Financial and Economic Analysis for Population Health

Glen P. Mays, University of Kentucky

Available at: https://works.bepress.com/glen_mays/299/
Financial and Economic Analysis for Population Health

Glen Mays, PhD, MPH
Cezar Mamaril, PhD, MS

University of Kentucky
Center for Public Health Systems and Services Research
Today’s Agenda

I. Fundamentals of financial & economic analysis
II. Tools for economic evaluation in public health
III. Examples of applying economic & financing principles to public health strategies
Trump meets with GM today.

Which input costs this firm more?

a. Steel
b. Health care
I. Fundamentals
Pop Health questions we can answer with financial and economic analysis

- How much do health problems cost society?
- Who incurs the cost of these problems?
- How much do public health interventions cost?
- Who pays for these interventions?
- Do outcomes achieved by public health interventions justify their costs?
- Where should new investments be directed to achieve their greatest impact?
Related questions of value...

- How much health can we produce through public health investments?
- Can public health investments help “bend the curve” to contain medical costs or costs incurred by other stakeholders?
Uncertainty and Controversy

Prevention Efforts Provide No Panacea on Health Costs

By JANET ADAMY

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

Prevention for a Healthier America:

INVESTMENTS IN DISEASE PREVENTION YIELD SIGNIFICANT SAVINGS, STRONGER COMMUNITIES
Public health spending and medical costs

Health spending growth rate 1996-2006

Growth rate due to cost per case

Growth rate due to prevalence

Roehrig et al. Health Affairs 2011
Challenges in demonstrating economic value 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
Key ingredients

Costs of the health conditions/problems
- Costs of health problems we want to address
- Who pays?
- Over what time frames?

Costs of implementation/intervention (investments)
- Costs of implementing interventions
- Who pays?
- Over what time frames?

Benefits/Returns
- Valuation of the outputs and outcomes attributable to interventions
- Who realizes returns?
- Over what time frames?
- Compared to what?
Setting and managing 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
Estimating value in public health: Key considerations

**Populations at risk**
- Size
- Heterogeneity

**Interventions**
- Primary, secondary or tertiary prevention programs
- Quality improvement projects
- Cross-cutting capabilities & infrastructure

**Perspective**
- Federal, state, agency, health system, or societal?

**Time Horizon**
- How long can you wait to realize benefits?
Estimating value in public health: Key considerations - Costs

**Direct costs**
- Costs to treat the health condition(s)
- Cost of implementing interventions/infrastructure

**Indirect costs**
- Economic value of productivity gains/losses or time savings/costs attributable to the intervention

**Intangibles**
- Quality of life, satisfaction, self-efficacy, social capital
Valuing Prevention & Public Health

Estimating value in public health: Key considerations

**Participation/Adherence**
- What proportion of the population at risk engages in the program/intervention?

**Break even**
- How long does it take to recoup investment?

**Maintenance/Persistence**
- How long do the benefits last?
- Recurring costs?
II. Tools
Tools for estimating costs of health conditions

CDC Chronic Disease Cost Calculator
https://www.cdc.gov/chronicdisease/calculator/

USDA Costs of Foodborne Illness

Medical Expenditure Panel Survey – query tool
https://meps.ahrq.gov/data_stats/meps_query.jsp
Implementation Costs: why we need to know?

“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 in public health

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

Implementation Cost Tools

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

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

- **Retrospective “cost accounting” methods** (micro-costing or gross-costing)
  - Administrative records, financial reports, billing data
  - Decomposition, allocation or modeling
  - Surveys with staff and/or administrators
Examples: Survey methods

Three dimensions of work:
- Mental effort and judgment
- Technical skill and physical effort
- Stress
### Examples: Survey methods

#### Table 4
Summary of Estimated Cost of Data Collection (in 1991 dollars)

<table>
<thead>
<tr>
<th>Collection Method</th>
<th>Total Cost&lt;sup&gt;a&lt;/sup&gt;</th>
<th>No. of Completes</th>
<th>Cost per Complete&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Cost per Rated Service&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone</td>
<td>$105,000</td>
<td>1200</td>
<td>$87.50</td>
<td>$175.00</td>
</tr>
<tr>
<td>1-Round Mail</td>
<td>$65,500</td>
<td>1200</td>
<td>$54.58</td>
<td>$109.17</td>
</tr>
<tr>
<td>2-Round Mail</td>
<td>$80,000</td>
<td>1267&lt;sup&gt;d&lt;/sup&gt;</td>
<td>$63.14</td>
<td>$133.33</td>
</tr>
<tr>
<td>Panel</td>
<td>$88,000</td>
<td>n/a</td>
<td>n/a</td>
<td>$146.67</td>
</tr>
</tbody>
</table>

<sup>a</sup>Total cost of data collection includes all field activities (e.g., interviewing, survey distribution, data reduction), supervision, management, and instrument/materials development.

