Fundamentals of Economic Evaluation for Public Health

Glen P. Mays, University of Kentucky

Available at: https://works.bepress.com/glen_mays/212/
Fundamentals of Economic Evaluation for Public Health

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Glen Mays, PhD, MPH
Cezar Mamaril, PhD, MS
Today’s Agenda

I. Fundamentals of economic evaluation
II. Tools for economic evaluation in public health
III. Examples of public health economic studies
IV. Group exercise: applying economic evaluation principles to programs
V. DSHS specific economic evaluations
VI. Interpretation, applications, limitations & caveats
I. Fundamentals of economic evaluation
Why economics in public health?

- 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

Trust for America's Health
WWW.HEALTHYAMERICANS.ORG
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

Investments
- Costs of implementing public health interventions
- Who pays: sources?
- Over what time frames?

Benefits/Returns
- Valuation of the outputs and outcomes attributable to public health 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

**Targets of study**
- Primary, secondary or tertiary prevention programs
- Quality improvement projects
- Cross-cutting 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
- Cost of implementing intervention/infrastructure
- Cost savings attributable to the intervention

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
Estimating value in public health: Key considerations - Benefits

**Efficiency gains (captured in cost measures)**
- Reduced labor costs
- Reduced material costs

**Productivity gains (captured in output measures)**
- Services delivered
- Cases detected

**Revenue gains (captured in financial measures)**

**Health gains (captured in outcome measures)**
- Deaths averted
- Cases prevented
- Quality-adjusted life years gained
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?
Estimating value in public health: Key considerations

- **Evidence** of program effectiveness
- Ability to **reach** populations at greatest risk
- Ability to **implement and maintain** active ingredients of programs/policies
- **Efficiency** in program delivery
Estimating value in public health: Key considerations

**Economies of scale**: many public health interventions 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 value in public health: common types of analyses

- Cost analysis
- Cost comparison/cost minimization
- Budget impact analysis
- Return-on-investment analysis
- Cost-effectiveness analysis
- Cost-benefit analysis
- Health impact assessment
“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

Tools of the trade

- 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
## Costing Methods

### TABLE 1. Overview of Costing Methods Available to US Researchers

<table>
<thead>
<tr>
<th>Method</th>
<th>Description of Method</th>
<th>Advantage</th>
<th>Disadvantage</th>
<th>Issues for Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microcosting</td>
<td>Enumerate staff time, supplies, and items used to provide a specific service and estimate their cost.</td>
<td>Accurate, often needed to find a cost of a service intervention.</td>
<td>Method is labor intensive and not useful for finding overhead cost. It cannot be used to find total health care cost.</td>
<td>Need to include all costs: nonwage labor cost, person-level and institutional overhead, cost of development, set-up, screening, supplies, and space.</td>
</tr>
<tr>
<td>Activity-based cost allocation system.</td>
<td>Multistep cost allocation system. Assign cost of staff time, supplies, and equipment to production departments. Distribute overhead. Use relative values to find cost of specific products and assign cost to specific stays or encounters.</td>
<td>The best available estimate of economic costs of health services.</td>
<td>Used by relatively few hospitals, data may not be available to the researcher. Costing system unlikely to capture costs of a novel intervention tested in a research study.</td>
<td>Quality must be evaluated. Cost estimates may not be generalizable.</td>
</tr>
<tr>
<td>Cost-adjusted charges or total reimbursement.</td>
<td>Billed charges are adjusted by the ratio of cost-to-charges in a hospital cost report.</td>
<td>Charges routinely created for most of US health care. Hospital cost reports are available from Medicare.</td>
<td>Requires strong assumptions that charge is proportional to economic cost. Charges difficult to obtain for care received at other sites. Difficult to use to cost ambulatory care.</td>
<td>Use of unadjusted charge. Exclusion of cost of physician services to inpatients. Exclusion of patient copayments and deductibles from reimbursement amount.</td>
</tr>
<tr>
<td>Gross costing</td>
<td>Quantities of different services are determined, and cost estimated using service specific unit cost.</td>
<td>Relative ease of implementation.</td>
<td>Strong assumptions about homogeneity of services.</td>
<td>Data on characteristics of service may be inadequate. Use of appropriate unit costs.</td>
</tr>
</tbody>
</table>
First Principles

Estimating total economic costs of an activity

- **Costs** = value of resources used to produce activity
- **Resources** = people, facilities, equipment, supplies

...Key concept: **opportunity costs**
Financial Costs

- **Expenditures** for resources to implement the activity – based on market prices
- Often reflected in expenditure reports, invoices
- Convenient, sometimes incomplete, measures

