



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



Institute of Medicine. **For the Public's Health: Investing in a Healthier Future.** Washington, DC: National Academies Press; 2012.

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.resolve.org/site-healthleadershipforum/>

- FPHS Categories articulated and defined ([V1](#))

DEFINITIONS

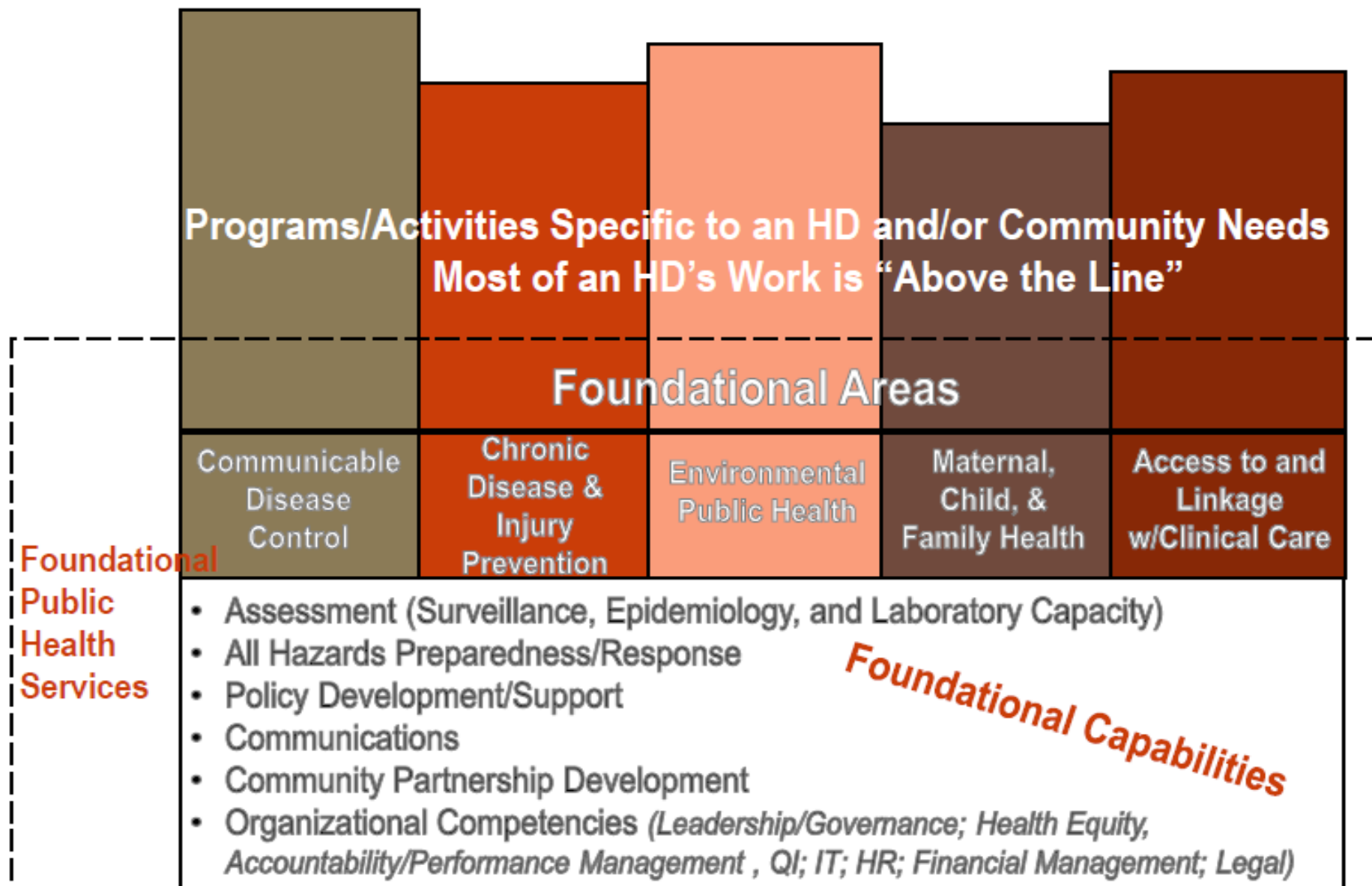
Foundational Capabilities (FC): Cross-cutting skills that need to be present in state & local health departments everywhere for the health system to work anywhere. Needed to support the foundational areas, & other programs & activities, key to protecting community health & achieving equitable health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



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

Accessible at http://works.bepress.com/glen_mays/128/

- 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.

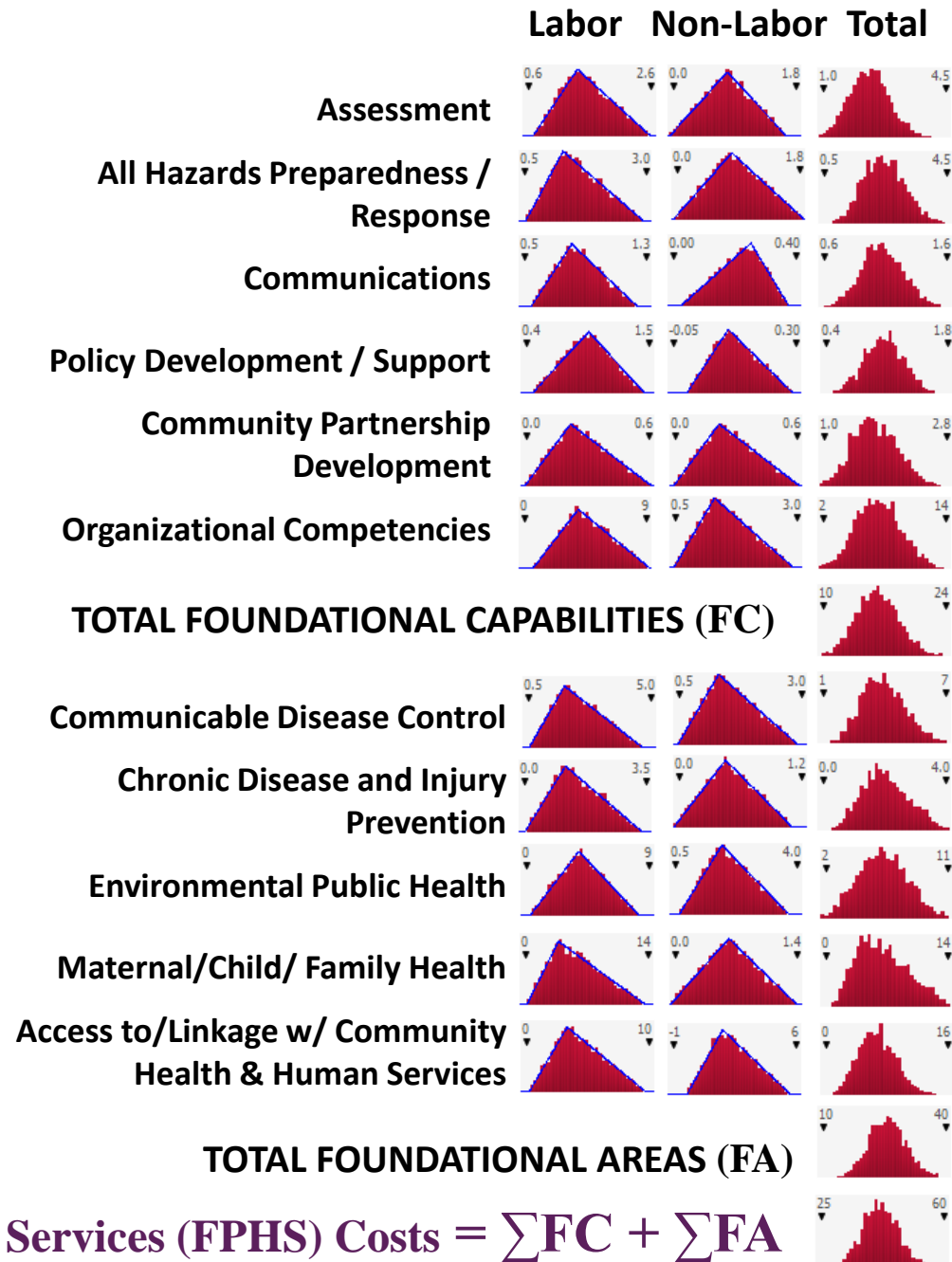
Development of FPHS CE Methodology

- 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 → 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 a analytical, decision-making tool & planning aid.

