Fall November 16, 2014

# Estimating the Costs of Foundational Public Health Services: Pilot Results of an Expert Consensus Methodology

Cezar B Mamaril, *University of Kentucky*
Glen P Mays, *University of Kentucky*

# Cost Estimates of Foundational Public Health Services:

# Results from Piloting the Expert Consensus Methodology in Kentucky

C.B. Mamaril, Ph.D.

Glen P. Mays, Ph.D., MPH

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# Acknowledgements


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  - Keith Branham, UK DrPH student
  - Carrie Holsinger, UK DrPH student
  - Scott Secamiglio, MPH

# Workgroup on Public Health Cost Estimation

Terry Allan, MPH
Cuyahoga County (OH) Board of Health

Ricardo Basurto-Davila, PhD
Los Angeles County (CA) Health Department

Patrick Bernet, PhD
Florida Atlantic University

Yu-Wen Chiu, DrPH
Louisiana State University

Phaedra Corso, PhD
University of Georgia

Dwight V. Denison, PhD
University of Kentucky

Laura Dunlap, PhD
Research Triangle Institute

Thomas Getzen, PhD
Temple University
International Health Economics Association

Cezar Mamaril, PhD
University of Kentucky

Justin Marlowe, PhD
University of Washington

Glen Mays, PhD
University of Kentucky

Jennifer Tebaldi, MBA
State of Washington Department of Health

Herminia Palacio, MD
Robert Wood Johnson Foundation

Jeanne S. Ringel, PhD
RAND

Rexford Santerre, PhD
University of Connecticut

Sergey Sotnikov, PhD
U.S. Centers for Disease Control and Prevention

Study Manager:

Lizeth Fowler, MS, MPA
University of Kentucky

# Toward a deeper understanding of costs & returns

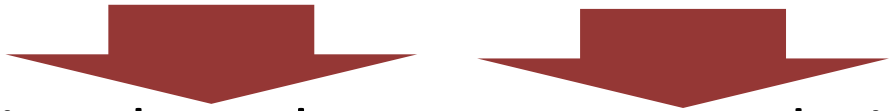
**2012 Institute of Medicine Recommendations**

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

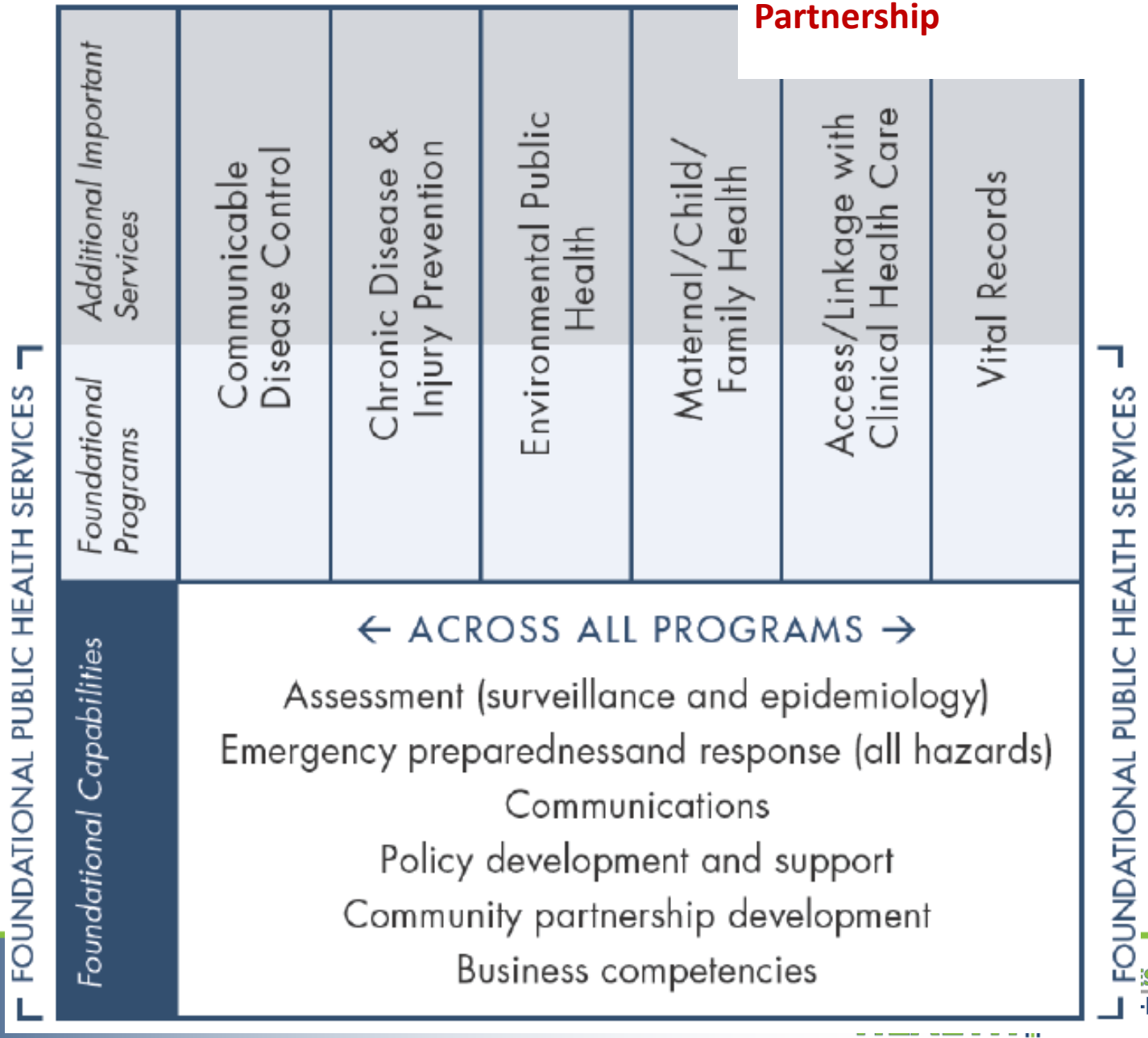
# Defining what to cost: the public health package

- The National Workgroup developed definitions of foundational public health capabilities, specified in the Public Health Leadership Form's ***Articulation of Foundational Capabilities and Foundational Areas***

  http://www.resolv.org/site-healthleadershipforum/defining-and-constituting-foundational-capabilities-and-areas/

# Defining what to cost

**Washington Public Health Improvement Partnership**



# Cost-Estimation Workgroup – Review

- ***Workgroup on Public Health Cost Estimation*** convened to develop a methodology for estimating the resources required to develop and maintain foundational capabilities by governmental public health agencies at both state and local levels.