**Examples:**
- Salaries for project personnel
- Supply costs
- Computer purchases
- Cost of curriculum materials
Economic Costs

Value of the lost benefit because the resource is not available for its next best use

Examples:

- Volunteer time
- Donated space

Shadow prices may be used when market price does not accurately reflect the value of the resource
Developing a cost classification system

Perspective: who incurs cost
Timeframe: over what period
Type of resource
  - Labor, equipment, supplies, facilities, etc
Activity domains/areas
  - Training, curriculum development, surveillance, recruitment, screening, administration
  - Pre-implementation vs. post-implementation
“Direct” vs. “indirect” activities
Capital vs. operating costs (& depreciation)
Developing a cost classification system

Common resource categories

- Noncontract labor
- Contract services
- Materials/supplies
- Building/facilities
- Donated labor and resources
- Other resources not funded directly
Developing a cost classification system

Don’t overlook...

- Resources that are hard to measure or value
- Resources used in small amounts
- Resources procured without money
  - Volunteer time
  - Parent/caregiver time
  - Intervention recipient time
  - In-kind contributions/donated materials
  - Existing resources
Developing a cost classification system

Include measures of units of activity

- Unit costs

Fixed vs. variable costs

- Variable costs vary with activity level
- Fixed costs are constant despite volume of activity
- Long term, all costs are variable
Developing a cost classification system

- Handling resources that are shared by multiple programs, activities, or organizations

- Cost allocation methods
  - Time
  - Intensity of use
Conducting a cost study

1. Define Purpose/Scope
2. Literature Scan
3. Solicitation of experts
4. Development of Cost Categories
5. Instrument Pilot Test/Validation
6. Data Collection
7. Cost Analysis
Conducting a cost study: focus

- Program/intervention
- Cross-cutting infrastructure (e.g. PHAB stds)
  - Assessment
  - Surveillance
  - Planning
  - Policy development
- Organization
- Industry/enterprise
Cost data collection methods

- Direct observation methods
- Time studies and time-and-motion methods
  - random moment time sampling
- Activity logs
- Analysis of administrative records
- Surveys
  - Program delivery staff
  - Program managers/directors
- Group process methods with vignettes
Examples: Survey methods

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

Analyzing costs

Average vs. marginal costs?

Compared to what?
- Doing nothing
- Status quo
- Other settings, implementation strategies
- Other activities/interventions

Quantifying variation in costs
- Scale and scope
- Context
Analyzing costs: example

**WISEWOMAN Cost Analysis**

**Steps:**
1. Calculate total costs for 6-month period
2. Divide by # women screened in same period

<table>
<thead>
<tr>
<th>Activity</th>
<th>Per capita costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outreach/follow-up</td>
<td>$22</td>
</tr>
<tr>
<td>Screening</td>
<td></td>
</tr>
<tr>
<td>WISEWOMAN screening</td>
<td>$98</td>
</tr>
<tr>
<td>Annual prescriptions</td>
<td>$26</td>
</tr>
<tr>
<td>Additional office visits</td>
<td>$3</td>
</tr>
<tr>
<td>Total screening</td>
<td>$127</td>
</tr>
<tr>
<td>Intervention</td>
<td>$121</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$270</strong></td>
</tr>
</tbody>
</table>

Cost-Effectiveness of WISEWOMAN, a Program Aimed at Reducing Heart Disease Risk among Low-Income Women. Eric A. Finkelstein, PhD, Olga Khavjou, MA, and Julie C. Will, PhD
Analyzing costs

- Identifying determinants of costs
- Cost function estimation
- Examining cost heterogeneity and efficiency
  - Stochastic frontier analysis
  - Data envelopment analysis
Analyzing costs

Explaining the efficiency of local health departments in the U.S.: an exploratory analysis

Kankana Mukherjee · Rexford E. Santerre · Ning Jackie Zhang

DOI 10.1007/s10729-010-9136-5
Resources

- 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


- RTI. Substance Abuse Services Cost Analysis Program. 
Cost-effectiveness analyses: prevention vs treatment

ROI analyses: worksite health promotion

Estimating value in public health: levels of analyses

- Macro-level analysis
- Infrastructure-level analysis
- Intervention-level analysis
- Process-level analysis
**Example:**

**Macro-level Analysis**

NATIONAL RETURN ON INVESTMENT OF $10 PER PERSON
(Net Savings in 2004 dollars)