Illustrating the Model Simulation Approach: Current Per Capita Costs

*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.



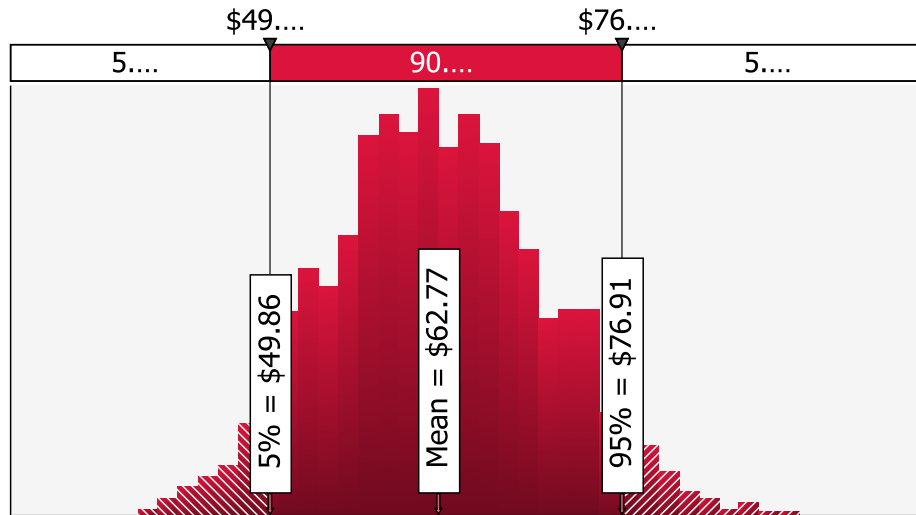
Model Simulation Results from FPHS CE Pilot Sample Survey Sites

(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)

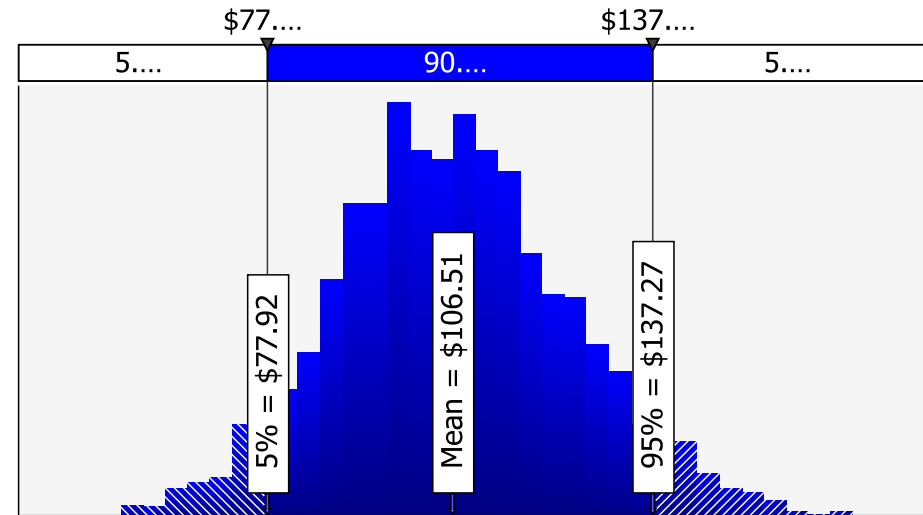


Total Per Capita Costs of Foundational Public Health Services (FPHS)

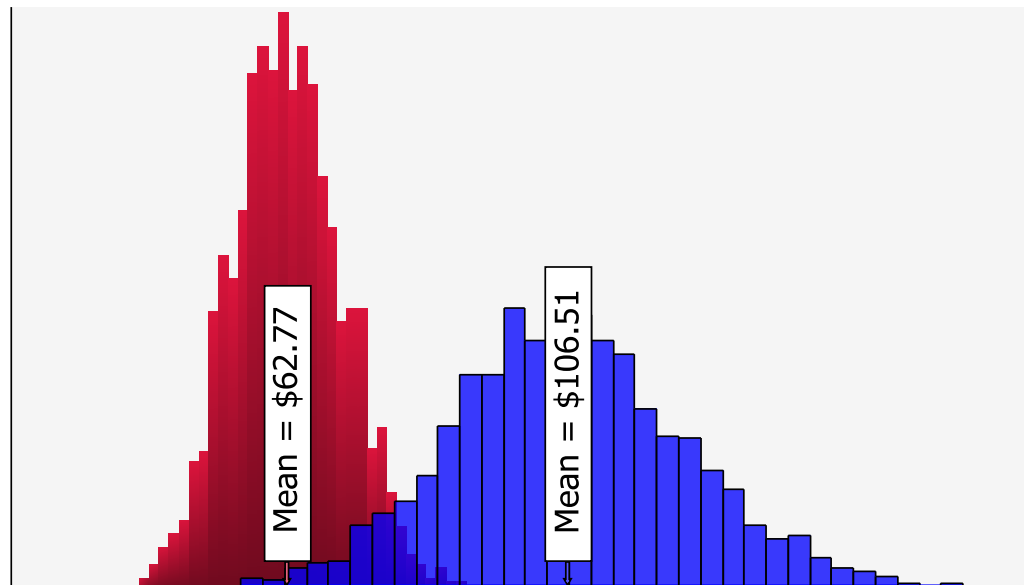
(**Full Combined Sample:** **Current Per Capita Costs in Red** – **Projected/Need in Blue**)