- First Meeting at RESOLVE – November 22, 2013
- Series of conference calls to specify methodology
- January 30, 2014 in person meeting to finalize cost-estimation methodology
- Final report on recommended methodology:

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

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

# Cost estimation methods

- Prospective “expected cost” methods
  - Vignettes
  - Surveys with staff and/or administrators
  - Delphi group processes
- Concurrent “actual cost” methods (micro-costing)
  - Time studies with staff
  - Activity logs with staff
  - Direct observation
- Retrospective “cost accounting” methods
  - Modeling and decomposition using administrative records
  - Surveys with staff and/or administrators

# Key issues: What's the cost of capability?

- Delineating state vs. local roles and division of effort
- Identifying scale and scope effects
  - By population served
  - By range of programs supported (portfolio effect)
- Identifying input factors that affect costs
  - Resource prices
  - Case mix
- Identifying key output differences across settings
  - Intensity
  - Quality
  - Reach

# Background and Overview: Piloting the Methodology in Kentucky

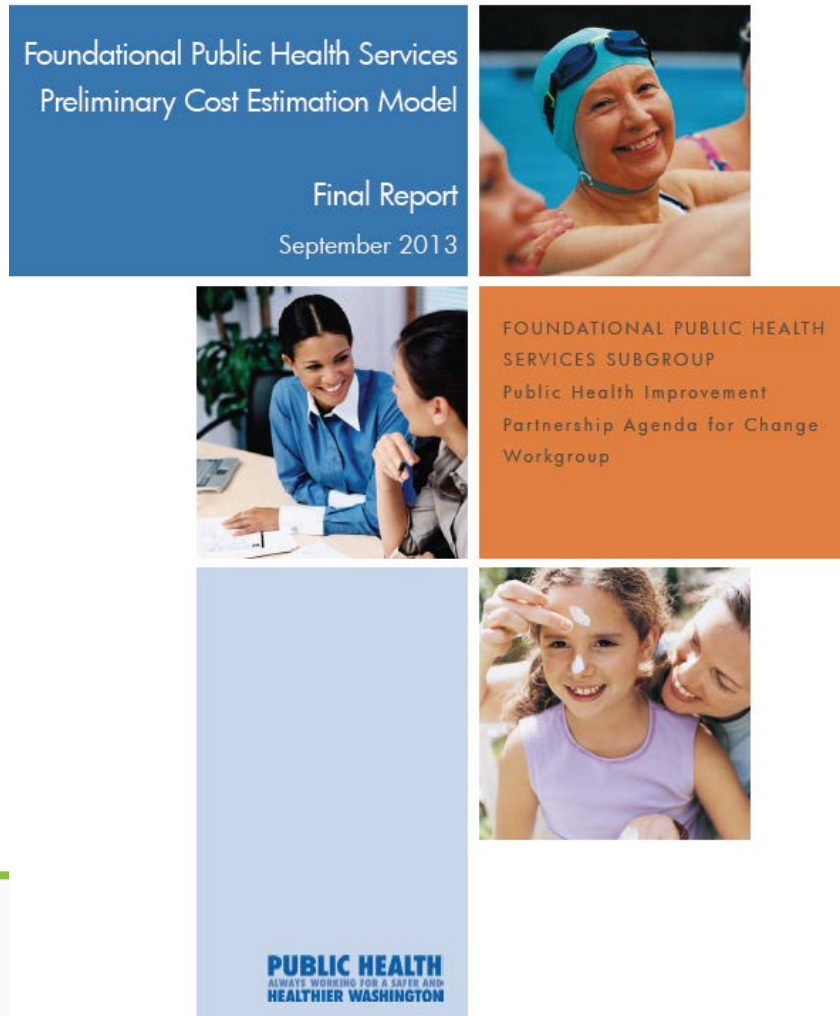
- Discussions with Kentucky Health Department Association (KHDA) to introduce & explain ***Foundational Public Health Services (FPHS)*** framework using RESOLVE FPHS articulation/definitions document
- Buy-in: KHDA formed a finance workgroup to evaluate how to incorporate FPHS framework into current financial & performance reporting system.
  - Crosswalk of chart of accounts with FPHS framework
- Participation in Cost-Estimation Pilot Project (6 members of workgroup serving as a representative sample – from small rural to large urban to multi-county health districts)
- Development of a cost data collection instrument

# Drawing from and Building on FPHS Cost Estimation in Washington State

- Use Public Health Improvement Partnership's September 2013 Report on estimating the cost of Foundational Capabilities (Berk and Associates)

- Use Washington Delivery and Cost Studies (DACS) to cost out FPHS with additional granularity – disagregate labor resource use from non-labor costs, etc.

- Adapt Washington's Excel based data collection instrument to national FPHS definitions and national sampling frame



| OCCUPATION CATEGORIES | Assessment (surveillance and epidemiology) | |
|---|---|---|
| | current | need |
| Public health manager | 0 | 0 |
| Registered nurse | 0 | 0 |
| Licensed practical or vocational nurse (LPN/LVN) | 0 | 0 |
| Nursing aide and home health aide | 0 | 0 |
| Public health physician | 0 | 0 |
| Oral health care professional | 0 | 0 |
| Environmental health worker | 0 | 0 |
| Laboratory worker | 0 | 0 |
| Epidemiologist | 0 | 0 |
| Health educator | 0 | 0 |
| Community health worker | 0 | 0 |
| Nutritionist | 0 | 0 |
| Information systems specialist | 0 | 0 |
| Public information specialist | 0 | 0 |
| Behavioral health professional | 0 | 0 |
| Emergency preparedness staff | 0 | 0 |

