Model Simulation Techniques to Estimate the Cost of Foundational Public Health Services (FPHS)

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Toward a deeper understanding of costs & returns in public health

2012 Institute of Medicine Recommendations

- Identify the components & **costs of a minimum package** of public health services
  - Foundational capabilities
  - Array of Basic programs
- Implement a **national chart of accounts** for tracking spending & flow of funds
- Expand **research on costs & effects** of public health delivery

Defining What to Cost: The Public Health Package

- Washington State’s **Foundational Public Health Services**
- Ohio’s Public Health Futures Committee: **Minimum Package of Services**
- Colorado’s **Core Public Health Services**

National Workgroup on Foundational Public Health Capabilities – Public Health Leadership Forum (PHLF)

- The National Workgroup developed definitions of foundational public health capabilities, specified in the *Public Health Leadership Forum’s Articulation of Foundational Capabilities & Foundational Areas* (funded by RWJF, facilitated by RESOLVE):
  
  [http://www.resolv.org/site-healthleadershipforum/](http://www.resolv.org/site-healthleadershipforum/)

- FPHS Categories articulated and defined (V1)
DEFINITIONS

**Foundational Capabilities (FC):** Cross-cutting skills that need to be present in state & local health departments *everywhere* for the health system to work *anywhere*. Needed to support the foundational areas, & other programs & activities, key to protecting community health & achieving equitable health outcomes.

**Foundational Areas (FA):** substantive areas of expertise or program-specific activities in all state & local health departments essential to protect the community’s health.

**Foundational Public Health Services (FPHS):** Suite of skills, programs, & activities that must be available in state & local health departments system-wide; includes foundational capabilities & areas.
Defining what to cost

RESOLVE/Articulation of Definitions Workgroup (as of November 2014)

**Foundational Areas**

- **Programs/Activities Specific to an HD and/or Community Needs**
  - Most of an HD’s Work is “Above the Line”

**Foundational Public Health Services**

- Communicable Disease Control
- Chronic Disease & Injury Prevention
- Environmental Public Health
- Maternal, Child, & Family Health
- Access to and Linkage w/Clinical Care

**Foundational Capabilities**

- Assessment (Surveillance, Epidemiology, and Laboratory Capacity)
- All Hazards Preparedness/Response
- Policy Development/Support
- Communications
- Community Partnership Development
- Organizational Competencies (Leadership/Governance; Health Equity, Accountability/Performance Management, QI; IT; HR; Financial Management; Legal)
FPHS CE Workgroup & Research Team

- **Workgroup on Foundational Public Health Services (FPHS) Cost Estimation (CE)** convened to develop a methodology for estimating the resources required by governmental public health agencies to implement foundational public health services. Released a report on recommended methodology:

  **Estimating the Costs of Foundational Public Health Capabilities: A Recommended Methodology**


- Pilot-Tested Methodology with KHDA Finance Workgroup comprised of 6 Kentucky Health Departments (June-October 2014)

- Pre-Tested web-based survey questionnaire using FPHS V2 definitions with selected Ohio LHDs from AOHC (February 2015-May 2015).

- Ongoing national survey of LHDs in selected states (July 2015-present)
DATA COLLECTION INSTRUMENT: Basic Process Flow

- Adapted & modified Washington PBRN Delivery and Cost Studies (DACS) FPHS CE data-collection instrument.
- Questionnaire is divided into six sections:
  1) LHD **workforce composition** (# of employees per category)
  2) LHD **labor resource use** (average hrs/wk per occupational category)
  3) **Salary** and Indirects (wage rate scale: min-ave-max)
  4) Total **Annual Non-Labor** Costs (per FPHS category)
  5) **Needs assessment** (current relative to full attainment of projected need)
  6) **Scenario costing** of Community Health Assessment (Anchoring Vignette)
- Participating FPHS CE respondents receive a [unique link](#) to access questionnaire. Supporting documents include [Articulation of FPHS V2 Definitions](#) + [Excel version of survey instrument](#) + [survey instructions](#).
- FPHS CE respondent answers survey based on understanding of each FPHS capability and area as defined and articulated.
Development of FPHS CE Methodology

- Given inherent burden of complex survey, goal of efficiently self-administered to capture estimates that account for variation in costs due to the dynamic nature of public health.

- **Pragmatic Empirical approach**: Simulation modelling approach to estimate cost of implementing FPHS by modeling variation (i.e. uncertainty) associated with collected cost data.

