Tougher than Rocket Science, or Just Messier?
Using Research to Improve U.S. Public Health Delivery

Glen P Mays, University of Kentucky

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Using Research to Improve U.S. Public Health Delivery

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University of Victoria | Renewing Public Health Systems & Services | 9 October 2014
Overview

- Why study public health systems?
- Examples of systems research in public health
  - Delivery system organization & structure
  - Finance and economics
- Resources for advancing the field
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

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
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

Commonwealth Fund 2012
Drivers of population health failures

Drivers of population health failures

>75% of US health spending is attributable to conditions that are largely preventable

– Cardiovascular disease
– Diabetes
– Lung diseases
– Cancer
– Injuries
– Vaccine-preventable diseases and sexually transmitted infections

<5% of US health spending is allocated to prevention and public health

CDC 2008 and CMS 2011
Evidence-based public health strategies reach less than two-thirds of U.S. populations at risk:

- Smoking cessation
- Influenza vaccination
- Hypertension control
- Nutrition & physical activity programs
- HIV prevention
- Family planning
- Substance abuse prevention
- Interpersonal violence prevention
- Maternal and infant home visiting for high-risk populations
A field of inquiry examining the **organization**, **financing**, and **delivery** of public health services at local, state and national levels, and the **impact** of these activities on **population health**

Strategies to promote health and prevent disease & injury on a population-wide basis: programs, policies, administrative practices

Mays, Halverson, and Scutchfield. 2003
PHSSR’s place in the continuum

**Intervention Research**
- What works – proof of efficacy
- Controlled trials
- *Guide to Community Preventive Services*

**Services/Systems Research**
- How to organize, implement and sustain in the real-world
  - Reach
  - Enforcement/Compliance
  - Quality/Effectiveness
  - Cost/Efficiency
  - Equity/Disparities
- Impact on population health
- Comparative effectiveness & efficiency
Striving for authenticity in practice-based research

- Research that tests effectiveness & impact of public health practices in real-world *public health settings*
- Research designed to address uncertainties and information needs of real-world public health *decision-makers*
- Research that evaluates the implementation and impact of *innovations in practice*
- Research that uses *observations generated through public health practice* to produce new knowledge
Complexity in public health delivery systems

Health & Social Systems
- Resources & expertise
- Participation incentives
- Compatibility of missions
- Scale of operations

Public Health Agencies
- Legal authority
- Governing structure
- Leadership
- Staffing levels & mix
- Scope of services
- Intergovernmental relationships

Population & Environment
- Needs
- Preferences
- Risks
- Threats
- Resources
- Perceptions

Strategic Interactions
- Scope of activity
- Division of responsibility
- Distribution of effort
- Nature & intensity of relationships

Decision Support
- Accreditation
- Performance measures
- Practice guidelines
- Quality improvement

Outputs and Outcomes
- Reach
- Effectiveness
- Timeliness
- Adherence to EBPs
- Efficiency
- Equity

Mays et al 2009
A Key PHSSR Goal: 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
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
Diffusion of Public Health PBRNs

First cohort (December 2008 start-up)
Second cohort (January 2010 start-up)
Affiliate/Emerging PBRNs (2011-14)
PBRNs as Mechanisms for Learning

Translation & application

Engaged practice settings

Identify Common questions of interest

Research partner

Apply Rigorous research methods

Analysis & interpretation

Data exchange

Identify Engaged practice settings

Data exchange & analysis

Translation & application

Engaged practice settings

Identify Common questions of interest

Research partner

Translate 

application
Pathways for research and learning about public health value

- Measuring practice & performance
- Detecting variation in practice
  - Organization
  - Financing
  - Workforce
- Examining determinants of variation
  - Law & policy
  - Information
  - Preference
- Determining consequences of variation
  - Health outcomes
  - Medical care use
  - Economic outcomes
  - Disparities
- Testing strategies to reduce harmful, wasteful, & inequitable variation in practice and outcomes
PBRN Research Progression

Delivery System Organization and Structure

Practice Variation

Volume, Intensity, and Quality of Delivery

Cost of Delivery

Value of Delivery
A PBRN Timeline

2008: Launch

2009: First cohort of PBRNs start

2010: Second cohort of PBRNs start

RIAs

Quick Strikes

2011: Affiliate networks start

RACE awards

2012: MPROVE Awards

2013: DACS Awards start

2014: DIRECTIVE Awards Announced

Affiliate networks start

RACE awards

MPROVE Awards

DACS Awards start

DIRECTIVE Awards Announced
PBRN Reach

- 1593 local public health agencies
- 35 state agencies
- 52 academic research units
- 58 professional & community organizations
Productivity & Dissemination

- 60 competitively awarded research projects
- 68 articles in peer-reviewed journals
- 221 presentations and conferences & meetings
- 51 reports & tools in the grey literature

Earned media in elite venues: Modern Healthcare, Forbes, Kaiser Health News, Men’s Health

- >15,000 downloads of Frontiers in PHSSR articles
- >8,000 downloads from Research Archive
- >2,000 page views on PublicHealthEconomics blog
National Coordinating Center