| OCCUPATION CATEGORIES | Total reported on FTE tab (Current) | Total reported on FTE tab (Need) | AVERAGE of Salaries + Indirects (Current) | AVERAGE of Salaries + Indirects (Need) | CALCULATED Total of Salaries + Indirects (Current) | CALCULATED Total of Salaries + Indirects (Need) |
|---|---|---|---|---|---|---|
| Public health manager | 0 | 0 | | | $0 | $0 |
| Registered nurse | 0 | 0 | | | $0 | $0 |
| Licensed practical or vocational nurse (LPN/LVN | 0 | 0 | | | $0 | $0 |
| Nursing aide and home health aide | 0 | 0 | | | $0 | $0 |
| Public health physician | 0 | 0 | | | $0 | $0 |
| Oral health care professional | 0 | 0 | | | $0 | $0 |
| Environmental health worker | 0 | 0 | | | $0 | $0 |
| Laboratory worker | 0 | 0 | | | $0 | $0 |
| Epidemiologist | 0 | 0 | | | $0 | $0 |
| Health educator | 0 | 0 | | | $0 | $0 |
| Community health worker | 0 | 0 | | | $0 | $0 |
| Nutritionist | 0 | 0 | | | $0 | $0 |
| Information systems specialist | 0 | 0 | | | $0 | $0 |
| Public information specialist | 0 | 0 | | | $0 | $0 |
| Behavioral health professional | 0 | 0 | | | $0 | $0 |
| Emergency preparedness staff | 0 | 0 | | | $0 | $0 |
| Administrative or clerical personnel | 0 | 0 | | | $0 | $0 |
| Communication Staff | 0 | 0 | | | $0 | $0 |
| WIC Coordinator | 0 | 0 | | | $0 | $0 |
| Other | 0 | 0 | | | $0 | $0 |
| | 0 | | | | $0 | $0 |

| Communicable Disease Control | Public health manager | | Registered nurse | | Licensed practical or vocational nurse (LPN/LVN) | | Nursing aide and home health aide | | Public health physician | | Oral health care professional | | Environmental health worker | | Laboratc worker | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | n |
| Provide timely, relevant, accurate information | | | | | | | | | | | | | | | | |
| Identify assets, develop plans, advocate for initiaves | | | | | | | | | | | | | | | | |
| Receive lab reports, conduct investigations, respond to outbreaks | | | | | | | | | | | | | | | | |
| Per CDC, assure availability of notification services | | | | | | | | | | | | | | | | |
| Per CDC, assure treatment of active TB | | | | | | | | | | | | | | | | |
| Coordinate/integrate other programs and services | | | | | | | | | | | | | | | | |
| Needs to total 100% | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

| Chronic Disease and Injury Prevention | Public health manager | | Registered nurse | | Licensed practical or vocational nurse (LPN/LVN) | | Nursing aide and home health aide | | Public health physician | | Oral health care professional | | Environmental health worker | | Laboratc worker | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | n |
| Provide timely, relevant, accurate information | | | | | | | | | | | | | | | | |
| Identify assets, develop plans, a initiaves | | | | | | | | | | | | | | | | |

| NON-LABOR CATEGORIES | Assessment (surveillance and epidemiology) | | Emergency Preparedness (All Hazards) | | Communication | | Policy Development and Support | | Community Partnership Development | | Business Competencies | | Communicable Disease Control | | Chronic Disease and Injury Prevention | | Environmental Public Health | | Maternal/Child/ Family Health | | Access/Linkage with Clinical Health Care | | Vital Records | | TOTAL | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need | current | need |
| Communication | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Supplies/Materials | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Travel/Registration | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| IT | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Vehicles | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Printing | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Contract/Services | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Training | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| Other | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| TOTAL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

FPHS Cost Estimation Work in Washington State (DACS) – Bekemeier, Marlowe, Whitman et. al. 2014

PUBLIC HEALTH | SERVICES & SYSTEMS RESEARCH PRACTICE-BASED RESEARCH NETWORKS

# Costing Methodology (1/2)

- Adapt Washington DACS instrument as a starting template and modify & enhance accordingly
- Goal is for cost data collection instrument to be efficiently self-administered and capture estimates that account for uncertainty (i.e. dynamic nature of public health - FPHS demand and supply)
- Empirical approach: Estimate FPHS Costs by modeling uncertainty associated with cost data collected
    - Given sample size, quantify uncertainty through model simulation
- Generate probability distribution – the range of all possible values and the likelihood of their occurence
    - Independent variables / Inputs → Input Distribution
    - Dependent variable / Output → Distribution of output values calculated from all possible combinations ('scenarios') of input values
    - Best of all, these probability distributions can be graphed!

| Estimated allocated employee hours per week by foundational capability, foundational area & employee category | | Health department director | Public health manager | Registered nurse | Licensed practical or vocational nurse (LPN/LVN) | Nursing aide and home health aide | Public health physician | Environmental health worker | Laboratory worker | Epidemiologist |
|---|---|---|---|---|---|---|---|---|---|---|
| FOUNDATIONAL CAPABILITIES (Hours per week per individual for LHD employee/labor functions or services performed that may cut across multiple if not all foundational areas) | | | | | | | | | | |
| Assessment (surveillance and epidemiology) | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Emergency Preparedness (All Hazards) | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Communication | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Policy Development and Support | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Community Partnership Development | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Organizational Competencies | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| FOUNDATIONAL AREAS (Hours per week per individual for LHD employee/labor functions or services performed specific to each foundataional area or responsibility that is not related to any foundational capability as to avoid double-counting) | | | | | | | | | | |
| Communicable Disease Control | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Chronic Disease and Injury Prevention | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Environmental Public Health | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Maternal/Child/ Family Health | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |
| Access/Linkage with Clinical Health Care | min | | | | | | | | | |
| | ave | | | | | | | | | |
| | max | | | | | | | | | |

# Survey Instrument (1/4) Labor Resource Use

**Minimum, average or most-likely, Maximum**

**weekly hours conversion rate: 37.5 hrs/week = 1 FTE**

| OCCUPATION CATEGORIES | Annual Salary + Benefits (per 1 FTE basis) | | |
|---|---|---|---|
| | Minimum | Average | Maximum |
| Public health manager | | | |
| Registered nurse | | | |
| Licensed practical or vocational nurse (LPN/LVN) | | | |
| Nursing aide and home health aide | | | |
| Public health physician | | | |
| Oral health care professional | | | |
| Environmental health worker | | | |
| Laboratory worker | | | |
| Epidemiologist | | | |
| Health educator | | | |
| Community health worker | | | |
| Nutritionist | | | |
| Information systems specialist | | | |
| Public information specialist | | | |
| Behavioral health professional | | | |
| Emergency preparedness staff | | | |
| Administrative or clerical personnel | | | |
| Communication Staff | | | |
| WIC Coordinator | | | |
| Other (please indicate positions below) | | | |

