations engaged in local public health delivery

A typology of public health delivery systems

<table>
<thead>
<tr>
<th>Scope</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>Mod</th>
<th>Mod</th>
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<td>Mod</td>
<td>Low</td>
<td>Mod</td>
<td>Low</td>
<td>Mod</td>
</tr>
</tbody>
</table>

Source: Mays et al. 2010; 2012

% of communities

Comprehensive

Conventional

Limited

Source: Mays et al. 2010; 2012
Changes in health associated with delivery system

Percent Changes in Preventable Mortality Rates by System Typology (cluster)

Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply
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)

Cost ($1000s)

Mays et al. forthcoming
Simulated Effects of Regionalization

Mays et al. forthcoming
Scale effects in delivery of local injury prevention programs

Source: 2010 NACCHO National Profile of Local Health Departments Survey
Emerging evidence: 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?
Public health’s share of national health spending

USDHHS National Health Expenditure Accounts

$Billions

% of total health spending

%NHE

$Billions

0.00%
0.50%
1.00%
1.50%
2.00%
2.50%
3.00%
3.50%

State and Local

Federal
Factors driving growth in medical spending

Roehrig et al. Health Affairs 2011
The problem with public health spending

- Federal & state funding sources often targeted to communities based in part on disease burden, risk, need
- Local funding sources often dependent on local economic conditions that may also influence health
- Public health spending may be correlated with other resources that influence health

Sources of Local Public Health Agency Revenue, 2010

- Federal direct: 7%
- Medicaid: 9%
- Medicare: 2%
- Fees: 6%
- Federal pass-thru: 13%
- Other: 12%
- State direct: 23%
- Local: 28%

NACCHO 2010
Variation in Local Public Health Spending

Gini = 0.485

Mays et al. 2009
Changes in Local Public Health Spending
1993-2010

- 62% growth
- 38% decline

Mays et al. 2009
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
## Effects of public health spending on medical care spending 1993-2008

Change in Medical Care Spending Per Capita Attributable to 1% Increase in Public Health Spending Per Capita

<table>
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<th>Model</th>
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<th>Elasticity</th>
<th>S.E.</th>
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<tr>
<td>One year lag</td>
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<td>-0.088</td>
<td>0.013***</td>
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<td>Five year lag</td>
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<td>-0.112</td>
<td>0.053**</td>
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<td>Ten year lag</td>
<td>4387</td>
<td>-0.179</td>
<td>0.112</td>
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Log regression estimates controlling for community-level and state-level characteristics

*p<0.10  **p<0.05  ***p<0.01

Mays et al. forthcoming
Estimated value of public health spending

- 10% increase in public health spending in average community:

  Public health cost $594,291
  Medical cost offset -$515,114 (Medicare only)
  LY gained 148
  Net cost/LY $534

Mays et al. forthcoming
2012 Institute of Medicine Recommendations

- Double current federal spending on public health
- Allow greater flexibility in how states and localities use federal public health funds
- Identify components and costs of a minimum package of public health services
- Implement national chart of accounts for tracking spending & funds flow
- Expand research on costs and effects of public health delivery

What are Public Health PBRNs?

A collection of public health agencies and their partner organizations engaged in an ongoing collaboration with research center(s) to conduct rigorous, applied studies of strategies for organizing, financing, and/or delivering public health services in real-world community settings.

Mays et al. 2010; 2012
How can PBRNs help?

- Practice partners to help identify the most pressing questions to answer
- Multiple practice settings for analysis and comparison
- Research partners to help design studies that balance rigor, relevance, feasibility
- Collaborative interpretation of results
- Translating results to timely practice and policy actions
The Robert Wood Johnson Foundation’s Public Health PBRN Program

- First cohort (December 2008 start-up)
- Second cohort (January 2010 start-up)
- Affiliate/Emerging PBRNs

National Coordinating Center
New frontiers through PBRN research

- Examining effects of public health delivery system characteristics on the delivery of evidence-based programs and policies:
  - Tobacco
  - Diabetes
  - Nutrition and physical activity
  - Vaccination
  - Food safety
  - HIV and STI prevention
  - Environmental health

Mays et al. 2012
Examples: Obesity prevention practices in CO

- **Question of interest:** How does the public health delivery system influence adoption and implementation of evidence-based strategies to promote healthy eating and active living through the LiveWell Colorado initiative?

- **Practice settings:** 25 local communities in CO

- **Factors examined:**
  - Use of local data
  - Adherence to evidence-based strategies
  - Success strategies measured in RE-AIM
  - Network characteristics associated with success

- **Study design:** observational practice variation study, mixed-method
Examples: Communicable disease protection in MA

- **Question of interest:** How does the public health delivery system influence adoption and implementation of evidence-based strategies for food safety and infectious disease investigation?

- **Practice settings:** 351 municipalities in MA

- **Factors examined:**
  - Adherence to consensus practices
  - Timeliness of investigation
  - Role of staffing, funding, IT, and partnerships

- **Study design:** observational practice variation study, mixed-method
Examples: Diabetes prevention in KY

- **Question of interest:** How does the public health delivery system influence adoption and implementation of evidence-based self-management strategies for diabetes?

- **Practice settings:** 6 health department jurisdictions serving 30 counties

- **Factors examined:**
  - Adherence to EBPs
  - RE-AIM measures of success
  - Strength of collaboration

- **Study design:** pre-post design with QI intervention
Examples: Studying Production Processes

Multi-Network Practice and Outcome Variation (MPROVE) Study, 2012-13

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
Conclusions: getting inside the box

- Engagement of practice and research partners
- Better measures and data sources
- Research designs in real-world settings
- What works best in which settings and why
- Informed public health decisions
- Smarter investments and greater value
For More Information

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