<table>
<thead>
<tr>
<th></th>
<th>1-2 Years</th>
<th>5 Years</th>
<th>10-20 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. Total</strong></td>
<td>$2,848,000,000</td>
<td>$16,543,000,000</td>
<td>$18,451,000,000</td>
</tr>
<tr>
<td><strong>ROI</strong></td>
<td>0.96:1</td>
<td>5.6:1</td>
<td>6.2:1</td>
</tr>
</tbody>
</table>

Source: Trust for America’s Health, 2009
Example:
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
II. Tools for economic evaluation in public health
Existing public use tools

AHRQ Asthma ROI calculator
http://nhqrnet.ahrq.gov/asthma/

CDC Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC)
http://apps.nccd.cdc.gov/sammec/

CDC LeanWorks Obesity Cost Calculator
http://www.cdc.gov/leanworks/costcalculator/index.html

RWJF Diabetes Self-Management ROI Calculator
http://www.diabetesinitiative.org

HIMSS Electronic Health Record ROI
http://www.himss.org/ASP/ROI_Calc.asp
Existing public use tools

County Health Calculator: impact of education and income
http://countyhealthcalculator.org/

OSHA Safety Pays Cost Calculator for Occupational Health

Economic Impact Analysis Tool
https://www.raconline.org/econtool/

CommunityFlu 2.0
http://www.cdc.gov/flu/pandemic-resources/tools/index.htm

Integrated Disease Surveillance and Response Cost Calculator
http://www.cdc.gov/globalhealth/healthprotection/ghsb/idsr/default.htm

Community Health Advisor: physical activity and tobacco prevention
http://www.communityhealthadvisor.org/
Estimating value in public health: National Public Health Improvement Initiative

- **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
The Public Health ROI Calculator:

PUBLIC HEALTH RETURN ON INVESTMENT TEMPLATE

Demonstration Version

October 29, 2012

Prepared for:
The Association of State and Territorial Health Officials

Prepared by:
Glen P. Mays, Ph.D., M.P.H.
Center for Public Health Services and Systems Research
University of Kentucky

Available for download: http://works.bepress.com/glen_mays/64/

Supported by the U.S. Centers for Disease Control and Prevention's National Public Health Improvement Initiative
The Public Health ROI Calculator: Demonstration Version

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

Available for download: [http://works.bepress.com/glen_mays/64/](http://works.bepress.com/glen_mays/64/)
Pathways to Realizing ROI for QI

- Reductions in standard operating costs
  - Greater efficiencies realized

- Revenue enhancements
  - Increased cost reimbursement

- Increased productivity of agency functions
  - Increased service encounters

- Decreased time to produce outputs
  - Reduced cycle time process

Available for download: [http://works.bepress.com/glen_mays/64/](http://works.bepress.com/glen_mays/64/)
# Planning and Development Costs

| Cost Category | Pre-Implementation (Baseline) | Post-Implementation (Year 1) | Year 2 ...
|---------------|-------------------------------|-----------------------------|----------
| Personnel Costs |                               |                             |          
| Non-Personal  |                               |                             |          
| • Contracted Services |                         |                             |          
| • Office Operations   |                            |                             |          
| • Facilities/Maint/Rent |                       |                             |          
| • Communications     |                            |                             |          
| • Equipment          |                            |                             |          
| • Construction/Renovation |                   |                             |          
| Other Direct Costs  |                               |                             |          
| Indirect Costs      |                               |                             |          

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# Routine Operating Costs

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Pre-Implementation (Baseline)</th>
<th>Post-Implementation (Year 1)</th>
<th>Year 2 …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Personal</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Contracted Services</td>
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<td></td>
</tr>
<tr>
<td>• Office Operations</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Facilities/Maint/Rent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Communications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Construction/Renovation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Direct Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Available for download: [http://works.bepress.com/glen_mays/64/](http://works.bepress.com/glen_mays/64/)
# Outcomes/Outputs

| Cost Category                        | Pre-Implementation | Post-Implementation (Year 1) | Year 2 ...
|--------------------------------------|--------------------|-----------------------------|----------
| Service Units Delivered              |                    |                             |          
| Required Production Time             |                    |                             |          
| Target Population Reach              |                    |                             |          
| Other Outcomes/Outputs               |                    |                             |          

Available for download: [http://works.bepress.com/glen_mays/64/](http://works.bepress.com/glen_mays/64/)
How the Tool Calculates ROI

- \( \text{ROI} = \text{Benefits} - \text{Costs} \)

Improvements in Routine Operations – Investment Costs

\( \text{Investment Costs} \)

(Routine Operations + Other Outcomes) – Investment Costs

\( \text{Investment Costs} \)

Available for download: http://works.bepress.com/glen_mays/64/
Incorporates Standard Accounting Practices in ROI Calculation

