4-3-2013

Public Health ROI: Evidence, Experience and Remaining Questions

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Public Health ROI: Evidence, Experience and Remaining Questions

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UTMB Public Health Symposium • Galveston, TX • 3 April 2013
Value in the U.S. health system

WHO 2010
Equity in population health

Deaths* per 100,000 Population
U.S. Average = 103 Deaths per 100,000

Quartile (range)
- Top (70.2–83.8) Best: MN
- Second (85.9–96.9)
- Third (98.5–111.5)
- Bottom (112.8–160.0) Worst: DC

Best state: 70.2
Top 5 average: 74.1
Median: 96.9
Bottom 5 average: 141.7
Worst state: 150.4
District of Columbia: 160.0

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
Factors driving growth in medical spending

Health spending growth rate 1996-2006

Growth rate due to cost per case

Growth rate due to prevalence

Roehrig et al. Health Affairs 2011
Key questions about value

Do outcomes achieved by public health strategies justify their costs?

Where should new investments be directed to achieve their greatest impact?

How much health can we produce through public health investments?

Can public health investments help “bend the curve” to contain medical costs?
Key questions about value

What level of resources are required to deliver a given bundle of public health activities for a given population?

How do delivery costs vary across communities and population groups?

Where are the opportunities to realize efficiencies in delivery?
Prevention Efforts Provide No Panacea on Health Costs

Preventing Chronic Disease: An Important Investment, But Don’t Count On Cost Savings

An overwhelming percentage of preventive interventions add more to medical costs than they save.

by Louise B. Russell

HEALTH AFFAIRS - Volume 28, Number 1

Prevention for a Healthier America:

INVESTMENTS IN DISEASE PREVENTION YIELD SIGNIFICANT SAVINGS, STRONGER COMMUNITIES
Challenges in demonstrating ROI in public health

- Time lag between costs and benefits
- Distribution of costs and benefits: concentrated costs but diffuse benefits
- Measurement of costs and benefits requires good information systems
- Attribution of benefits: the counterfactual
ROI Key Ingredients

Investments

- Costs of implementing public health strategies
- Who’s investments?

Returns

- Valuation of the outputs and outcomes attributable to public health strategies
- Who realizes returns?
- Over what time frames?
- Compared to what?
Valuing Prevention & Public Health

Managing ROI Expectations

Cost savings – a high bar

Cost effectiveness – value for dollars spent
  – Compared to status quo
  – Compared to other possible investments
  – Compared to doing nothing

…Key concept: opportunity costs
Achieving ROI in public health: Key Considerations

- **Economies of scale**: many public health activities can be delivered more efficiently across larger populations

- **Economies of scope**: efficiencies can be realized by using the same infrastructure to deliver an array of related programs and services
Estimating ROI in public health: Discrete interventions

- Smoking cessation interventions cost an estimated $2,587 for each life-year gained.
- $1 spent on STD and pregnancy prevention produces $2.65 in medical cost savings.
- $1 spent on preconception care for diabetic women produces $5.19 in medical cost savings.
- $1 spent on childhood immunization produces $6.30 in medical cost savings.

Source: Centers for Disease Control and Prevention 2011
Estimating ROI in public health: Individual Programs

Washington State Comprehensive Tobacco Prevention and Control Program: $5 in health care savings per $1 investment

Source: Dilley et al., AJPH 2011
Emerging evidence: what about aggregate public health ROI?

- 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?
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

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

NACCHO 2010
Local variation in 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

Percent change

Infant mortality  Heart disease  Diabetes  Cancer  Influenza  All-cause  Alzheimers

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

Mays et al. 2011
Medical Care Offsets Attributable to Local Public Health Spending, 1993-2008

Medical Cost Offset = 0.88%

Mays et al. Health Services Research, 2009
Effects of public health spending on medical care spending 1993-2008

Change in Medical Care Spending Per Capita Attributable to 10% Increase in Public Health Spending Per Capita