Current Per Capita Costs (\$) – Full Sample

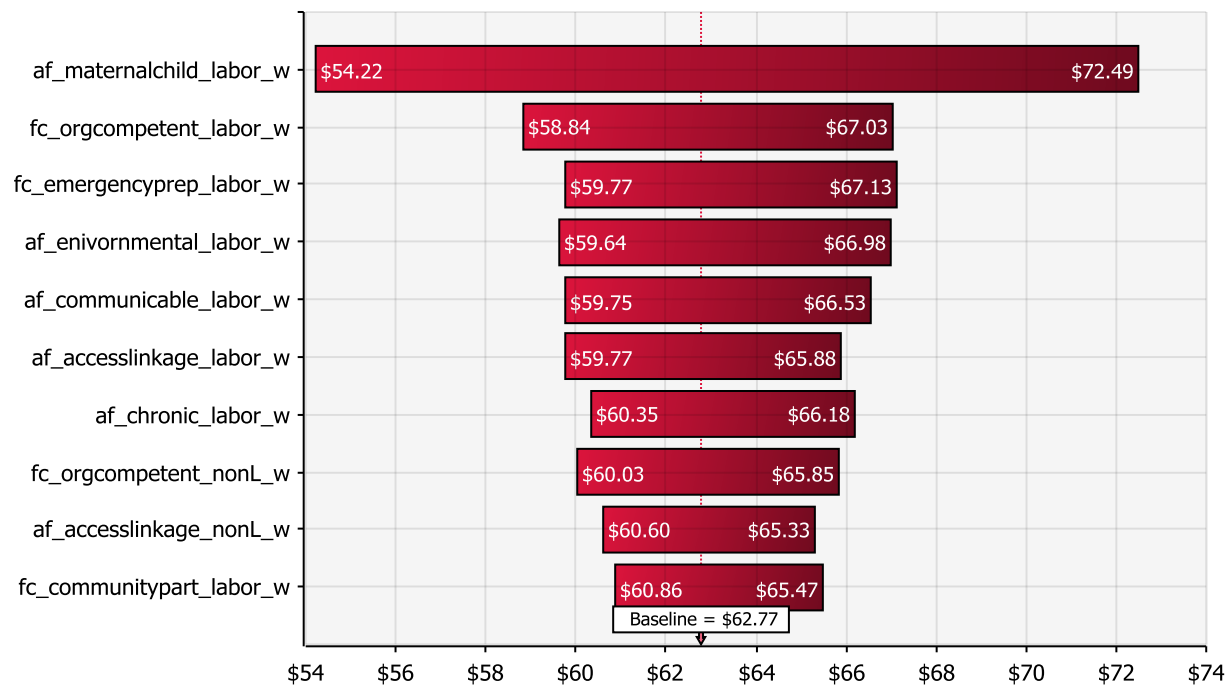


Per Capita Cost of Projected / Need (\$) - Full Sample

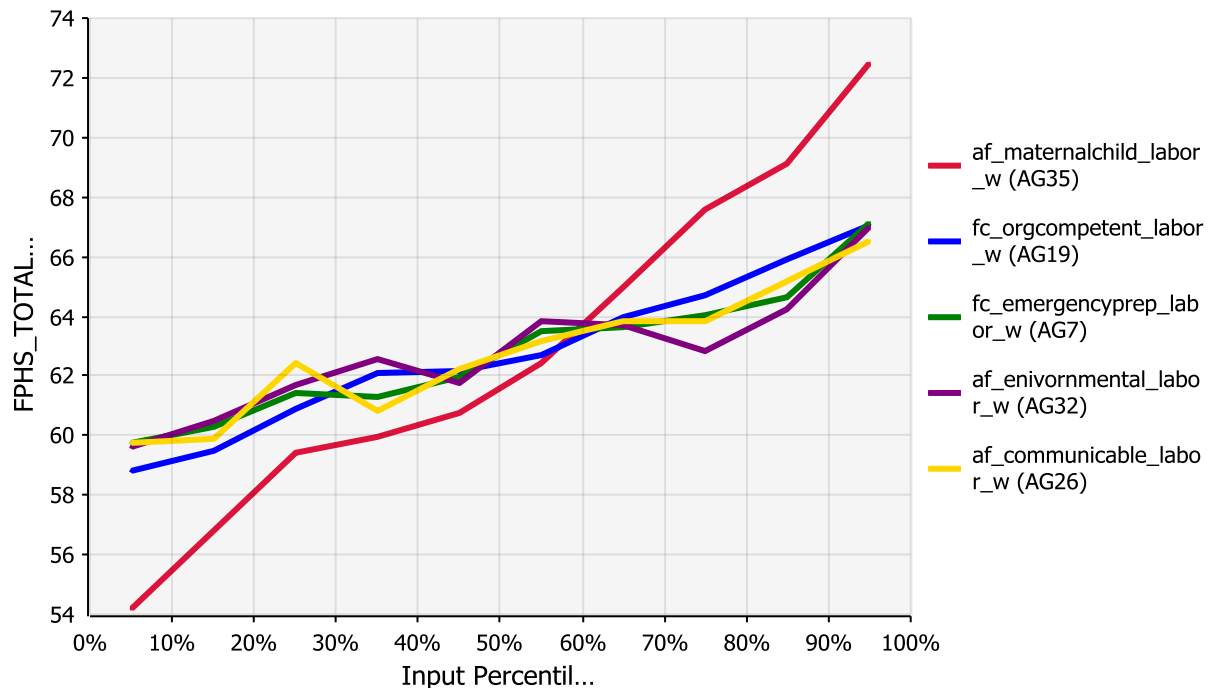


Graph Overlay of Current & Projected / Need – Full Sample

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



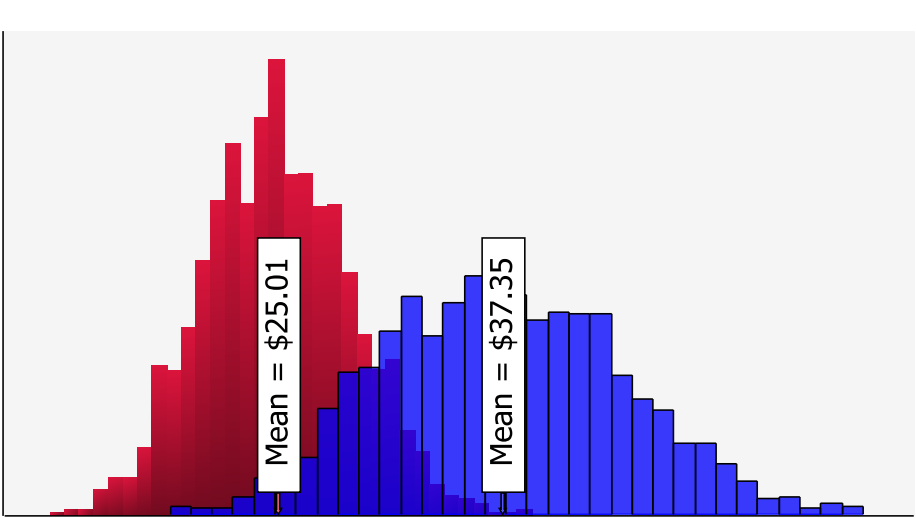
“Spider Graph” – change in output mean across range of input values (i.e. total per capita FPHS costs)



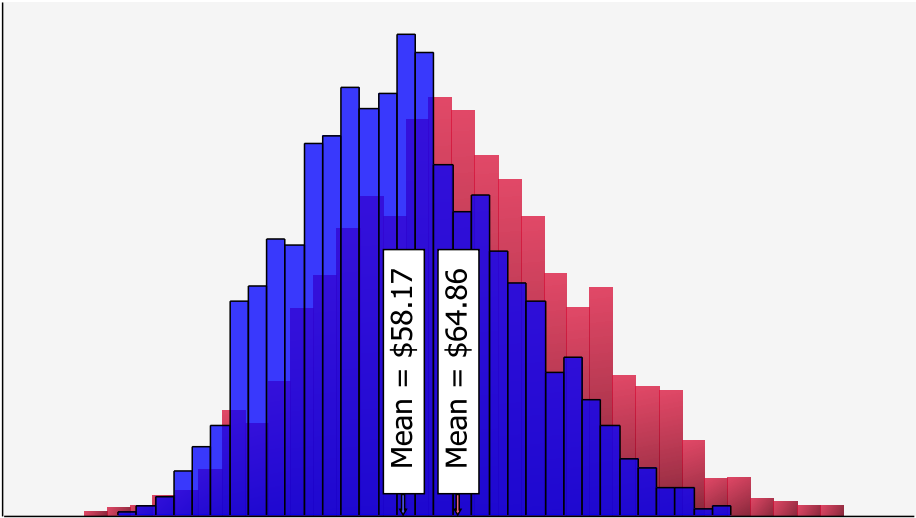
SENSITIVITY ANALYSES

Total Per Capita Costs of Foundational Public Health Services (FPHS)