**Survey Instrument (2/4) Wage Scale**

# Survey Instrument (3/4) Non-Labor Costs

| Estimated annual non-labor costs by foundational capability, foundational area & non-labor category | | Communication | Supplies / Materials | Travel / Registration | IT | Vehicles | Printing | Contracts / Services | Training | Other | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FOUNDATIONAL CAPABILITIES (Estimated annual NON-Labor costs in dollars) | | | | | | | | | | | |
| Assessment (surveillance and epidemiology) | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Emergency Preparedness (All Hazards) | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Communication | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Policy Development and Support | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Community Partnership Development | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Organizational Competencies | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| FOUNDATIONAL AREAS (Estimated annual NON-Labor costs in dollars specific to each foundataional area that is not related to any foundational capability as to avoid double-counting) | | | | | | | | | | | |
| Communicable Disease Control | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Chronic Disease and Injury Prevention | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Environmental Public Health | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Maternal/Child/ Family Health | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |
| Access/Linkage with Clinical Health Care | min | | | | | | | | | | $0 |
| | ave | | | | | | | | | | $0 |
| | max | | | | | | | | | | $0 |

**Minimum, average or most-likely, Maximum**

**Annual total non-labor costs**

# Crosswalk of FPHS with Kentucky's Chart of Accounts

| | | | | | |
|---|---|---|---|---|---|
| Additional Services | Programs/Activities Specific to Local Community Need Cost Centers - **715, 718, 730, 748, 769, 810, 813, 858, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 882, 891** | | | | |
| Foundational Public Health ~~Programs~~ "Responsibilities" | Communicable Disease Control<br>**801, 806, 807, 842, 843, 845** | Chronic Disease & Injury Prevention<br>**722, 723, 738, 765, 805, 809, 818, 832, 836, 841, 856, 857** | Environmental Public Health<br>**500, 520, 540, 560, 580, 591** | Maternal, Child & Family Health<br>**760, 766, 767, 768, 803, 804, 808, 816, 833, 848, 852, 853, 854** | Access to & Linkage with Clinical Care<br>**712, 741, 770, 800, 802, 811, 883** |
| Foundational Public Health Capabilities | *Across all Programs (i.e. cross-cutting)*<br>Assessment (Surveillance and Epidemiology) - **844, 890**<br>Emergency Preparedness & Response (All Hazards)-**746,747,749,757,759,763,771,815,821,822,823,824,825**<br>Communications<br>Policy Development & Support - **836, 890**<br>Community Partnership Development - **735, 736, 740, 756, 761, 837, 893**<br>Organizational/Business Competencies (Governance, Equity, IT, HR, etc.) - **724, 750, 888, 894, 897, 898** | | | | |

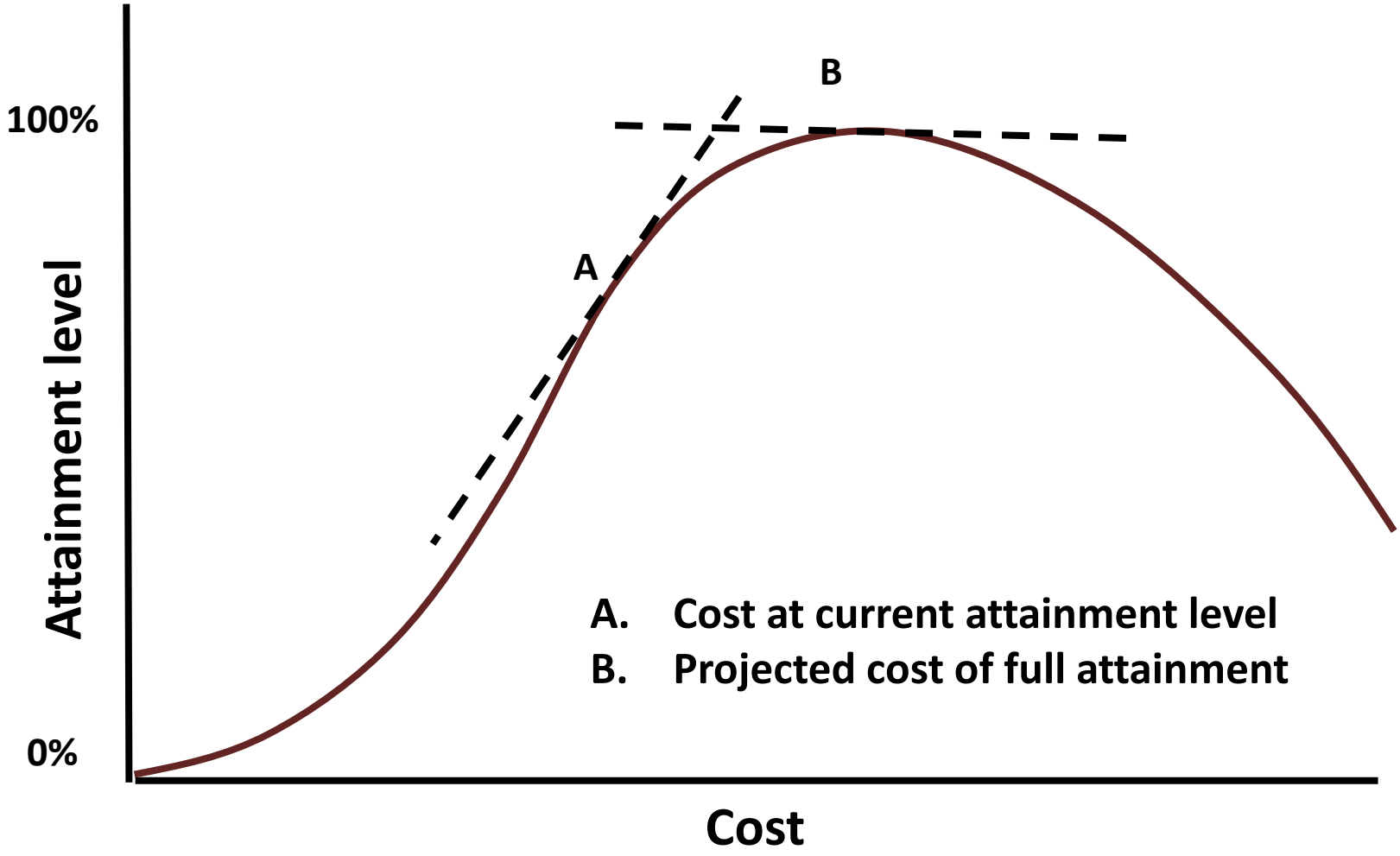
# Survey Instrument (4/4): Current Attainment Scale
# Used to derive FPHS Projected Costs