<sup>b</sup>Cost per complete is derived by dividing the total cost of data collection by the number of completed cases. (This calculation is not applicable to the panel-rating methodology.)

<sup>c</sup>Cost per service is derived by dividing the total cost of data collection by the 600 rated services.

<sup>d</sup>667 completes for the first round and 600 completes for the second round.
Examples: Survey methods

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

Available at:

Examples: Survey methods

ASTHO’s Public Health ROI Calculator

- **Goal**: Develop 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
ASTHO’s Public Health ROI Calculator

Requires data on:

– Operating costs before and after implementation of your public health strategy
– Revenues (if any) before and after implementation of your public health strategy
– Measures of outputs/services before and after
– Measures of health and economic outcomes (if available) before and after

More resources for implementation costing

- USDHHS Assistant Secretary for Planning and Evaluation. Guide to Analyzing the Cost-Effectiveness of Community Public Health Prevention Approaches. 
  www.aspe.hhs.gov/health/reports/06/cphpa/report.pdf


- WHO Cost-It template
  http://www.who.int/choice/toolkit/cost_it/en/
III. Examples
Examples: Intervention-level analysis

- 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
ROI of worksite wellness

Example: Mortality reductions attributable to local public health spending, 1993-2008

- Infant mortality
- Heart disease
- Diabetes
- Cancer
- Influenza
- All-cause
- Alzheimers

Mays et al. Health Affairs, 2011  http://content.healthaffairs.org/content/30/8/1585.abstract
### Aggregate value of spending

<table>
<thead>
<tr>
<th>Source</th>
<th>Cost per Life-Year Gained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical care spending, 1990-2000</td>
<td>$36,300</td>
</tr>
<tr>
<td>(Cutler et al. NEJM, 2006)</td>
<td></td>
</tr>
<tr>
<td>Public health spending, 1993-2005</td>
<td>$12,200-$25,600</td>
</tr>
</tbody>
</table>
Example: Medical Care Offsets Attributable to Local Public Health Spending, 1993-2008

Medical Cost Offset = 0.088%

Quintiles of public health spending/capita

- Quintile 1
- Quintile 2
- Quintile 3
- Quintile 4
- Quintile 5

Public health spending/capita
- Quintile 1: 120
- Quintile 2: 80
- Quintile 3: 40
- Quintile 4: 20
- Quintile 5: 0

Medicare spending per recipient
- Quintile 1: 7200
- Quintile 2: 6800
- Quintile 3: 6400
- Quintile 4: 6000
- Quintile 5: 5800

Mays et al. Health Services Research, 2009
Example: Projecting effects of new public health spending

- 1% increase in public health spending in average community over 10 years:

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public health cost</td>
<td>$7.2M</td>
</tr>
<tr>
<td>Medical cost offset</td>
<td>-$6.3M (Medicare only)</td>
</tr>
<tr>
<td>Deaths averted</td>
<td>175.8</td>
</tr>
<tr>
<td>Life years gained</td>
<td>1758</td>
</tr>
<tr>
<td>Net cost/LY</td>
<td>$546</td>
</tr>
</tbody>
</table>

Mays et al. 2011
Examples: Program ROI

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
- Costing with electronic time logs

Felix, Mays et al. 2011

http://content.healthaffairs.org/content/30/7/1366.abstract
Examples: Program ROI

By Holly C. Felix, Glen P. Mays, M. Kathryn Stewart, Naomi Cottoms, and Mary Olson

THE CARE SPAN

Medicaid Savings Resulted When Community Health Workers Matched Those With Needs To Home And Community Care

Felix, Mays et al. 2011
http://content.healthaffairs.org/content/30/7/1366.abstract
Three Year Aggregate Estimates

- Combined Medicaid spending reductions: $3.515 M
- Program implementation costs: $0.896 M
- Net savings: $2.629 M
- ROI: $2.92

Examples: Program ROI

Felix, Mays et al. 2011
http://content.healthaffairs.org/content/30/7/1366.abstract
Interpreting & using results: Key considerations

- Uncertainty and sensitivity analysis
- Measurement error
- Attribution and threats to validity
- Scenario analysis
- Upper-bound and lower-bound estimates
Advancing Economic 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
For More Information

Systems for Action

National Coordinating Center
Systems and Services Research to Build a Culture of Health

Supported by The Robert Wood Johnson Foundation

Glen P. Mays, Ph.D., M.P.H.
glen.mays@uky.edu
@GlenMays

Email: systemsforaction@uky.edu
Web: www.systemsforaction.org
www.publichealtheconomics.org
www.publichealthsystems.org
Journal: www.FrontiersinPHSSR.org
Archive: works.bepress.com/glen_mays
Blog: publichealtheconomics.org