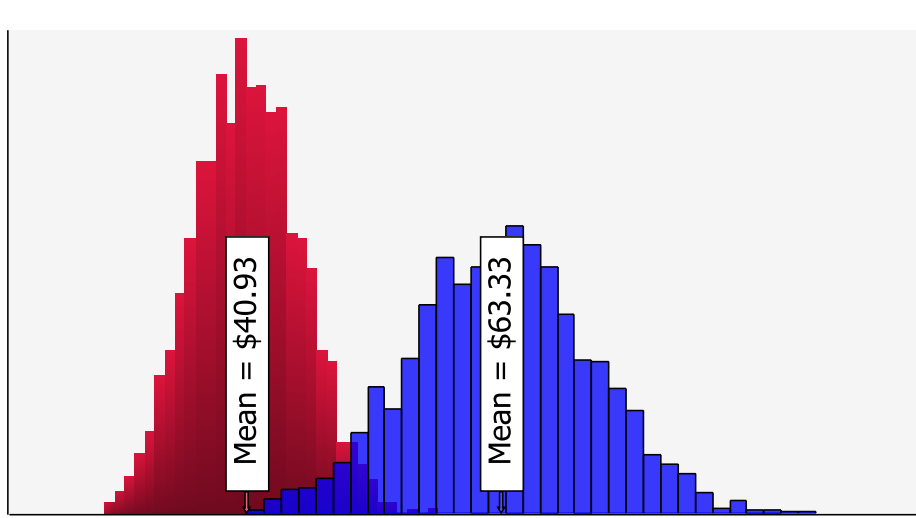
(**Between** States: Graph Overlay of **Kentucky in Blue** / **Ohio in Red**)



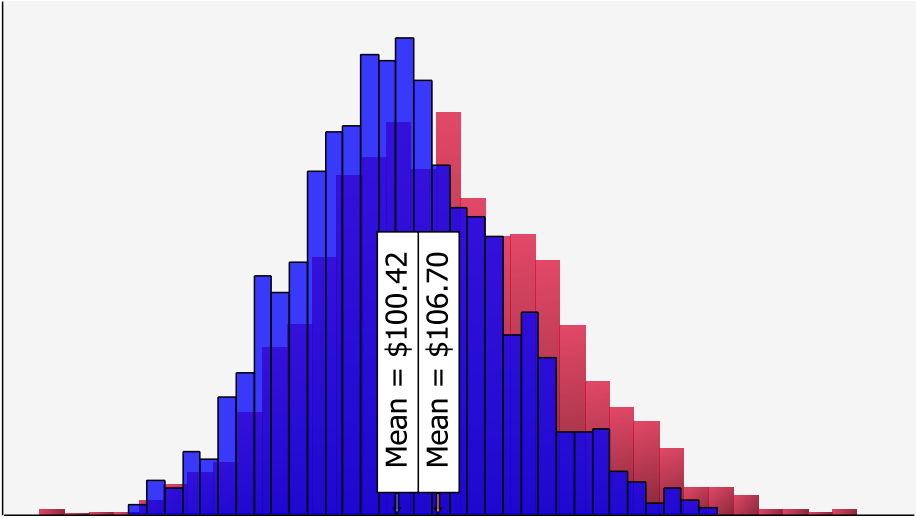
TOTAL FOUNDATIONAL AREAS: CURRENT



TOTAL FOUNDATIONAL AREAS: PROJECTED/NEED



TOTAL FPHS COSTS: CURRENT

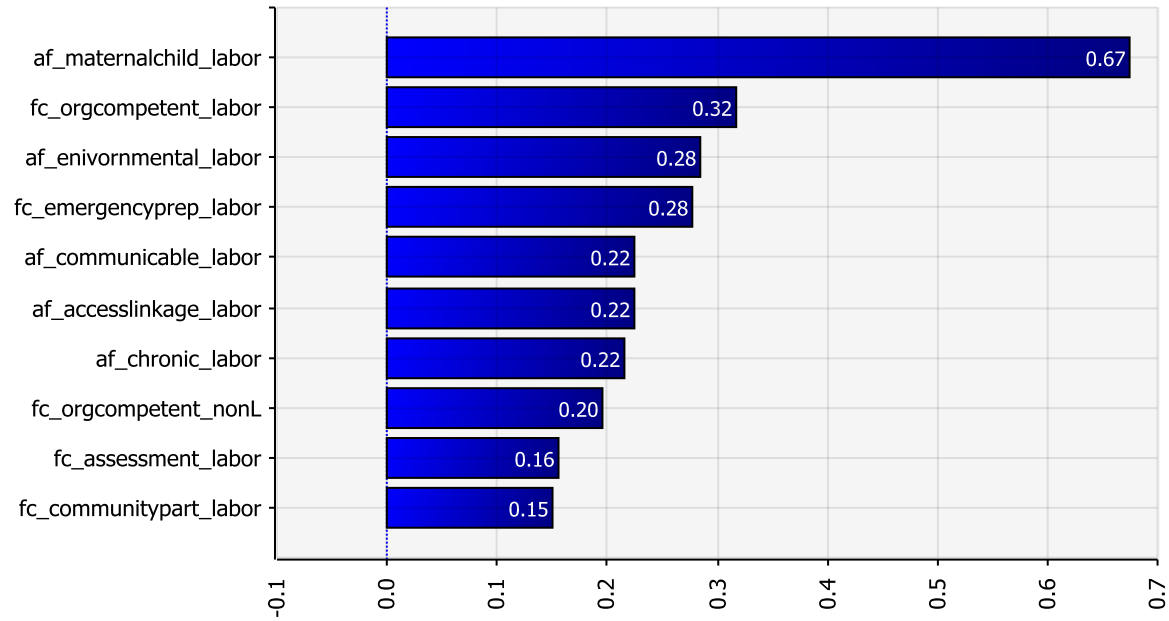


TOTAL FPHS COSTS: PROJECTED/NEED

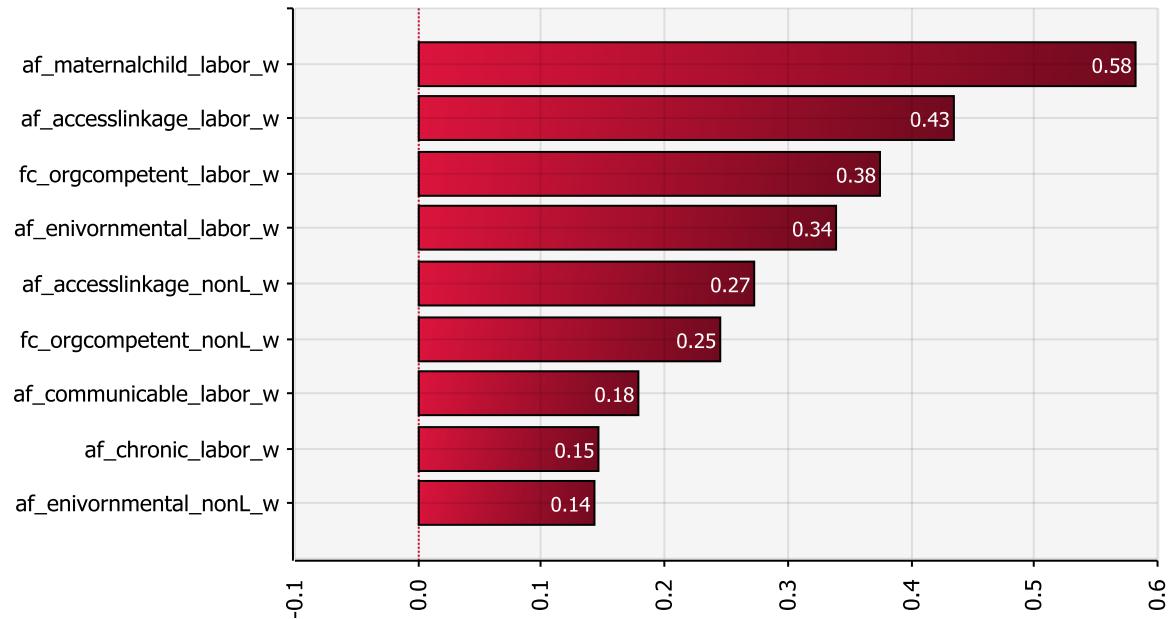
SENSITIVITY ANALYSIS (Standardized Regression Coefficients)

