Public Health Services Research: Informing Public Health Practice & Policy

Glen P Mays, University of Kentucky

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Overview

Why study public health systems?

Examples of systems research in public health
- Delivery system organization & structure
- Finance and economics

Resources for advancing the field
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

Commonwealth Fund 2012
Drivers of population health failures

Proportional Contribution to Premature Death

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

Drivers of population health failures

>75% of US 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 US health spending is allocated to prevention and public health

CDC 2008 and CMS 2011
Evidence-based public health strategies reach less than two-thirds of U.S. populations at risk:

- Smoking cessation
- Influenza vaccination
- Hypertension control
- Nutrition & physical activity programs
- HIV prevention
- Family planning
- Substance abuse prevention
- Interpersonal violence prevention
- Maternal and infant home visiting for high-risk populations
Medical Care
- Fragmentation
- Duplication
- Variability in practice
- Limited accessibility
- Episodic and reactive care
- Insensitivity to consumer values & preferences
- Limited targeting of resources to community needs

Social Supports

Public Health
- Fragmentation
- Variability in practice
- Resource constrained
- Limited reach
- Insufficient scale
- Limited public visibility & understanding
- Limited evidence base
- Slow to innovate & adapt

Inefficient delivery

Inequitable outcomes

Limited population health impact
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
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*

Strategies to promote health and prevent disease & injury on a population-wide basis: programs, policies, administrative practices

Mays, Halverson, and Scutchfield. 2003
**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
- Resources & expertise
- Participation incentives
- Compatibility of missions
- Division of responsibility
- Scale of operations
- Scope of activity
- Breadth of organizations

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

Decision Support
- Accreditation
- Performance measures
- Practice guidelines
- Quality improvement

Strategic Interactions
- Needs
- Preferences
- Risks
- Threats
- Resources
- Perceptions
- Population & Environment
- Scope of activity
- Division of responsibility
- Distribution of effort
- Nature & intensity of relationships

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

Mays et al 2009
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.
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?
U.S. Delivery of Recommended Public Health Activities

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

Organizations engaged in local public health delivery

% Change 2006-2012  Scope of Delivery 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

Patterns of interaction in public health delivery systems

Estimated crowd-out in hospital contributions to public health activities

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

Scope
High       High         High          Mod           Mod         Low          Low
Centralization
Mod        Low         High          High           Low         High         Low
Integration
High       High         Low          Mod           Mod         Low          Mod

Source: Mays et al. 2010; 2012

% of communities

Comprehensive
Conventional
Limited
Source: Mays et al. 2010; 2012
Relative Change in Preventable Mortality Rates Associated with Changes in Delivery System Type, 1998-2012

Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply.
Some Promising Examples

Hennepin Health ACO

- Partnership of county health department, community hospital, and FQHC
- Accepts full risk payment for all medical care, public health, and social service needs for Medicaid enrollees
- Fully integrated electronic health information exchange
- Heavy investment in care coordinators and community health workers
- Savings from avoided medical care reinvested in public health initiatives
  - Nutrition/food environment
  - Physical activity
Some Promising Examples

Massachusetts Prevention & Wellness Trust Fund

- $60 million invested from nonprofit insurers and hospital systems
- Funds community coalitions of health systems, municipalities, businesses and schools
- Invests in community-wide, evidence-based prevention strategies with a focus on reducing health disparities
- Savings from avoided medical care are reinvested in Trust Fund
Some Promising Examples
Arkansas Community Connector Program

- Use community health workers & public health infrastructure to identify people with unmet social support needs
- Connect people to home and community-based services & supports
- Link to hospitals and nursing homes for transition planning
- Use Medicaid and SIM financing, savings reinvestment
- ROI $2.92

Source: Felix, Mays et al. *Health Affairs* 2011

[www.visionproject.org](http://www.visionproject.org)
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?
Public health spending dynamics

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, 1993-2010

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 in Low-Income vs. High Income 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 in Communities with Low vs. High Public Health Infrastructure

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

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

Mays et al. forthcoming 2014
Crowding Out: Medicaid and Public Health Spending under Health Reform

- Do states respond to increases in Medicaid spending by changing (reducing) spending on other public health activities?
- What are the likely health and economic effects of Medicaid-induced changes in public health spending?
Results: Medicaid and Public Health Shares of State Spending
### Results: Estimated Crowd Out Effects