"Based on your understanding of how each public health foundational capability and foundational area is defined, please provide your **global or overall assessment** on the following question: ***For each foundational category, what is the estimated percentage currently being met by your health department?*** "

| **FOUNDATIONAL CAPABILITIES** | Point Estimate | Range (Min, Most Likely, Max) |
|---|---|---|
| Assessment (surveillance and epidemiology) | | |
| Emergency Preparedness (All Hazards) | | |
| Communication | | |
| Policy Development and Support | | |
| Community Partnership Development | | |
| Organizational Competencies | | |

| **FOUNDATIONAL AREAS** | Point Estimate | Range |
|---|---|---|
| Communicable Disease Control | | |
| Chronic Disease and Injury Prevention | | |
| Environmental Public Health | | |
| Maternal/Child/ Family Health | | |
| Access/Linkage with Clinical Health Care | | |

# Estimation of "projected" costs from current attainment ratings



# Costing Methodology (2/2)

- Latin Hypercube Sampling
  - A sampling technique that will accurately recreate the probability distributions specified by distribution functions in fewer iterations, when compared with Monte Carlo sampling.
    - All possible values in input distribution are “sampled” for use in calculating total FPHS Costs (i.e. output values).
    - Output distribution generated from output values computed from “bins” or sets of scenarios containing all possible input values.
    - Iteration – Each time the outcome value is recalculated using a new set or combination of possible input values (i.e. cost estimate of each FPHS category)
- Sensitivity Analysis
  - Determine which inputs (i.e. FPHS categories) have the greatest impact on overall FPHS costs

# Costing Methodology Outputs

- Methodology produces a ***cost distribution*** for each Foundational Capability (FC) and Foundational Area (FA) specified in the National FPHS Definition document
- Separate estimates of "current" and "projected" costs

  **Current**: cost of resources currently used to produce FCs and FAs

  **Projected**: cost of resources estimated to be required to fully meet FC and FA definitions, based on current levels of attainment

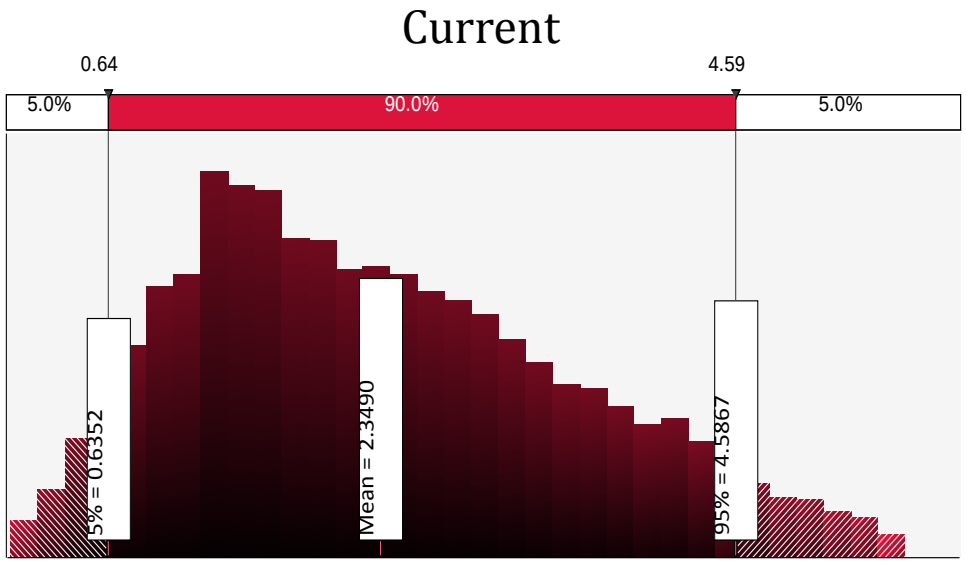
# Costing Methodology Outputs

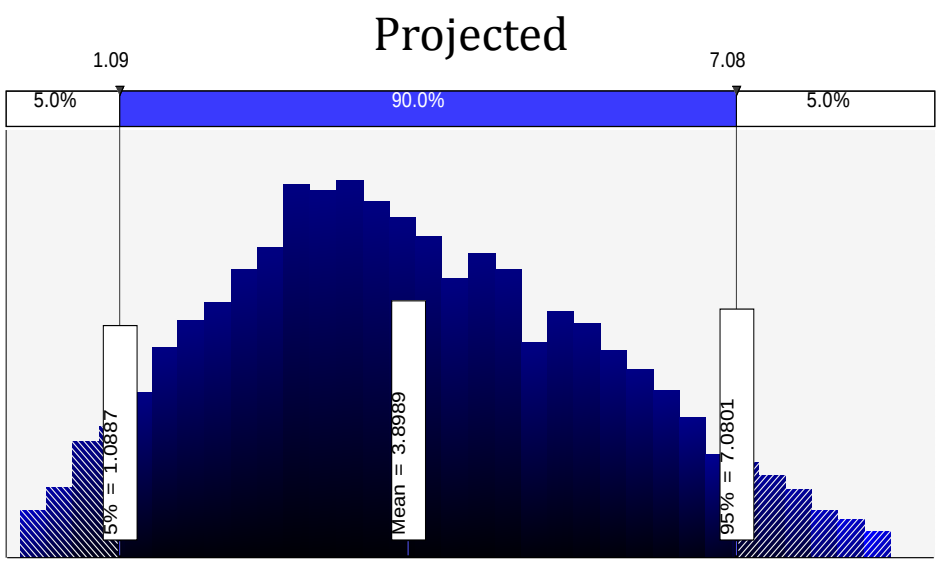
- Foundational Capabilities (FCs) Costs
  - Health Assessment
  - Emergency Preparedness
  - Communications
  - Policy Development and Support
  - Community Partnership Development
  - Organizational Competencies

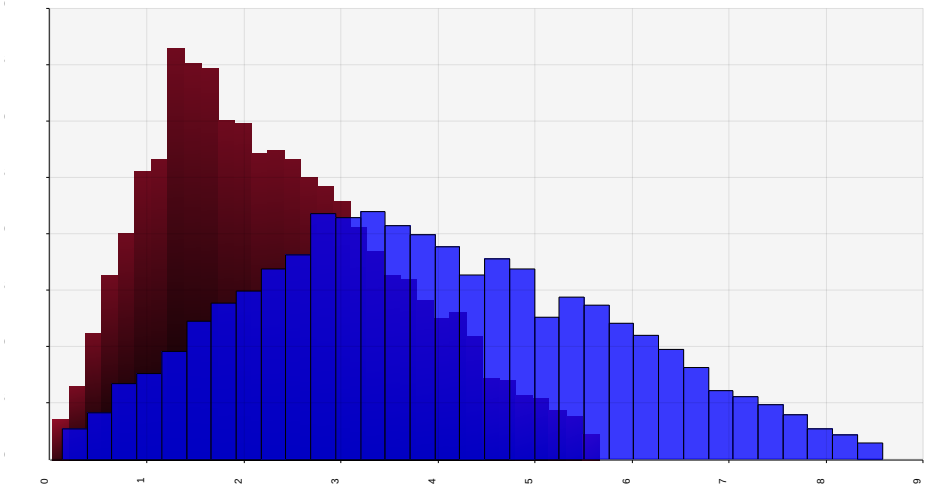
- Foundational Areas (FA) Costs
  - Communicable Disease Control
  - Chronic Disease & Injury Prevention
  - Environmental Health
  - Maternal and Child Health
  - Access and Linkage to Clinical Care