Current Per Capita Total FPHS Costs

Kentucky

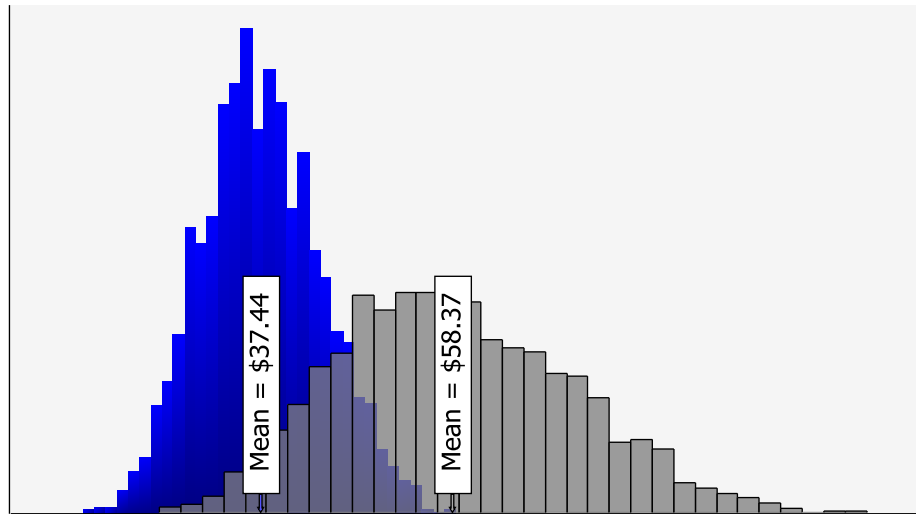


Ohio

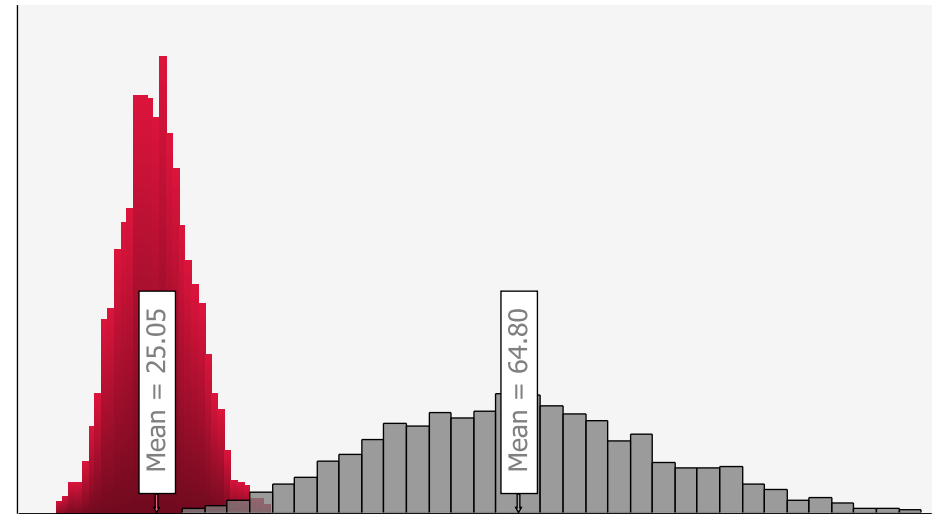


Total Per Capita Costs of Foundational Public Health Services (FPHS)

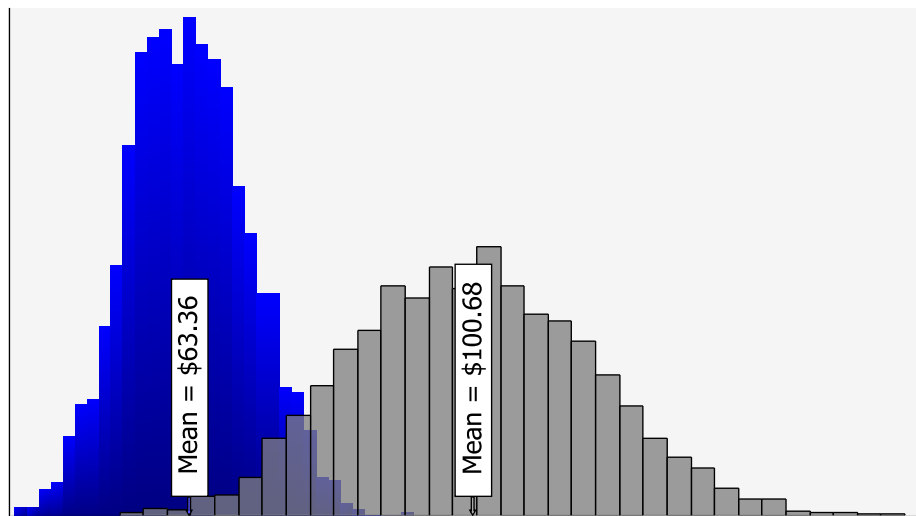
(**Within** State: Current vs Projected/Need Graph Overlay in **Kentucky** & **Ohio**)



