How Can Public Health Economics Help Health Systems Focus Upstream?

Glen P Mays, University of Kentucky
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British Columbia Ministry of Health    |    Population and Public Health Division    |    10 October 2014
Vicious cycles to learning systems

Limited public understanding & political support

Incoherence in missions, complex, fragmented, variable responsibilities & expectations, financing & delivery systems

Large inequities in resources & capabilities, variable productivity and efficiency

Resources incongruent with preventable disease burden

Gaps in reach & implementation of efficacious strategies, difficulties demonstrating impact, value & ROI

Translate evidence for policy and administrative decisions & advocacy

Discover causes & consequences of variation in public health delivery
“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.”

Informing practice and policy decisions

- 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
Public health economics in the U.S.

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

- State and local expenditures
- Federal expenditures

Data source: 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

Percent of communities
Change in per-capita expenditures ($)
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

1.2% increase in public health spending in the average community over 10 years:

- Public health cost: $7.2M
- Medical cost offset: -$6.3M (Medicare only)
- Deaths averted: 175.8
- Life years gained: 1758
- Net cost/LY: $546
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
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
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) vs. Cost ($1000s)

Quality (Perceived Effectiveness) vs. Cost ($1000s)

Scope (% of Activities) vs. Cost ($1000s)
Simulated Effects of Regionalization

-20%
-15%
-10%
-5%
0%
5%
10%
15%
<25,000
<50,000
<100,000
<150,000
Per Capita Cost
Scope
Quality

Regionalization Thresholds
Estimated crowd-out in hospital contributions to public health activities

Note: GLLAMM estimates, holding all other variables constant in the model
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

Public Health Spending Share

Medicaid Spending Share

FMAP>60

FMAP<=60
**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
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

Cost data collection methods

- **Prospective “expected cost” methods**
  - Vignettes
  - Surveys with staff and/or administrators
  - Delphi group processes

- **Concurrent “actual cost” methods (micro-costing)**
  - Time studies with staff
  - Activity logs with staff
  - Direct observation

- **Retrospective “cost accounting” methods**
  - Modeling and decomposition using administrative records
  - Surveys with staff and/or administrators
Examples: Survey methods

Four dimensions of work:
- Time
- Cognitive effort
- Physical effort
- Stress

Additional cost components:
- Practice expense
- Malpractice expense
Examples: Survey methods

- Surveys program managers
- Refers to expenditure records (not budgets)
- Explicit allocation of resources across multiple programs

Available at:


Examples: Medicaid administrative claiming

- Public health agencies that claim Medicaid reimbursement for outreach and enrollment activities
- Requires periodic time studies to document agency time and effort devoted to reimbursable activities
Key issues: cost of capabilities

- Delineating state vs. local roles and division of effort
- Identifying scale and scope effects
  - By population served
  - By range of programs supported (portfolio effect)
- Identifying input factors that affect costs
  - Resource prices
  - Case mix
- Identifying key output differences across settings
  - Intensity
  - Quality
  - Reach
Defining what to cost: the public health package

- Washington State’s Foundational Public Health Services
- Ohio’s Public Health Futures Committee: Minimum Package of Services
- Colorado’s Core Public Health Services
- National Workgroup on Foundational Public Health Capabilities
## Defining what to cost:

### Washington Public Health Improvement Partnership

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

### Foundational Capabilities

- Assessment (surveillance and epidemiology)
- Emergency preparedness and response (all hazards)
- Communications
- Policy development and support
- Community partnership development
- Business competencies

**ACROSS ALL PROGRAMS**
### 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
All local health departments should be responsible for providing the following services in their district, directly or by contracting

- 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
Local health departments play a role in assuring these services are provided in their community, by public health or other organizations

- 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
All local health departments should have access to the following skills and resources. Access can occur through cross-jurisdictional sharing.

- Quality assurance
- Information management and analysis
- Policy development
- Resource development
- Legal support
- Laboratory capacity
- Support and expertise for community engagement strategies

Source: Association of Ohio Health Commissioners, Public Health Futures: Considerations for a new framework for local public health in Ohio (June 15, 2012)
Ohio’s Cost Estimates (preliminary)

### Exhibit 4. Model of Core Spending

<table>
<thead>
<tr>
<th>Core spending</th>
<th>Multipliers</th>
<th>Sample Computation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Estimated impact of agency features</td>
<td>-0.4340</td>
<td>0.0000</td>
</tr>
<tr>
<td>Estimated impact of population features</td>
<td>0.0000</td>
<td>0.0025</td>
</tr>
<tr>
<td>Population size (log)</td>
<td>0.8572</td>
<td>0.9053</td>
</tr>
<tr>
<td>Percent population rural</td>
<td>0.2747</td>
<td>0.5795</td>
</tr>
<tr>
<td>Percent population nonwhite</td>
<td>2.5749</td>
<td>2.7096</td>
</tr>
<tr>
<td>Percent non-English speaking</td>
<td>1.0886</td>
<td>-5.5211</td>
</tr>
<tr>
<td>Percent 65+ years old (%)</td>
<td>-2.1059</td>
<td>0.3036</td>
</tr>
<tr>
<td>Income per capita ($100,000)</td>
<td>-2.3900</td>
<td>-1.1500</td>
</tr>
<tr>
<td>Percent uninsured (%)</td>
<td>-1.3601</td>
<td>3.4406</td>
</tr>
<tr>
<td>Physicians per 100,000 population</td>
<td>0.0006</td>
<td>0.0004</td>
</tr>
<tr>
<td>NACCHO % of Core Svc</td>
<td>1.0009</td>
<td>1.4116</td>
</tr>
<tr>
<td>Constant</td>
<td>4.9783</td>
<td>2.9009</td>
</tr>
</tbody>
</table>

Local per capita:  $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

- **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

Scale up to produce national estimates of resource requirements for “minimum package”
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

Disseminate
- Share results to improve care for everyone
  - Internal and External Scan
  - Identify problems and potentially innovative solutions

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

Implement
- Apply the plan in pilot and control settings

Internal

External
For More Information

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