Effects of 10% Growth in Medicaid Spending Share on Public Health Spending Share

<table>
<thead>
<tr>
<th>Model</th>
<th>Coeff.</th>
<th>S.E.</th>
<th>Per Capita Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>State PH spending</td>
<td>-0.82</td>
<td>0.31***</td>
<td>-13.1%</td>
</tr>
<tr>
<td>Local PH spending</td>
<td>-0.77</td>
<td>0.38***</td>
<td>-14.8%</td>
</tr>
</tbody>
</table>

***p<0.01
Projected Health Effects of Crowd Out

At median levels of crowd-out:

- 12.3% increase in infant mortality rate
- 5.5% increase in cardiovascular mortality rate
- 2.7% increase in diabetes mortality rate
- 1.9% increase in cancer mortality rate

Reduce or fully offset the direct mortality gains from increases in health insurance coverage (e.g. Sommers et al 2014)

Using 10-year mortality effect estimates from Mays and Smith, *Health Affairs* 2011
Understanding costs, resource requirements and value in public health delivery

- Align spending with preventable disease burden
- Identify and address inequities in resources
- Improve productivity and efficiency
- Demonstrate value: linking spending to outcomes
- Strengthen fiscal policy: financing mechanisms
Why a stronger focus on costs?

“Poor costing systems have disastrous consequences. It is a well-known management axiom that what is not measured cannot be managed or improved. Since providers misunderstand their costs, they are unable to link cost to process improvements or outcomes, preventing them from making good decisions. Poor cost measurement [leads] to huge cross-subsidies across services. Finally, poor measurement of costs and outcomes also means that effective and efficient providers go unrewarded.”

Toward a deeper understanding of costs & returns

2012 Institute of Medicine Recommendations

- Identify the components and costs of a minimum package of public health services
  - Foundational capabilities
  - Basic programs
- Implement a national chart of accounts for tracking spending and flow of funds
- Expand research on costs and effects of public health delivery

Defining what to cost:

<table>
<thead>
<tr>
<th>Additional Important Services</th>
<th>Communicable Disease Control</th>
<th>Chronic Disease &amp; Injury Prevention</th>
<th>Environmental Public Health</th>
<th>Maternal/Child/Family Health</th>
<th>Access/Linkage with Clinical Health Care</th>
<th>Vital Records</th>
</tr>
</thead>
</table>

**Foundational Programs**

**Foundational Capabilities**

← ACROSS ALL PROGRAMS →

- Assessment (surveillance and epidemiology)
- Emergency preparedness and response (all hazards)
- Communications
- Policy development and support
- Community partnership development
- Business competencies
## Washington’s Cost Estimates (preliminary)

### Estimated Cost of Providing Foundational Public Health Services Statewide

<table>
<thead>
<tr>
<th>Services Ranked By Cost</th>
<th>Total Estimated Cost of FPHS</th>
<th>State Dept. of Health</th>
<th>Local Health Jurisdictions</th>
<th>State DOH</th>
<th>LHJs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundational Capabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Assessment</td>
<td>11,350,000</td>
<td>5,410,000</td>
<td>5,935,000</td>
<td>48%</td>
<td>52%</td>
</tr>
<tr>
<td>B. Emergency Preparedness and Response</td>
<td>10,825,000</td>
<td>3,620,000</td>
<td>7,205,000</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>C. Communication</td>
<td>3,960,000</td>
<td>750,000</td>
<td>3,210,000</td>
<td>19%</td>
<td>81%</td>
</tr>
<tr>
<td>D. Policy Development and Support</td>
<td>4,415,000</td>
<td>1,115,000</td>
<td>3,300,000</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>E. Community Partnership Development</td>
<td>4,885,000</td>
<td>860,000</td>
<td>4,025,000</td>
<td>18%</td>
<td>82%</td>
</tr>
<tr>
<td>F. Business Competencies</td>
<td>40,265,000</td>
<td>15,995,000</td>
<td>24,270,000</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Foundational Programs</strong></td>
<td>252,290,000</td>
<td>134,890,000</td>
<td>117,405,000</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>A. Communicable Disease Control</td>
<td>33,760,000</td>
<td>9,010,000</td>
<td>24,750,000</td>
<td>27%</td>
<td>73%</td>
</tr>
<tr>
<td>B. Chronic Disease and Injury Prevention</td>
<td>24,855,000</td>
<td>12,590,000</td>
<td>12,265,000</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td>C. Environmental Public Health</td>
<td>95,800,000</td>
<td>33,760,000</td>
<td>62,045,000</td>
<td>35%</td>
<td>65%</td>
</tr>
<tr>
<td>D. Maternal/Child/Family Health</td>
<td>25,175,000</td>
<td>13,765,000</td>
<td>11,410,000</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>E. Access/Linkage with Clinical Health Care</td>
<td>65,585,000</td>
<td>62,145,000</td>
<td>3,440,000</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>F. Vital Records</td>
<td>7,115,000</td>
<td>3,620,000</td>
<td>3,495,000</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td><strong>Total Cost</strong></td>
<td>327,990,000</td>
<td>162,640,000</td>
<td>165,350,000</td>
<td>50%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Source: DOH, 2013; Participating LHJs, 2013; and BERK, 2013.

