Laboratories and the Value Stream 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 value and ROI
Failures in population health

Figure 1. There are large differences in life expectancy and health care spending across OECD countries 2008\(^1\)

1. Or latest year available.
Source: OECD Health Data 2010.
Failures in population health

Premature Deaths per 100,000 Residents

Commonwealth Fund 2012
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 change in U.S. public health

- Hospital community benefit
- Recession shocks
- Innovation Center Funding
- ACOs and PCMHs
- Value-based payment
- Health insurance expansions
- Community Transformation Grants
- Employer wellness incentives
- Public health Accreditation
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.
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.

Internal:
- Inference

External:
- Experience

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 knowledge of value

- 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
Pathways for research and learning about public health value

- Measuring practice & performance
- Detecting variation in practice
- Examining determinants of variation
  - Organization
  - Financing
  - Workforce
- Determining consequences of variation
  - Health outcomes
  - Economic outcomes
- Testing strategies to reduce **harmful**, **wasteful**, & **inequitable** variation in practice and outcomes

**Descriptive**

**Inferential**

**Translational**
Variation in Public Health Practice in the U.S.
Delivery of IOM recommended public health activities

Variation in Public Health Practice in the U.S.
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>
</tr>
</thead>
<tbody>
<tr>
<td>-50%</td>
<td>10%</td>
</tr>
<tr>
<td>-30%</td>
<td>30%</td>
</tr>
<tr>
<td>-10%</td>
<td>50%</td>
</tr>
</tbody>
</table>

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
Economics in public health variation

Public health agency expenditures per capita, 2010

Gini = 0.485
Economics in public health variation

Percent of communities

Change in per-capita expenditures ($), 1993-2010

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

Estimating value 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
Applying a value lens to laboratories

- Identify the value chain
  information → action → outcome

- Consider the roles of information **volume**, completeness, **quality**, and **timeliness**

- Identify the **costs** of information production

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

- 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**

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**Local Variation In Public Health Preparedness: Lessons From California**

Even in California—one of the best-prepared states—much work remains to ensure preparedness for a public health emergency.

by Nicole Lurie, Jeffrey Wasserman, Michael Stoto, Sarah Myers, Poki Narmkung, Jonathan Fielding, and Robert Burciaga Valdez

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**EXHIBIT 1**

Characteristics Of Local Public Health Agencies (LPHAs) Participating In Test Of Response To Case Reports, 2004

<table>
<thead>
<tr>
<th>LPHA</th>
<th>Region</th>
<th>Population served(a)</th>
<th>Urban/rural(b)</th>
<th>Mean time until calls returned (minutes)</th>
<th>Longest period before calls returned (minutes)</th>
<th>Number of calls not returned</th>
<th>Percent “warm transfers”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Midwest</td>
<td>Small</td>
<td>Rural</td>
<td>93</td>
<td>630</td>
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<td>44</td>
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<tr>
<td>2</td>
<td>Midwest</td>
<td>Medium</td>
<td>Rural</td>
<td>51</td>
<td>350</td>
<td>1</td>
<td>57</td>
</tr>
<tr>
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<td>Medium</td>
<td>Urban</td>
<td>4</td>
<td>6</td>
<td>0</td>
<td>88</td>
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<tr>
<td>4</td>
<td>Midwest</td>
<td>Large</td>
<td>Urban</td>
<td>14</td>
<td>30</td>
<td>0</td>
<td>50</td>
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<tr>
<td>5</td>
<td>Midwest</td>
<td>Large</td>
<td>Urban</td>
<td>10</td>
<td>23</td>
<td>0</td>
<td>38</td>
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Lurie et al. 2004
Multi-Network Practice and Outcome Variation Examination Study (MPROVE)

- Identify service delivery measures for selected, high-value public health services
- Create a registry of measures collected consistently across local communities
- Profile geographic variation in the delivery of selected public health services across local communities
- Decompose variation into attributable components:
  - need-sensitive or preference-sensitive factors
  - supply-sensitive factors
- Examine associations between service delivery & outcomes
## Participating MPROVE networks

<table>
<thead>
<tr>
<th>Network</th>
<th>State Agencies</th>
<th>Local Agencies</th>
<th>Academic Units</th>
<th>Other</th>
<th>Total</th>
<th>Lead Institution</th>
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</thead>
<tbody>
<tr>
<td>CO</td>
<td>1</td>
<td>55</td>
<td>2</td>
<td>15</td>
<td>73</td>
<td>Association</td>
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<td>FL</td>
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<td>3</td>
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<tr>
<td>MN</td>
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<td>75</td>
<td>1</td>
<td>1</td>
<td>78</td>
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<td>36</td>
<td>2</td>
<td>1</td>
<td>40</td>
<td>Local agency</td>
</tr>
<tr>
<td>NJ</td>
<td>1</td>
<td>100</td>
<td>2</td>
<td>1</td>
<td>104</td>
<td>Academic</td>
</tr>
<tr>
<td>TN</td>
<td>1</td>
<td>16</td>
<td>2</td>
<td>1</td>
<td>20</td>
<td>Academic</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>349</strong></td>
<td><strong>12</strong></td>
<td><strong>22</strong></td>
<td><strong>389</strong></td>
<td></td>
</tr>
</tbody>
</table>
MPROVE Measure Domains

- Communicable disease control
- Chronic disease prevention
- Environmental health protection
MPROVE Measurement Dimensions

- **Availability/scope**: are selected services/activities produced or performed by the public health agency or delivery system

- **Volume/intensity**: absolute or relative frequency of service delivery over a given unit of time

- **Capacity**: ratio of inputs to size of the relevant target population or risk (e.g. sanitarians per 1000 septic tanks, food safety inspectors per 1000 licensed food vendors)

- **Reach**: percent of the target population reached by the activity
MPROVE Measurement Dimensions

- **Quality-Appropriateness**: Does the public health agency and/or system act based on objectively measured health needs and risk profiles of the population served? What is the degree of concordance between a community’s documented health needs/risks and the scope of public health activities performed by the public health agency or the system as a whole?

- **Quality-Effectiveness/Fidelity**: Does the public health agency and/or system implement its activities based on available scientific knowledge and fidelity to evidence-based guidelines? To what extent are programs and services concordant with evidence-based guidelines and professional consensus standards?

- **Quality-Timeliness**: Are public health activities implemented at the appropriate points in time to maximize health protection and minimize the risk of disease transmission or injury?

- **Quality-Community Centeredness/Engagement**: To what extent are relevant stakeholders engaged in planning, priority-setting, selection, and implementation of public health activities undertaken by the public health agency and/or system? To what extent are public health activities tailored appropriately to at-risk population groups based on the groups’ values, preferences, needs, knowledge, skills, and resources?
MPROVE Measurement Dimensions

- **Quality-Efficiency**: To what extent are public health activities implemented in ways that optimize the use of financial and human resources? To what extent do implementation processes avoid waste and delays in service? To what extent do the benefits of public health activities justify their costs?

- **Quality-Equity**: Are there disparities in the reach of public health activities to different population sub-groups defined by personal characteristics such as race, ethnicity, geography, or socio-economic status? Are there disparities in effectiveness, timeliness, community-centeredness, and/or efficiency?
Example: timeliness of enteric disease investigations

State public health research network

Multi-network Practice and Outcome Variation Examination Study (MPROVE) 2014
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)
PBRNs as Mechanisms for Learning

- Identify Common questions of interest
- Engaged practice settings
- Research partner
- Translation & application
- 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

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.

Implement
Apply the plan in pilot and control settings.

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

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.

Internal

External

For more information

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