- **Amortization**
  - The cost of an investment should not be absorbed entirely in the first year
  - Amortization rate spreads the agency’s cost/investment over the useful life of the product

- **Present value**
  - The relative worth of a single dollar changes over time
  - Accurate comparisons are made by applying a discount rate (inflation) to
    - Costs
    - Returns

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Tool Can Be Used throughout Project

- Prospectively – Planning Phase
- Implementation Phase
- Retrospectively – Post Implementation

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Example Quality Improvement Initiative

Improving the Connecticut Department of Public Health Databases

- AIM: Make three DPH databases compliant with the CT DPH policy on collecting sociodemographic data (similar to federal OMB-15 directive in 1997)

- Increase the percentage of compliant databases from 4% to 10%

- Put a plan in place to modify the remaining databases

- Make sure that all newly-designed databases are aligned with the DPH data collection policy.

- The modification process for the targeted databases was implemented and this strategy was followed on a continuous quality improvement basis through 2014.

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health
## Salary Costs for QI Initiative Team

<table>
<thead>
<tr>
<th>Personnel (see below)</th>
<th>Reporting Period:</th>
<th>Pre-Implementation - Baseline</th>
<th>Implementation Period 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>From</td>
<td>To</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/1/12</td>
<td>8/19/12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Salary and Fringe</th>
<th>FTE %</th>
<th>Cost</th>
<th>Salary and Fringe</th>
<th>FTE %</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Sponsor - Epidemiologist 4</td>
<td>5.00%</td>
<td>87,931.00</td>
<td>$ 1,721.98</td>
<td>3.00%</td>
<td>87,931.00</td>
<td>$ 725.43</td>
</tr>
<tr>
<td>Project leader-Epidemiologist 2</td>
<td>20.00%</td>
<td>53,143.00</td>
<td>$ 4,162.87</td>
<td>20.00%</td>
<td>53,143.00</td>
<td>$ 2,922.87</td>
</tr>
<tr>
<td>Epidemiologist 4</td>
<td>4.00%</td>
<td>87,931.00</td>
<td>$ 1,377.59</td>
<td>2.00%</td>
<td>87,931.00</td>
<td>$ 483.62</td>
</tr>
<tr>
<td>Epidemiologist 3</td>
<td>6.00%</td>
<td>76,884.00</td>
<td>$ 1,806.77</td>
<td>5.00%</td>
<td>76,884.00</td>
<td>$ 1,057.16</td>
</tr>
<tr>
<td>Section Chief: Practitioner Licensing</td>
<td>5.00%</td>
<td>100,000.00</td>
<td>$ 1,958.33</td>
<td>5.00%</td>
<td>100,000.00</td>
<td>$ 1,375.00</td>
</tr>
<tr>
<td>Manager Vital Statistics</td>
<td>5.00%</td>
<td>86,300.00</td>
<td>$ 1,690.04</td>
<td>5.00%</td>
<td>86,300.00</td>
<td>$ 1,186.63</td>
</tr>
<tr>
<td>Section Chief: IT</td>
<td>4.00%</td>
<td>100,000.00</td>
<td>$ 1,566.67</td>
<td>2.00%</td>
<td>100,000.00</td>
<td>$ 550.00</td>
</tr>
</tbody>
</table>

*Source: Susan Logan, MS, MPH, Connecticut Department of Public Health*
## Salary Costs for QI Initiative Team: Implementation Periods 2 and 3

<table>
<thead>
<tr>
<th>Personnel (see below)</th>
<th>From</th>
<th>To</th>
<th>From</th>
<th>To</th>
<th>FTE %</th>
<th>Salary and Fringe</th>
<th>Cost</th>
<th>FTE %</th>
<th>Salary and Fringe</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Sponsor - Epidemiologist 4</td>
<td>12/12</td>
<td>12/31/13</td>
<td>1/14</td>
<td>12/31/14</td>
<td>6.00%</td>
<td>87,931.00</td>
<td>$5,715.52</td>
<td>6.00%</td>
<td>87,931.00</td>
<td>$5,275.86</td>
</tr>
<tr>
<td>Project leader-Epidemiologist 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.00%</td>
<td>53,143.00</td>
<td>$4,605.73</td>
<td>8.00%</td>
<td>53,143.00</td>
<td>$4,251.44</td>
</tr>
<tr>
<td>Epidemiologist 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.00%</td>
<td>87,931.00</td>
<td>$3,810.34</td>
<td>4.00%</td>
<td>87,931.00</td>
<td>$3,517.24</td>
</tr>
<tr>
<td>Epidemiologist 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>-</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>Section Chief: Practitioner Licensing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>-</td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>Manager Vital Statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.00%</td>
<td>86,300.00</td>
<td>$2,804.75</td>
<td>3.00%</td>
<td>86,300.00</td>
<td>$2,589.00</td>
</tr>
<tr>
<td>Section Chief: IT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.00%</td>
<td>100,000.00</td>
<td>$3,250.00</td>
<td>3.00%</td>
<td>100,000.00</td>
<td>$3,000.00</td>
</tr>
</tbody>
</table>