- Total costs = $\sum FC + \sum FA$

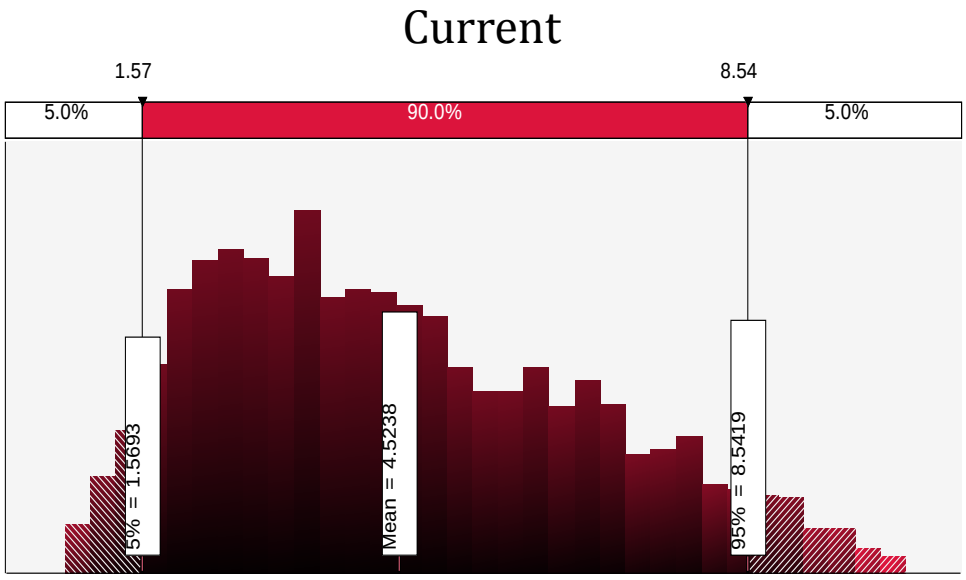
# Foundational Capability (FC) – Assessment (per capita $)