Local per capita: $24.0  
State per capita: $23.6

Defining what to cost: Ohio

Figure 1.

Ohio Minimum Package of Local Public Health Services

**CORE PUBLIC HEALTH SERVICES**

- Environmental health services
- Communicable disease control
- Epidemiology services
- Access to birth and death records
- Health promotion and prevention
- Emergency preparedness
- Linking people to health services
- Community engagement

**OTHER PUBLIC HEALTH SERVICES**

- Clinical preventive and primary care services (e.g., immunizations, clinics)
- Specific maternal and child health programs (e.g., WIC, Help Me Grow)
- Non-mandated environmental health services (e.g., lead screening)
- Other optional services (e.g., home health, school nurses)

**FOUNDATIONAL CAPABILITIES**

- Quality assurance
- Information management and analysis
- Policy development
- Resource development

- Legal support
- Laboratory capacity
- Support and expertise for community engagement strategies

Ohio’s Cost Estimates (preliminary)

Per capita estimate: $32.2

Source: Patrick Bernet and Ohio Research Association for Public Health Improvement.

www.raphi.org
Defining what to cost: Colorado

Colorado Core Public Health Services

- Core Services Promulgated into Rule October 2011:
  - Assessment, Planning, and Communication
  - Vital Records and Statistics
  - Communicable Disease Prevention, Investigation, and Control
  - Prevention and Population Health Promotion
  - Emergency Preparedness and Response
  - Environmental Health
  - Administration and Governance

...performed in accordance with the 10 Essential Public Health Services
Colorado’s Cost Estimates (preliminary)

Colorado Local Core Public Health Services, 2012

- Enviro Health: 27%
- Prev and Pop Promo: 31%
- Communicable Diseases: 9%
- Admin and Govern.: 28%
- EPR: 5%

Total: $192.6M
Per capita: $37.1

Ongoing work: Public Health Delivery and Cost Studies (DACS)

- Set of 11 new studies conducted by PBRNs
- Focus on 1 or more public health services
- Estimate costs and cost variation across multiple settings
- Identify factors that drive variation in costs
- Use standardized approaches to cost measurement and cost analysis
- Generate national cost estimates for foundational PH capabilities
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
The Logic of Public Health PBRNs

- Translation & application
- Engaged practice settings
- Identify common questions of interest
- Research partner
- Apply rigorous research methods
- Data exchange
- Analysis & interpretation
Research Progression

Delivery System Organization and Structure

Practice Variation

Volume, Intensity, and Quality of Delivery

Cost of Delivery

Value of Delivery
PBRNs as Research Engines

- 32 networks
- 1,593 local public health agencies
- 35 state agencies
- 52 academic research units
- 58 professional & community organizations
- 60 competitively awarded research projects
- 81 articles in peer-reviewed journals
- 221 presentations and conferences & meetings
- 51 reports & tools in the grey literature
## 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>***</td>
</tr>
<tr>
<td>Planning/designing studies</td>
<td>81.6% 15.8%</td>
<td>***</td>
</tr>
<tr>
<td>Recruitment, data collection &amp; analysis</td>
<td>79.6% 50.3%</td>
<td>**</td>
</tr>
<tr>
<td>Disseminating study results</td>
<td>84.5% 36.6%</td>
<td>**</td>
</tr>
<tr>
<td>Applying findings in own organization</td>
<td>87.4% 32.1%</td>
<td>**</td>
</tr>
<tr>
<td>Helping others apply findings</td>
<td>76.5% 18.0%</td>
<td>***</td>
</tr>
<tr>
<td>Research implementation composite</td>
<td>84.04 (27.38) 30.20 (31.38)</td>
<td>**</td>
</tr>
<tr>
<td>N</td>
<td>209 505</td>
<td></td>
</tr>
</tbody>
</table>

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

Adjust
Use evidence to influence continual improvement

Implement
Apply the plan in pilot and control settings

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

Disseminate
Share results to improve care for everyone

Internal and External Scan
Identify problems and potentially innovative solutions

For More Information

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