**Data quality committee reviewing databases and overseeing fixes (Impl Prds 2 - 3)**

**Source:** Susan Logan, MS, MPH, Connecticut Department of Public Health
## Non-Personnel Investment Costs: Planning and Implementation Periods

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Baseline - Pre-implementation</th>
<th>Implementation - Year 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From     To</td>
<td>From     To</td>
</tr>
<tr>
<td><strong>Baseline - Pre-implementation</strong></td>
<td>4/1/12 8/19/12</td>
<td>8/20/12 11/30/12</td>
</tr>
<tr>
<td><strong>Implementation - Year 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Contracted services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other contracted services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifications done - 5 hours at $40.00/hr</td>
<td></td>
<td>200.00</td>
</tr>
<tr>
<td><strong>Office operations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>paper ($5/ream) and toner($602/crtndg)</td>
<td>303.50</td>
<td>303.50</td>
</tr>
<tr>
<td>Office supplies/postage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>flip charts (2 cartons at $41/crtnd), pens (4 dzn at $11.82/dzn), markers (4 at $2 ea), post-its ($15/18 pk)</td>
<td>76.26</td>
<td>76.26</td>
</tr>
<tr>
<td>Travel/conferencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinners ($26 per) and Taxis ($25 per): Travel to Portland, OR in Apr. and Charlotte, NC in Dec.</td>
<td>1,050.00</td>
<td>1,050.00</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other office operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>frames for certificates of recognition/appreciation (11 at $11.70/ frame)</td>
<td></td>
<td>128.70</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 hours of writing article for DPH newsletter and creating story board</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Subtotal direct costs

- Baseline - Pre-implementation: $17,815.61
- Implementation - Year 1: $17,466.42

### Indirect costs

- Baseline - Pre-implementation: $-
- Implementation - Year 1: $-

### Total costs of investment in strategy

- Baseline - Pre-implementation: $17,815.61
- Implementation - Year 1: $17,466.42

### Years of expected utility from pre-implementation investments (for amortization)

- Baseline - Pre-implementation: 1.00
- Implementation - Year 1: $-

### Amortized Pre-Implementation Investment Costs

- $17,815.61

---

**Source:** Susan Logan, MS, MPH, Connecticut Department of Public Health
Determining Costs and Savings for Outcomes and Outputs: ROI Produced

- Baseline and Post Periods
- Measures of Production Time
- Time to analyze data with standardized sociodemographic categories (expected reduction)
- Time to review databases (improves over time)
- Improve Health Outcomes: Based on finding new cases in sociodemographic groups

- Taking into account the Investment and Routine Operating Costs Only
  - Implementation Period 1
    - Benefit (savings) was 64 cents for every dollar spent
  - Implementation Period 2
    - Cost was $2.21 for every dollar spent
- Adding in Outcomes
  - Implementation Period 1 and Overall
    - Savings was $17.05 ($18.16 overall) for every dollar spent

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health
Outcome/Output Measures: Production Time Costs and Savings

<table>
<thead>
<tr>
<th>Description: output/event and time frame</th>
<th>Baseline</th>
<th>Post Period - Year I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total events</td>
<td>Average time (days)</td>
</tr>
<tr>
<td>Time to analyze data with standardized sociodemographic categories</td>
<td>7.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Number of databases reviewed by project sponsor and leader</td>
<td>8.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Number of databases reviewed by data quality committee</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>4.52</td>
</tr>
</tbody>
</table>

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health
### Outcome/Output Measures: Reach Outcomes: Rates

<table>
<thead>
<tr>
<th>Measures of Reach/Intermediate Outcomes</th>
<th>Description: target population and outcome</th>
<th>Baseline</th>
<th>Post Period - Year I</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALSE</td>
<td></td>
<td>Numerator</td>
<td>Denominator</td>
</tr>
<tr>
<td>Finding cancer cases based on self-identified gender</td>
<td>Using SEER cancer registry as source data</td>
<td>343</td>
<td>75,250</td>
</tr>
<tr>
<td>Finding cases of reportable disease based on sociodemographic characteristics (e.g. black race)</td>
<td>Focusing program services for African-Americans throughout the CT</td>
<td>5,000</td>
<td>660,000</td>
</tr>
<tr>
<td>Finding cases of adult lead poisoning based on sociodemographic characteristics (e.g. Hispanic)</td>
<td>Finding more cases of hispanic origin</td>
<td>22</td>
<td>874,500</td>
</tr>
</tbody>
</table>

| Composite reach                         |                                             | 5,365 | 1,609,750 | 333.28 | 5,880 | 1,609,750 | 365.27 |