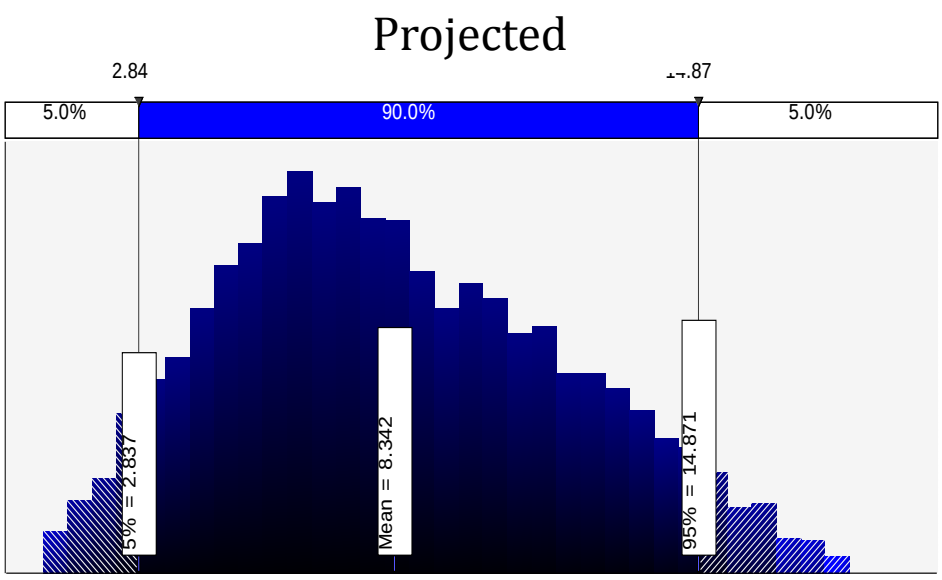


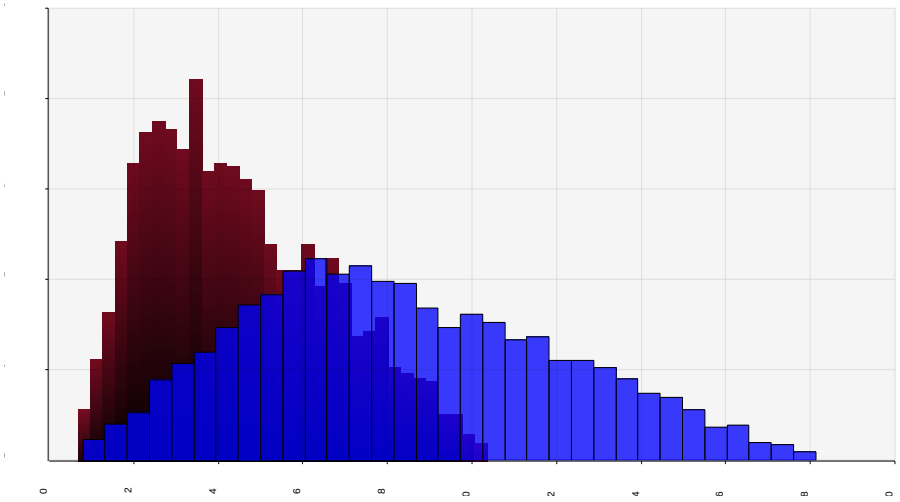



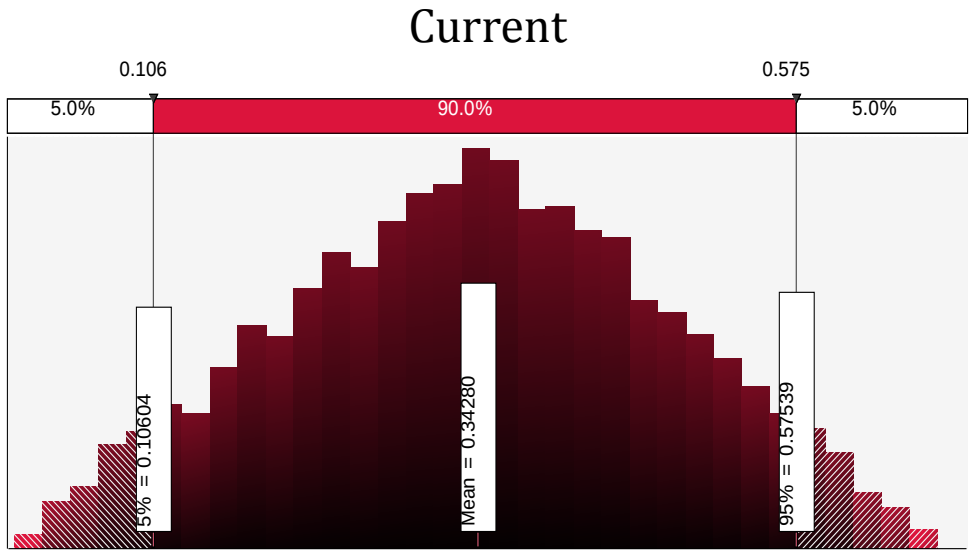
# FC_Emergency Preparedness-All Hazards Response (per capita $)

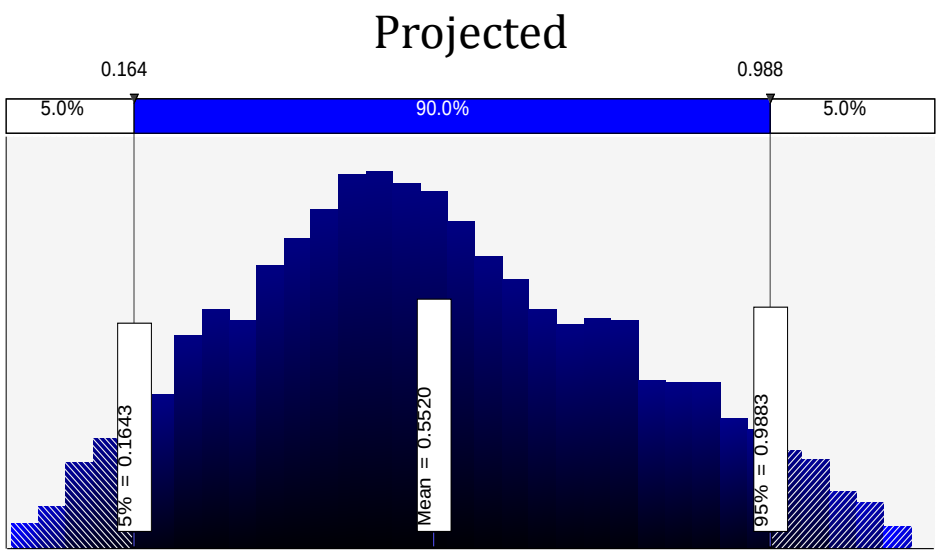


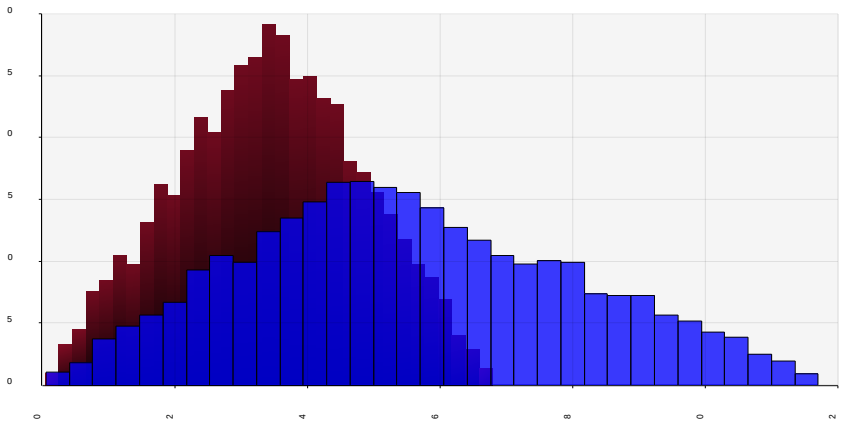



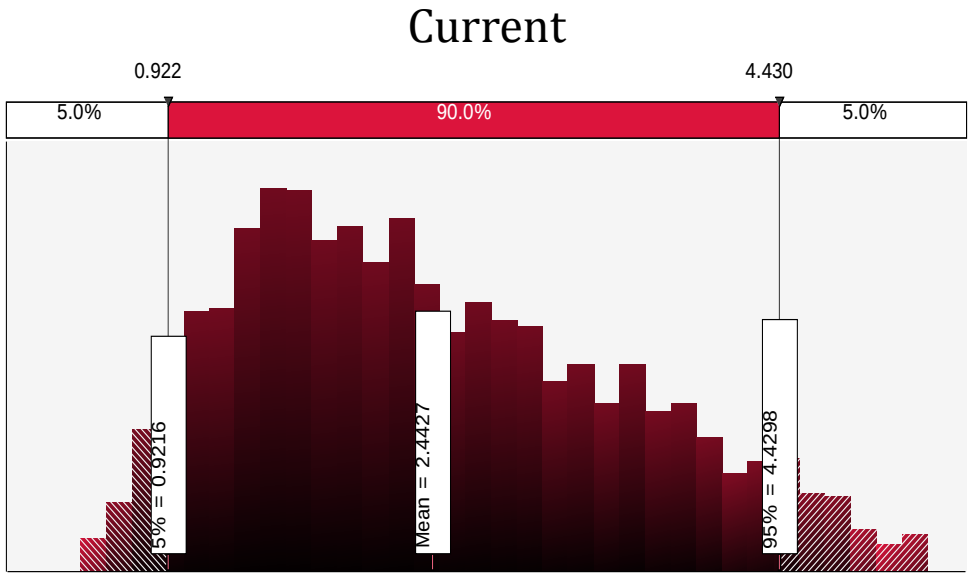
# FC_Communications (per capita $)