<table>
<thead>
<tr>
<th>Model</th>
<th>N</th>
<th>Elasticity</th>
<th>S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>One year lag</td>
<td>8532</td>
<td>-0.88</td>
<td>0.13***</td>
</tr>
<tr>
<td>Five year lag</td>
<td>6492</td>
<td>-1.12</td>
<td>0.53**</td>
</tr>
<tr>
<td>Ten year lag</td>
<td>4387</td>
<td>-1.79</td>
<td>1.12</td>
</tr>
</tbody>
</table>

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 the average U.S. community:

<table>
<thead>
<tr>
<th>Public health cost</th>
<th>$594,291</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical cost offset (Medicare)</td>
<td>-$515,114</td>
</tr>
<tr>
<td>Life years gained</td>
<td>148</td>
</tr>
<tr>
<td>Net cost/life year</td>
<td>$534</td>
</tr>
</tbody>
</table>

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

Learning about ROI through natural experiments

Delivery of recommended public health activities

% of activities

- Assurance
- Policy
- Assessment

1998 2006 2012

↑ 10%

↓ 5%

Organizations engaged in local public health delivery

A typology of public health delivery systems

Diversification | 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
Health outcomes and delivery system change

Percent Changes in Preventable Mortality Rates by Delivery System Type

- Cancer deaths/100,000 population
- Heart Disease Deaths/100,000
- Influenza Deaths/100,000
- Infectious Disease Deaths/100,000

Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply
What about efficiency in public health delivery?

![Bar chart showing efficiency of agencies and population served by jurisdiction size.]

Jurisdiction Size
- 500k+
- 50k – 499k
- <50k

% of Agencies vs. % of Population Served

Source: 2010 NACCHO National Profile of Local Health Departments Survey
Economies of scale and scope in public health

Mays et al. forthcoming
Simulated effects of regionalization in public health delivery

-20%
-15%
-10%
-5%
0%
5%
10%
15%

Per Capita Cost
Scope
Quality

<25,000  <50,000  <100,000  <150,000

Mays et al. forthcoming
Producing more and better ROI evidence: 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
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.
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
What are Public Health PBRNs?

A collection of *public health agencies* and their *partner organizations* engaged in an ongoing collaboration with an *academic research center* to conduct rigorous, applied studies of strategies for organizing, financing, and/or delivering public health services in *real-world community settings*. 
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
# PBRN Performance in Engaging Practice Settings

## 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)</td>
<td>30.20 (31.38) **</td>
</tr>
<tr>
<td>N</td>
<td>209</td>
<td>505</td>
</tr>
</tbody>
</table>
Estimating ROI in public health: National Public Health Improvement Initiative

- **Goal**: Develop ROI approaches to assess value of improvements in public health capacity, infrastructure, administrative processes

- **Near-term**: capture effects on labor costs, time costs, productivity

- **Longer-term**: capture effects on program delivery (reach, effectiveness), population health

- Beta version of ROI tool: http://works.bepress.com/glen_mays/64/
Implications for Policy and Practice

- Mortality reductions achievable through increases in public health spending may equal or exceed the reductions produced by expansions in medical care or insurance coverage.

- Increased public health investments help to reduce geographic disparities in population health and bend the medical cost curve.

- Gains from increased federal investments may be offset by reductions in state and local spending.
Implications: Advancing ROI Analysis in Public Health

- Enhanced tracking of public health expenditures
- Enhanced monitoring of program performance
  - Reach/targeting
  - Effectiveness
  - Efficiency
  - Equity
- Analysis of cross-cutting infrastructure needed to implement/maintain programs
Implications: toward a rapid-learning system in public health

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

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

2. Implement
   - Apply the plan in pilot and control settings.

3. Design
   - Design care and evaluation based on evidence generated here and elsewhere.

4. Adjust
   - Use evidence to influence continual improvement.

5. Disseminate
   - Share results to improve care for everyone.

Internal and External Scan
- Identify problems and potentially innovative solutions.

Internal
- Apply the plan in pilot and control settings.

External
- Share results to improve care for everyone.

For More Information

Supported by The Robert Wood Johnson Foundation

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