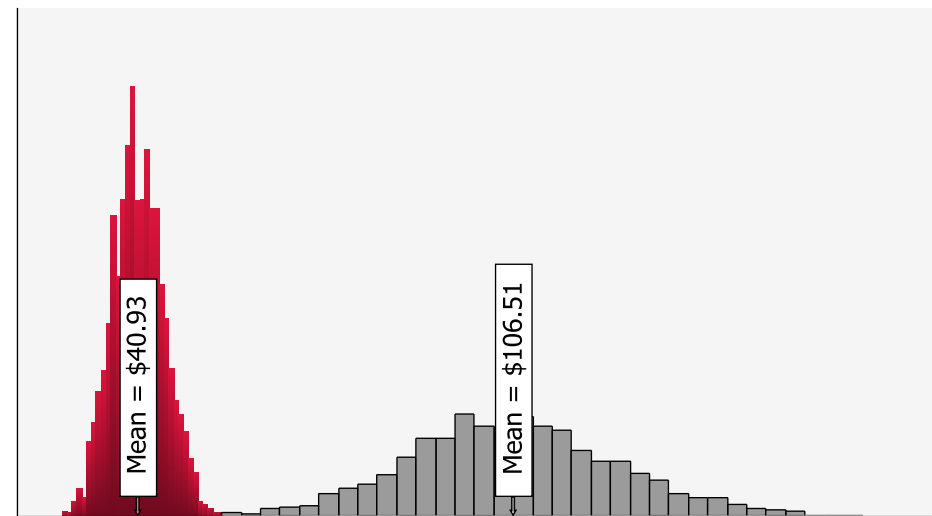
TOTAL FOUNDATIONAL AREAS: KENTUCKY



TOTAL FOUNDATIONAL AREAS: OHIO



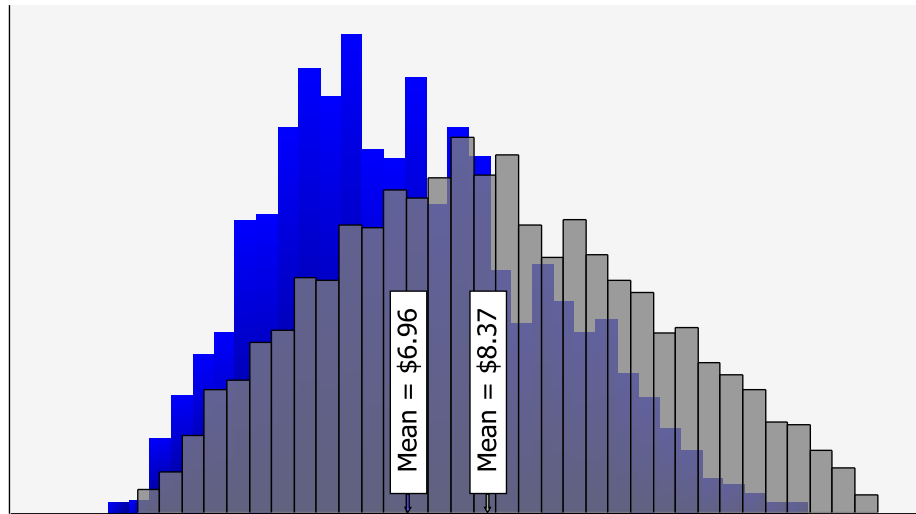
TOTAL FPHS COSTS: KENTUCKY



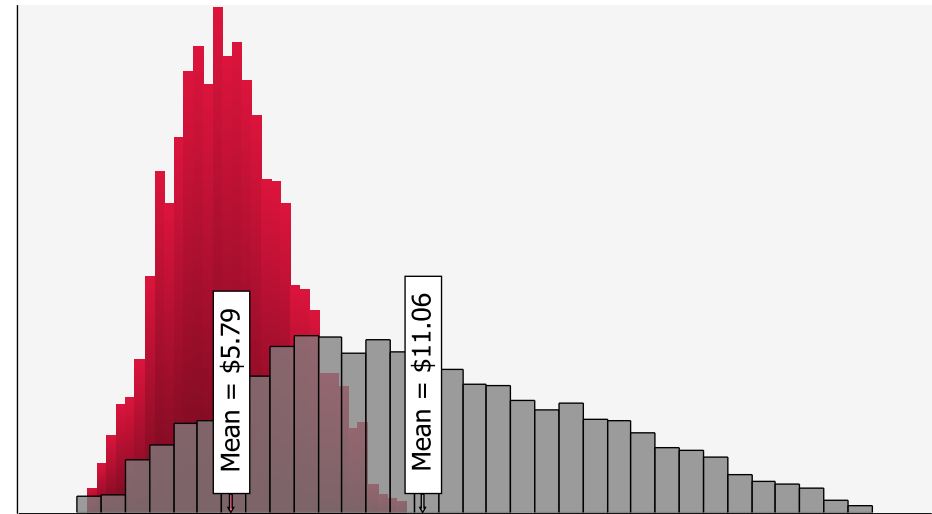
TOTAL FPHS COSTS: OHIO

Per Capita Costs of Foundational Areas By Sample Site

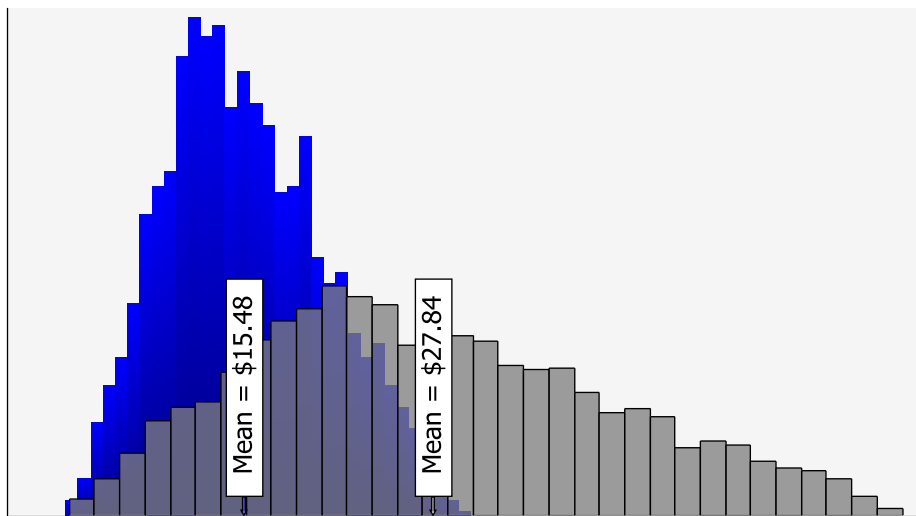
(**Within** State: Current vs Projected/Need Graph Overlay in **Kentucky** & **Ohio**)



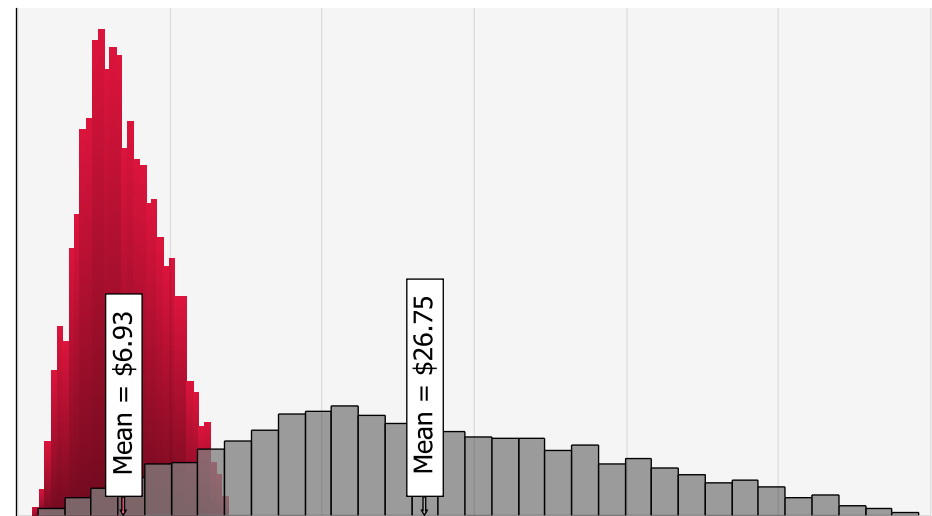
FA3-Environmental Public Health: KENTUCKY



FA3-Environmental Public Health: OHIO



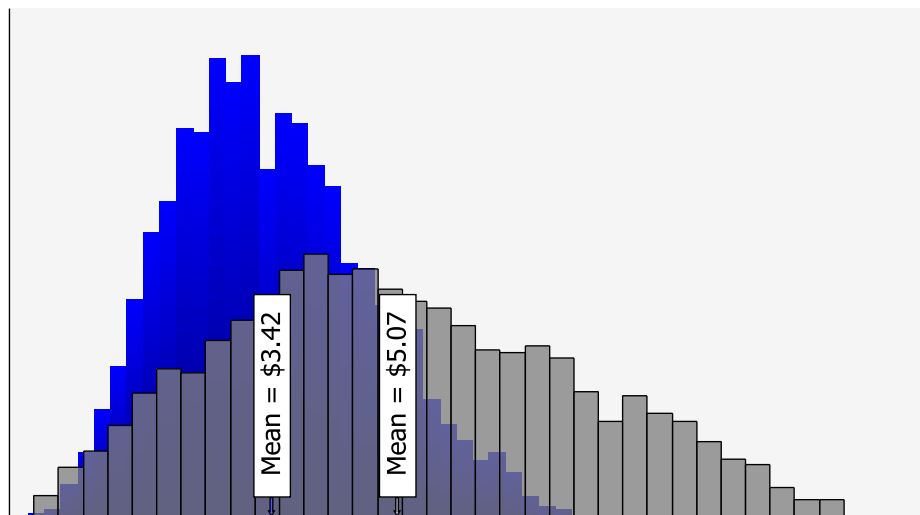
FA4-Maternal/Child/Family Health: KENTUCKY