- Generate probability distributions of costs – the range of all possible cost values & the likelihood of their occurrence (versus point estimate).
  - Input costs distribution \(\rightarrow\) Output value distribution
  - Distribution of output values calculated from all possible combinations (‘scenarios’=iterations) of input costs.
  - Since probability distributions can be graphed, useful as an analytical, decision-making tool & planning aid.
In summary, the FPHS CE Methodology produces a **cost distribution** (as opposed to point estimates) or each Foundational Capability (FC) & Foundational Area (FA) specified in the National FPHS Definitions_V2 document ...and for separate estimates of “current” & “projected/need” costs

- **Current**: cost of resources currently used to produce FCs & FAs
- **Projected/Need**: cost of resources estimated to be required to fully meet FC & FA definitions, based on current levels of attainment.

**Total Foundational Public Health Services (FPHS) Costs**

\[
\text{Total Foundational Public Health Services (FPHS) Costs} = \sum \text{FC} + \sum \text{FA}
\]
Model Simulation Results from FPHS CE Pilot Sample Survey Sites

(Population weighted per capita cost estimates from pilot survey of 6 LHDs in Kentucky & 8 LHDs in Ohio and preliminary results incorporating data from Washington DACS)
Total Per Capita Costs of Foundational Public Health Services (FPHS)

**Full Combined Sample:** Current Per Capita Costs in Red – Projected/Need in Blue

- **Current Per Capita Costs ($)** – Full Sample
- **Per Capita Cost of Projected / Need ($) - Full Sample**

Graph Overlay of Current & Projected / Need – Full Sample
### Sensitivity Analyses

**“Tornado Chart”** – inputs ranked by effect on output mean (i.e. total per capita FPHS costs)

<table>
<thead>
<tr>
<th>Input</th>
<th>Baseline</th>
<th>Effect on Mean</th>
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<tbody>
<tr>
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<td>$65.47</td>
<td>$60.86</td>
</tr>
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</table>

**Baseline = $62.77**

**“Spider Graph”** – change in output mean across range of input values (i.e. total per capita FPHS costs)
Total Per Capita Costs of Foundational Public Health Services (FPHS)

(Between States: Graph Overlay of Kentucky in Blue / Ohio in Red)
Total Per Capita Costs of Foundational Public Health Services (FPHS)

(Within State: Current vs Projected/Need Graph Overlay in Kentucky & Ohio)
Per Capita Costs of Foundational Areas By Sample Site (Within State: Current vs Projected/Need Graph Overlay in Kentucky & Ohio)

FA3-Environmental Public Health: KENTUCKY

FA3-Environmental Public Health: OHIO

FA4-Maternal/Child/Family Health: KENTUCKY

FA4-Maternal/Child/Family Health: OHIO
Per Capita Costs of Foundational Capabilities in each Sample Site

(Within State: Current vs Projected/Need Graph Overlay in Kentucky & Ohio)

FC5-Community Partnership: KENTUCKY

Mean = $3.42
Mean = $5.07

FC5-Community Partnership: OHIO

Mean = $3.89
Mean = $4.48

FC6-Organizational Competencies: KENTUCKY

Mean = $13.04
Mean = $20.60

FC6-Organizational Competencies: OHIO

Mean = $7.09
Mean = $18.50
Towards first generation estimates

Centralized

South Carolina

Shared

Florida

KY (6)

Georgia

Decentralized

California

WA (10)

OH (3/8)

New York

strata 1: administrative/governance structure

Arkansas

AR 1: <50k

AR 2: 50k-299k

AR 3: >=300k

South Carolina

SC 1: <50k

SC 2: 50k-299k

SC 3: >=300k

Florida

FL 1: <50k

FL 2: 50k-299k

FL 3: >=300k

Georgia

GA 1: <50k

GA 2: 50k-299k

GA 3: >=300k

California

CA 1: <50k

CA 2: 50k-299k

CA 3: >=300k

New York

NY 1: <50k

NY 2: 50k-299k

NY 3: >=300k

national estimate of current & need FPHS per capita costs
Total FPHS – Pilot KY+OH with Washington DACS (10 LHJs)

(combined & separate: Current Per Capita Costs in Red – Projected/Need in Blue)
Towards first-generation FPHS cost estimates…

• Part of the critical step outlined in 2012 IOM Report
• Model simulation results show both the variation across FPHS categories and the substantial gap between current costs of FPHS implementation and the projected costs to fully meet FPHS needs.
• Implications for D&I Research: This study demonstrates the feasibility and value of a hybrid cost-estimation methodology that combines survey-based cost allocation approaches with model simulation techniques to quantify the geographic variation of costs in implementing public health services
  • Includes the data-collection instrument and model simulation approach for analytical, decision-making, and policy related purposes.
Questions?

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