Maximizing ROI: Laboratories and the Value of Next-Generation Public Health

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Overview

- Drivers of change in public & population health
- Laboratory roles in next-gen public health
- Making the case for laboratory ROI and value
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
Drivers of population health failures

Proportional Contribution to Premature Death

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

Public health’s role in population health: 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
Pressures for public health change

Next Generation Population Health Improvement

- Hospital community benefit
- Recession shocks
- Innovation Center Funding
- ACOs and PCMHs
- Value-based payment
- Employer wellness incentives
- Health insurance expansions
- Community Transformation Grants
- Public health Accreditation
- Health information exchange
Learning how to succeed with population health strategies

- Designed to achieve large-scale health improvement: neighborhood, community, state
- 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
- Gaps and asymmetries in information
- Difficulties measuring progress
- Weak and variable institutions & infrastructure
- Imbalance: resources vs. needs
- Stability & sustainability of funding

Ostrom E. 1994
Standardization vs. Customization in public health delivery

**Standardization**
- ▼ Harmful variation
- ▼ Wasteful variation
- ▼ Inequitable variation
- ▼ Race to the bottom
- ▲ Network externalities: interoperability/coordination

**Customization**
- ▲ Target resources to greatest needs/risks
- ▲ Tailor approaches to values & preferences of stakeholders
- ▲ Deploy unique resources & skills to their best purposes

Effectiveness
Efficiency
Equity
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.
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

Changes in public health capability
Delivery of IOM recommended public health activities

- Assurance
- Policy
- Assessment

% of activities

- ↑ 10%
- ↓ 5%

1998 2006 2012

Variation in Public Health Delivery

Delivery of IOM recommended public health activities, 2012

Organizations contributing to local public health production

<table>
<thead>
<tr>
<th>% Change 2006-2012</th>
<th>Scope of Production 2012</th>
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<tr>
<td>-50%</td>
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- Local health agency
- Other local government
- State health agency
- Other state government
- Hospitals
- Physician practices
- Community health centers
- Health insurers
- Employers/business
- Schools
- CBOs

Inter-organizational relationships in public health delivery

Laboratory roles in next generation public health

- Expanding volume & quality of information
- Accelerating timeliness of testing & dissemination
- Examining cost/benefit trade-offs of new testing
- Innovating information transmission/exchange
- Harvesting laboratory information flows for research
- Using real-time laboratory information to target and tailor public health interventions
Enhancing laboratory capacity requires ROI

- Health AND economic returns
- Information production AND application
- Multiple users of laboratory information
  - Public health agencies
  - Health care providers
  - Other regulatory bodies
  - Industry
  - Individuals/families/communities

Key concept: value of information (VOI)
  - How does new information change decision-making & action
Example: from variation to ROI

Gini = 0.485

Public health agency expenditures per capita, 2010
Example: from variation to ROI

- 62% growth
- 38% decline
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

Quintile 1
Quintile 2
Quintile 3
Quintile 4
Quintile 5

Quintiles of public health spending/capita

ROI for public health spending

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
How does ROI vary across communities?

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 ROI 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
Applying the ROI lens to laboratories

1. Identify the value chain
   information → action → outcome

2. Consider the roles of information volume/ completeness, quality, and timeliness

3. Identify the costs of information production

4. Use variation in information production to model downstream effects on actions and outcomes

5. Evaluate the value of effects using health and/or monetary metrics: e.g. cases detected, cases prevented, QALYs saved, costs avoided
Example: detecting food-borne illness

Mixed Results In Tracking Food Scares

Minnesota health officials investigate all reports of food-borne illness, but officials in many states do not. From 1990 to 2006, Minnesota reported 548 outbreaks, while Kentucky reported 18.

Reported outbreaks of food-related illness
Per 100,000 people, 1990 to 2006

Source: Centers for Disease Control and Prevention
Example: timeliness in case report response
The push and pull of laboratory ROI

- ROI is contingent on the flow of information into and out of the laboratory
  - The right tests in the right circumstances at the right time
  - Accurate specimen collection & transport
  - Timely access and use of test results

- Labs can play important roles in push and pull
  - Monitor & feedback on submission volume & quality
  - Reminders & prompts
Considering economies of scale and scope

Scale (Population in 1000s)

Scope (% of Activities)

Quality (Perceived Effectiveness)
Adding fuel to the fire: 2012 Institute of Medicine Recommendations

- Identify components and costs of a “minimum package” of public health activities
- Allow greater flexibility in how states and localities use federal public health funds
- Implement national chart of accounts for tracking spending levels and flow of funds
- Expand research on costs and ROI of public health delivery

The importance of cost studies

Foundational Public Health Capabilities

- 3 state-specific studies to estimate current spending on FCs
- 1 national study to estimate FC resource requirements and cost function parameters

Public Health Delivery and Cost Studies

- 11 state-specific studies on cost variation
- 3 multi-state studies examining connections between spending, service delivery, and outcomes
PBRNs as Mechanisms for Learning

Translation & application

Identify Common questions of interest

Engaged practice settings

Research partner

Analysis & interpretation

Data exchange

Apply Rigorous research methods
Public Health PBRNs

- First cohort (December 2008 start-up)
- Second cohort (January 2010 start-up)
- Affiliate/Emerging PBRNs (2011-14) (New in 2013)
Laboratories and learning systems in public health

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