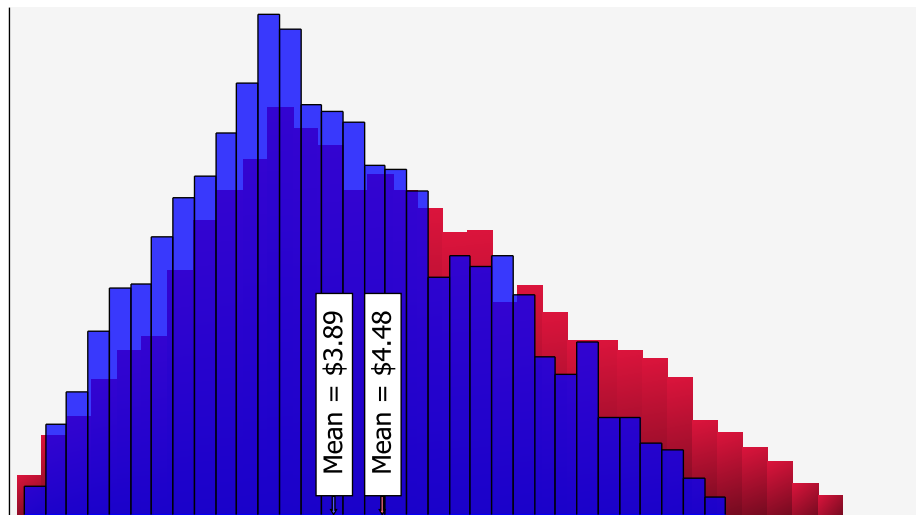
FA4-Maternal/Child/Family Health: OHIO

Per Capita Costs of Foundational Capabilities in each Sample Site

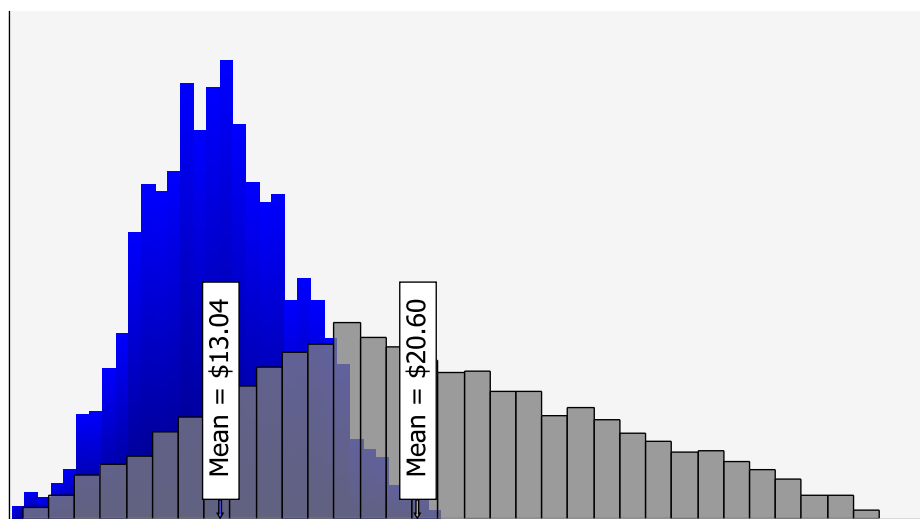
(**Within** State: Current vs **Projected/Need Graph** Overlay in **Kentucky** & **Ohio**)