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health

Did not include data in ROI calculations (unchecked)
## Outcome/Output Measures: Health Outcomes Savings

☑ Check here to use these measures in ROI calculations (checked)

<table>
<thead>
<tr>
<th>Measures of Health-Related Outcomes</th>
<th>Baseline</th>
<th>Post Period - Year 1</th>
<th>Post Period - Year 2</th>
<th>Post Period - Year 3</th>
<th>Est. Cost per Unit Outcome**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>Preventing cancer deaths (based on better follow-up) people who self-identify as other than male or female</td>
<td>Can prevent 5% of cancer deaths if invasive cancer found and reported</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Preventing readmissions for reportable diseases in blacks</td>
<td>Can reduce readmissions by 10%</td>
<td>500</td>
<td>550</td>
<td>600</td>
<td>660</td>
</tr>
<tr>
<td>Preventing further cases of adult lead poisoning in Hispanics in neighborhoods/communities</td>
<td>For every one person exposed and poisoned, there are 2 others exposed and potentially poisoned</td>
<td>44</td>
<td>60</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>Composite outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>561</td>
</tr>
<tr>
<td>Total value</td>
<td>-$5,644,000</td>
<td>-$6,185,000</td>
<td>-$6,670,000</td>
<td>-$7,300,000</td>
<td></td>
</tr>
</tbody>
</table>

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health
Return on Investment Analysis

II. Analysis INCLUDING Output and Outcome Measures (Production Time, Reach, and Health-Related Outcome Factors)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Implementation Period</th>
<th>Total (All Periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment in Project</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amortized Pre-Implementation Costs</td>
<td>$17,815.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ongoing Implementation Costs</td>
<td>$0.00</td>
<td>$14,766.42</td>
<td>$22,158.71</td>
</tr>
<tr>
<td>Total Annual Implementation Costs</td>
<td>$17,815.61</td>
<td>$14,766.42</td>
<td>$20,256.01</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td>$1.00</td>
<td>$0.97</td>
<td>$0.92</td>
</tr>
<tr>
<td>Total Discounted Annual Implementation Costs</td>
<td>$17,815.61</td>
<td>$14,336.33</td>
<td>$18,537.11</td>
</tr>
<tr>
<td><strong>Financial Gain/Loss Attributable to Project</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Changes in Operating Costs</td>
<td></td>
<td>$ (21,330.43)</td>
<td>$129,506.18</td>
</tr>
<tr>
<td>Estimated Changes in Revenue</td>
<td></td>
<td>$ -</td>
<td>$ -</td>
</tr>
<tr>
<td>Total Net Financial Gain/Loss</td>
<td></td>
<td>$ 21,330.43</td>
<td>$ (129,506.18)</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td></td>
<td>$ 0.97</td>
<td>$ 0.92</td>
</tr>
<tr>
<td>Total Discounted Annual Net Gain/Loss</td>
<td></td>
<td>$ 20,709.15</td>
<td>$(118,516.50)</td>
</tr>
<tr>
<td><strong>Non-Financial Gains/Losses Attributable to Project</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Production Time Gain/Loss</td>
<td></td>
<td>4.86</td>
<td>(20.40)</td>
</tr>
<tr>
<td>Monetary Value of Time Gain/Loss</td>
<td></td>
<td>$ 2,443.55</td>
<td>(11,396.54)</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td></td>
<td>$ 0.97</td>
<td>$ 0.92</td>
</tr>
<tr>
<td>Total Discounted Value of Time Gain/Loss</td>
<td></td>
<td>$ 2,372.38</td>
<td>$(10,429.45)</td>
</tr>
<tr>
<td><strong>Cumulative ROI including Time Cost</strong></td>
<td></td>
<td>$ 0.72</td>
<td>$(3.62)</td>
</tr>
<tr>
<td><strong>Estimated Changes in Health-Related Outcomes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated Cost per 1 Unit Improvement in Outcomes</td>
<td></td>
<td>$ 67.00</td>
<td>127.00</td>
</tr>
<tr>
<td>Monetary Value of Outcome Improvement/Loss</td>
<td></td>
<td>$ (95.12)</td>
<td>$ 1,250.05</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td></td>
<td>$ 0.97</td>
<td>$ 0.94</td>
</tr>
<tr>
<td>Total Discounted Value of Outcome Improvement/Loss</td>
<td></td>
<td>$ 525,242.72</td>
<td>$ 1,558,940.98</td>
</tr>
<tr>
<td><strong>Cumulative ROI including Value of Health-Related Outcomes</strong></td>
<td></td>
<td>$ 16.98</td>
<td>$ 18.49</td>
</tr>
<tr>
<td><strong>Cumulative ROI Including All Non-Financial Gains/Losses</strong></td>
<td></td>
<td>$ 17.05</td>
<td>$ 18.16</td>
</tr>
</tbody>
</table>