- Intramural research activities
  - **Public Health Value**: Cost estimation & economic evaluation
  - **Public Health Reform**: Effects of ACA on public health delivery

- Extramural research programs
  - Quick Strike studies
  - Natural Experiments in Public Health Delivery
  - Predoctoral and Postdoctoral Awards
  - Mentored Research Scientist Awards
National Coordinating Center

Data Development
- Periodic census surveys of local and state agencies
- National Longitudinal Survey of Public Health Systems
- Public Health Activities and Services Tracking (PHAST): compiling existing administrative data across states

Dissemination & Translation
- Weekly Work in Progress Webinars
- Open-access journal: Frontiers in PHSSR
- Newsletters, Podcasts, Blogs
- Briefings with policy stakeholders
Ongoing research: organization and structure

- Who contributes to public health delivery?
- How are roles and responsibilities divided?
- How and why do delivery systems vary and change over time?
- How do system structures affect public health delivery and outcomes?
Delivery of recommended public health activities

Variation in Scope of Public Health Delivery
Delivery of recommended public health activities, 2012

Inter-organizational relationships in public health delivery systems

Organizations contributing to local public health production

<table>
<thead>
<tr>
<th>Organization</th>
<th>% Change 2006-2012</th>
<th>Scope of Production 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local health agency</td>
<td>-50%</td>
<td>10%</td>
</tr>
<tr>
<td>Other local government</td>
<td>-30%</td>
<td>30%</td>
</tr>
<tr>
<td>State health agency</td>
<td>-10%</td>
<td>50%</td>
</tr>
<tr>
<td>Other state government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physician practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community health centers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health insurers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employers/business</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBOs</td>
<td></td>
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</tr>
</tbody>
</table>

Estimated crowd-out in hospital contributions to public health activities

Note: GLLAMM estimates, holding all other variables constant in the model
A typology of public health delivery systems

Scope                High       High         High          Mod           Mod         Low          Low
Centralization       Mod        Low         High          High           Low         High         Low
Integration          High       High         Low           Mod           Mod         Low          Mod

Source: Mays et al. 2010; 2012
Fixed-effects models control for population size, density, age composition, poverty status, racial composition, and physician supply.
Ongoing research: financing, costs and economics

- How does public health spending vary across communities and change over time?
- What are the health effects attributable to changes in public health spending?
- What are the medical cost effects attributable to changes in public health spending?
- What are the opportunities for improving efficiency in public health delivery?
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

Estimated value of public health spending

- 10% increase in public health spending in average community:

  - Public health cost: $594,291
  - Medical cost offset: -$515,114 (Medicare only)
  - LY gained: 148
  - Net cost/LY: $534
Economies of scale and scope in public health delivery systems

Jurisdiction Size

500k+

50k – 499k

<50k

% of Agencies

% of Population Served

Source: 2010 NACCHO National Profile of Local Health Departments Survey
Economies of scale and scope in public health delivery

Mays et al. 2013
Gains from regionalizing public health delivery

Mays et al. 2013
Measures of Interest

- **Availability/Scope:** specific activities produced
- **Volume/Intensity:** Frequency of producing activity over period of time
- **Capacity:** Labor and capital inputs assigned to an activity
- **Reach:** Proportion of target population reached by activity
- **Quality:** effectiveness, timeliness, equity of activity
- **Efficiency:** resources required to produce given volume of activity
MPROVE Example: Implementation of community-wide health education campaigns to promote physical activity
MPROVE Example: Implementation of educational interventions to reduce tobacco use and/or exposure
MPROVE Example: timeliness of enteric disease investigations

State public health research network

Multi-network Practice and Outcome Variation Examination Study (MPROVE) 2014
### Local Health Departments Engaged in Research Implementation & Translation Activities During Past 12 months

<table>
<thead>
<tr>
<th>Activity</th>
<th>PBRN Agencies</th>
<th>National Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percent/Mean</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identifying research topics</td>
<td>94.1%</td>
<td>27.5%</td>
</tr>
<tr>
<td>Planning/designing studies</td>
<td>81.6%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Recruitment, data collection &amp; analysis</td>
<td>79.6%</td>
<td>50.3%</td>
</tr>
<tr>
<td>Disseminating study results</td>
<td>84.5%</td>
<td>36.6%</td>
</tr>
<tr>
<td>Applying findings in own organization</td>
<td>87.4%</td>
<td>32.1%</td>
</tr>
<tr>
<td>Helping others apply findings</td>
<td>76.5%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Research implementation composite</td>
<td>84.04 (27.38)</td>
<td>30.20 (31.38)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>209</td>
<td>505</td>
</tr>
</tbody>
</table>

**Significance Levels:**
- ***: p < 0.001
- **: p < 0.01
Conclusions: getting inside the box

- Engagement of practice and research partners
- Sensitive and specific measures
- Research designs in real-world settings
- What works best in which settings and why
- Informed public health decisions
- Smarter investments and greater value
Toward a “rapid-learning system” in public health

For More Information

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