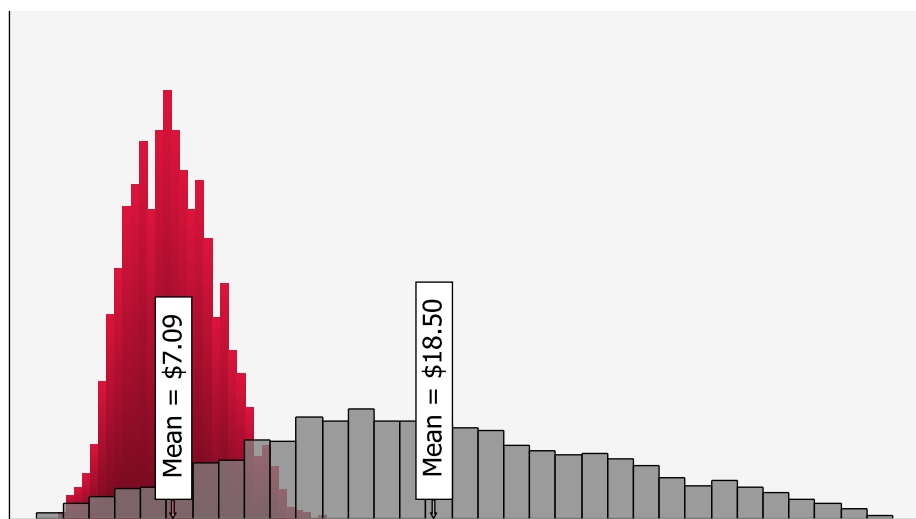
FC5-Community Partnership: KENTUCKY



FC5-Community Partnership: OHIO



FC6-Organizational Competencies: KENTUCKY

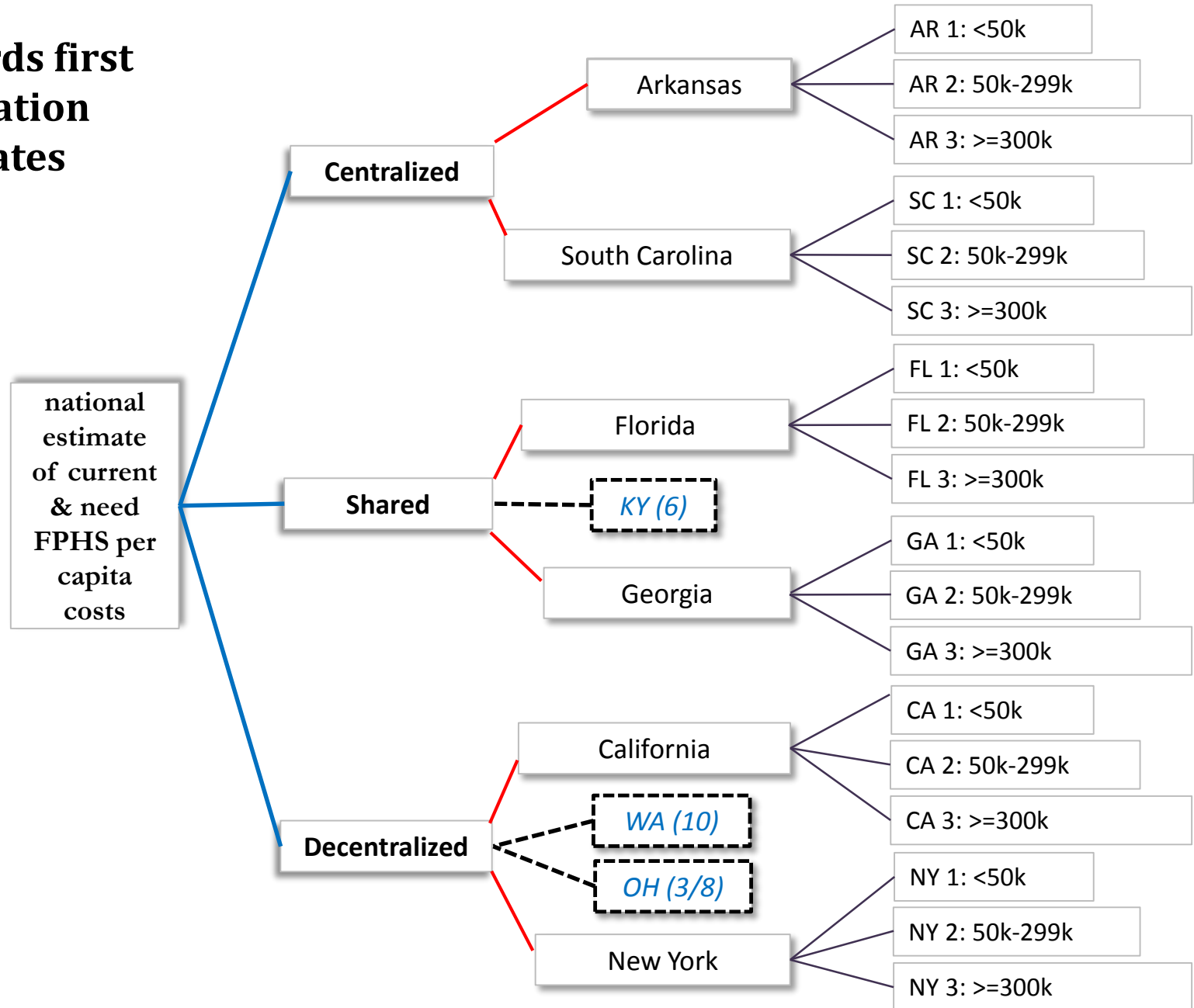


FC6-Organizational Competencies: OHIO

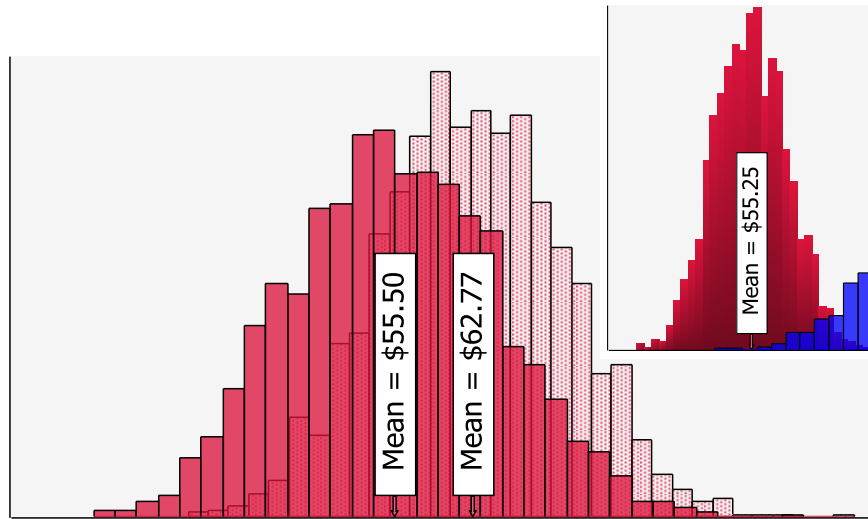
Strata 1: Administrative/Governance Structure

Strata 2: Population of Jurisdiction

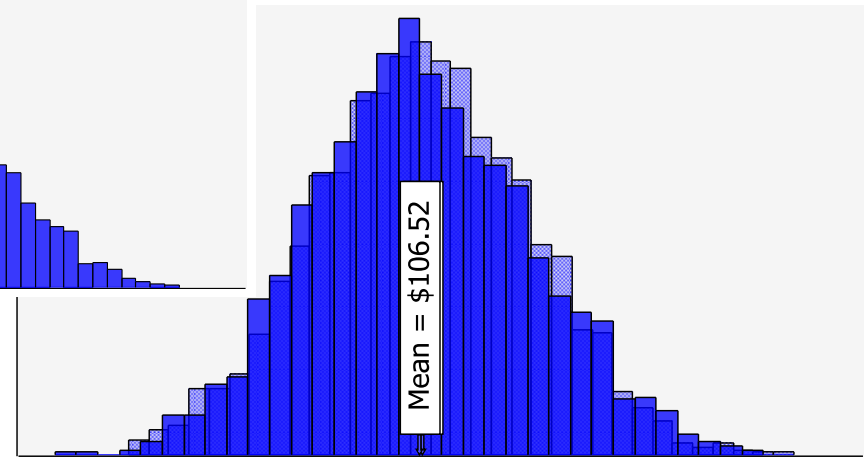
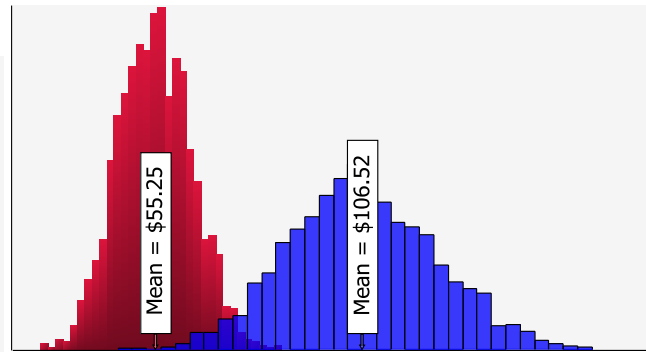
Towards first generation estimates



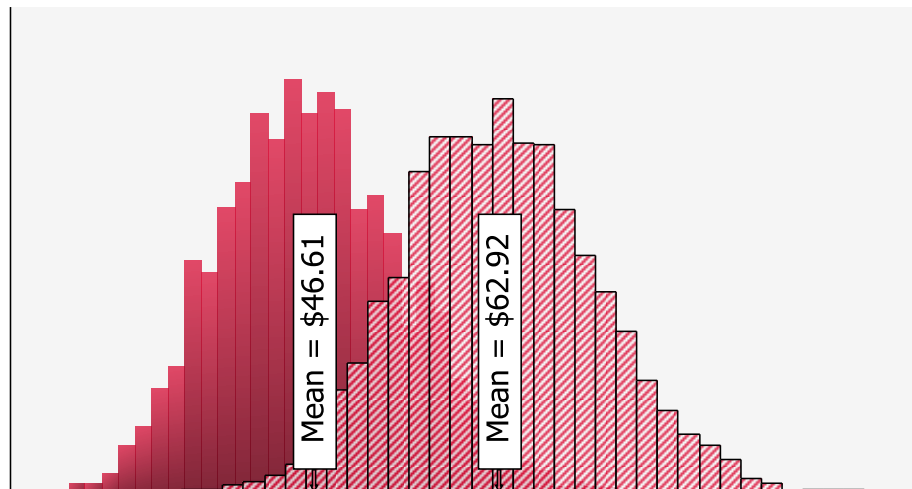
Total FPHS – Pilot KY+OH with Washington DACS (10 LHJs)
(**Combined & separate:** **Current Per Capita Costs in Red** – **Projected/Need in Blue**)



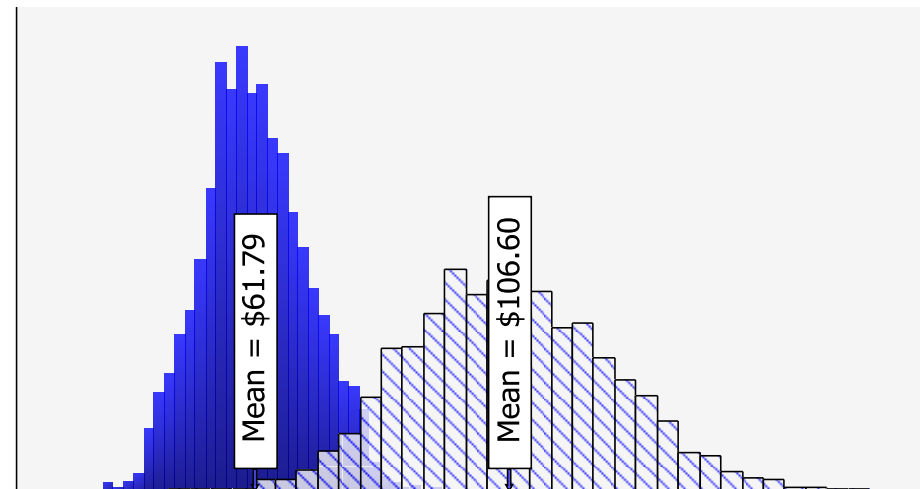
Current Per Capita Costs (\$) – Full Sample



Per Capita Cost of Projected / Need (\$) - Full Sample



Current Costs (WA DACS vs. KY-OH Pilot/)

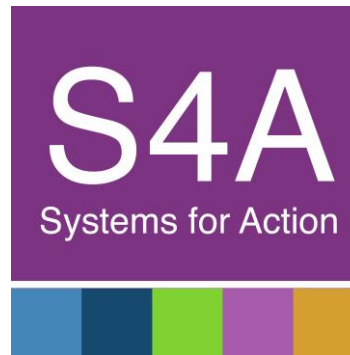


Projected Need (WA DACS vs. KY-OH Pilot/)

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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