Source: Susan Logan, MS, MPH, Connecticut Department of Public Health
Example: Increase Enrollment in Plan First – Virginia’s Medicaid Family Planning Program

Source: Josh Czarda, Virginia Department of Health
## Step 1: Calculating All Costs Pre–Implementation – Implementation Phases

Source: Josh Czarda, Virginia Department of Health

### IMPLEMENT THE PUBLIC

Use this sheet to enter the personnel and non-personnel costs incurred specifically to design, develop, and implement the public health strategy that is the object of this ROI analysis. These costs represent the resources that have been invested in the public health strategy each year. (Specific instructions below)

### Cost Category

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Reporting Period:</th>
<th>Pre-Implementation - Baseline</th>
<th>Implementation Period 1</th>
<th>Implementation Period 2</th>
<th>Implementation Period 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From</td>
<td>To</td>
<td>From</td>
<td>To</td>
<td>From</td>
</tr>
<tr>
<td>Performance Improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Improvement</td>
<td></td>
<td>5.00%</td>
<td>1,226.00</td>
<td>1.00%</td>
<td>1,758.00</td>
</tr>
<tr>
<td>Program Manager</td>
<td></td>
<td>0.00%</td>
<td>-</td>
<td>100.00%</td>
<td>43,333.00</td>
</tr>
<tr>
<td>Program Analyst</td>
<td></td>
<td>0.00%</td>
<td>-</td>
<td>100.00%</td>
<td>30,000.00</td>
</tr>
<tr>
<td>Other Staff Meeting Time</td>
<td></td>
<td>0.00%</td>
<td>-</td>
<td>1.50%</td>
<td>250,000.00</td>
</tr>
<tr>
<td>Other Staff Meeting Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contracted services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training and education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other contracted services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Printing</td>
<td></td>
<td>200.00</td>
<td>-</td>
<td>5,000.00</td>
<td>-</td>
</tr>
<tr>
<td>Office supplies/postage</td>
<td></td>
<td>250.00</td>
<td>-</td>
<td>2,500.00</td>
<td>-</td>
</tr>
<tr>
<td>Books/periodicals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel/conferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td>100.00</td>
<td>-</td>
<td>2,000.00</td>
<td>-</td>
</tr>
<tr>
<td>Other office operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facilities/Maintenance/Rent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer hardware</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction/renovation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other direct costs not</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal direct costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect cost percentage (see</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Total Costs

- Pre-Implementation - Baseline: $2,375.00
- Implementation Period 1: $162,547.25
- Implementation Period 2: $212,730.00
- Implementation Period 3: $72,304.17
Step 2: Measuring Immediate Impact

Measuring Increased Revenue from Medicaid Billing Through May 2013

Total Paid 2011
Total Paid 2012
2013 Claims

Source: Josh Czarda, Virginia Department of Health
### Initial View of Short Term ROI Calculations Using the Tool

#### ROI for Public Health Strategies

**Return on Investment Analysis**

**Virginia**

**Joshua Czarda**

### 1. Analysis EXCLUDING Output, Production Time and Outcome Factors

#### Discount Rate: 3%

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation (Baseline)</th>
<th>Implementation Period</th>
<th>Total (All Periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment in PH Strategy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Investment Costs</td>
<td>$475.00</td>
<td>$475.00</td>
<td>$475.00</td>
</tr>
<tr>
<td>Routine Operating Costs</td>
<td>$162,547.25</td>
<td>$212,730.00</td>
<td>$72,304.17</td>
</tr>
<tr>
<td><strong>Total Annual Costs</strong></td>
<td>$475.00</td>
<td>$163,022.25</td>
<td>$213,205.00</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td>1.00</td>
<td>0.97</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>Total Discounted Annual Investment Costs</strong></td>
<td>$475.00</td>
<td>$158,274.03</td>
<td>$200,966.16</td>
</tr>
</tbody>
</table>

#### Financial Gain/Loss Attributable to PH Strategy

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation (Baseline)</th>
<th>Implementation Period</th>
<th>Total (All Periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Changes in Operating Costs</td>
<td>$42,200.00</td>
<td>$12,260.00</td>
<td>$21,200.00</td>
</tr>
<tr>
<td>Estimated Changes in Revenue</td>
<td>$476,888.00</td>
<td>$770,857.00</td>
<td>$296,034.00</td>
</tr>
<tr>
<td><strong>Total Net Financial Gain/Loss</strong></td>
<td>$434,688.00</td>
<td>$758,597.00</td>
<td>$274,834.00</td>
</tr>
<tr>
<td>x Present Value Factors (see below)</td>
<td>0.97</td>
<td>0.94</td>
<td>0.92</td>
</tr>
<tr>
<td><strong>Total Discounted Annual Net Gain/Loss</strong></td>
<td>$422,027.18</td>
<td>$715,050.43</td>
<td>$251,512.04</td>
</tr>
</tbody>
</table>

### Return on Investment Summary

<table>
<thead>
<tr>
<th></th>
<th>Pre-Implementation (Baseline)</th>
<th>Implementation Period</th>
<th>Total (All Periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undiscounted Annual Net Cash Flows</td>
<td>$ (475)</td>
<td>$271,666</td>
<td>$545,392</td>
</tr>
<tr>
<td>Cumulative ROI</td>
<td>2.66</td>
<td>3.16</td>
<td>3.26</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>$962,271.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Rate of Return</td>
<td>57.29%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
III. Examples of economic evaluation in public health
Economies of scope and scale

Institutional and Economic Determinants of Public Health System Performance

Glen P. Mays, PhD, MPH, Megan C. McHugh, MPA, Kyumin Shim, PhD, Natalie Perry, DrPH, MPH, DrPH, MHSA, and Ramal Moonesinghe, PhD

Mays et al. 2006
Variations in policy design, implementation, enforcement

Estimated Effects of Smoke-free Policies on AMI admissions

<table>
<thead>
<tr>
<th>Study ID</th>
<th>ES (95% CI)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helena Montana</td>
<td>0.60 (0.21, 0.99)</td>
<td>1.76</td>
</tr>
<tr>
<td>Pueblo Colorado</td>
<td>0.73 (0.63, 0.85)</td>
<td>10.13</td>
</tr>
<tr>
<td>Piedmont Italy</td>
<td>0.89 (0.81, 0.98)</td>
<td>12.14</td>
</tr>
<tr>
<td>Bowling Green Ohio</td>
<td>0.61 (0.55, 0.67)</td>
<td>14.24</td>
</tr>
<tr>
<td>New York State</td>
<td>0.80 (0.80, 0.80)</td>
<td>17.20</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.89 (0.81, 0.97)</td>
<td>12.56</td>
</tr>
<tr>
<td>Saskatoon Canada</td>
<td>0.87 (0.84, 0.90)</td>
<td>16.35</td>
</tr>
<tr>
<td>Rome Italy</td>
<td>0.89 (0.85, 0.93)</td>
<td>15.61</td>
</tr>
<tr>
<td>Overall</td>
<td>0.81 (0.76, 0.86)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

NOTE: Weights are from random effects analysis

Glantz 2008
Example: comparison of alternative implementation strategies

- Limited adoption of DPP: cost, staffing
- Non-inferiority trial comparing standard intervention to CHW-delivered intervention
- Clinical and cost-effectiveness estimates
Estimating the aggregate value of public health spending

Change in Local Public Health Spending, 1993-2005

Fraction of Agencies

35%

65%

Change in Per Capita Spending (Current Dollars)
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
## 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

Medicare spending per recipient

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

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

<table>
<thead>
<tr>
<th>Public health cost</th>
<th>$7.2M</th>
</tr>
</thead>
<tbody>
<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. forthcoming 2012
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
Example: Program ROI

- Quasi-experimental research design
- Three year demonstration period + 1 year extension
- Measured expenditures for CCP participants one year before participation and up to 3 years after participation
- Constructed a statistically-matched comparison group of Medicaid recipients not served by CCP
- Use difference-in-difference models to estimate impact, controlling for time-varying covariates
Examples: Program ROI

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

Felix, Mays et al. 2011
[http://content.healthaffairs.org/content/30/7/1366.abstract](http://content.healthaffairs.org/content/30/7/1366.abstract)
IV. Small Group Exercise
V. DSHS Examples
VI. Interpretation, Limitations and Caveats
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

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Blog: publichealtheconomics.org

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