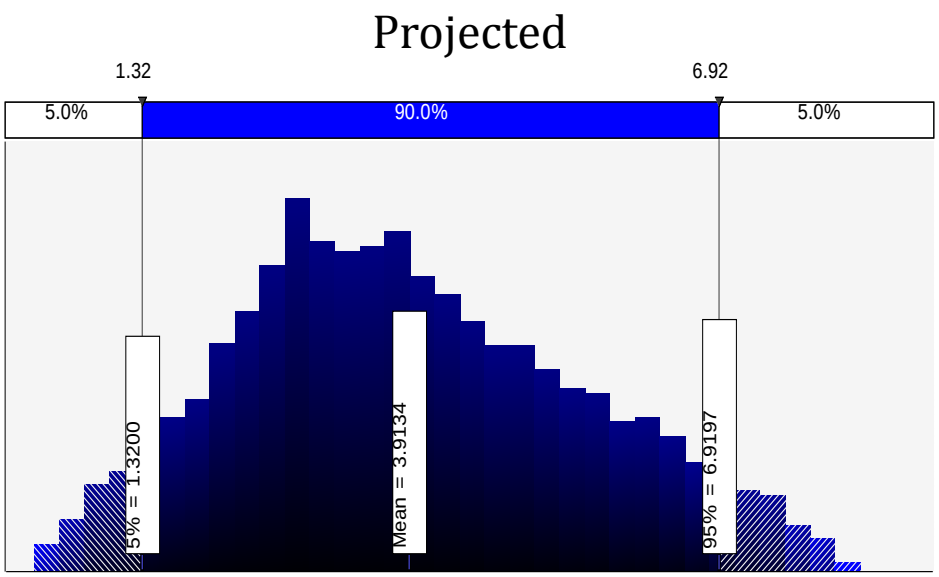


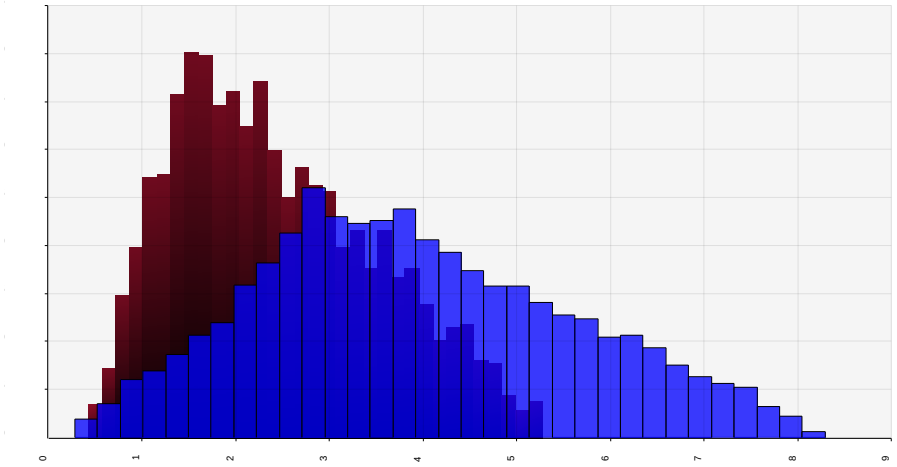



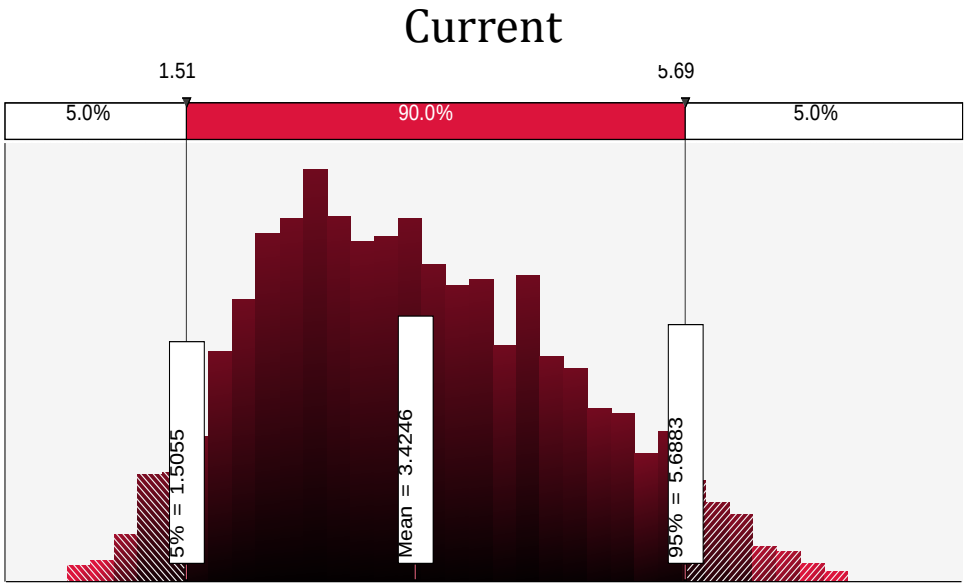
# FC_Policy Development & Support (per capita $)

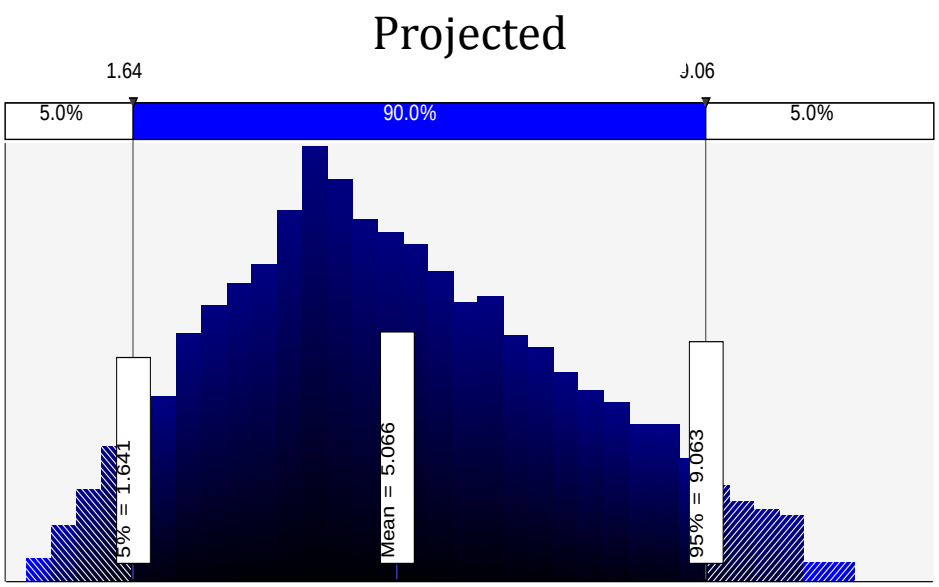


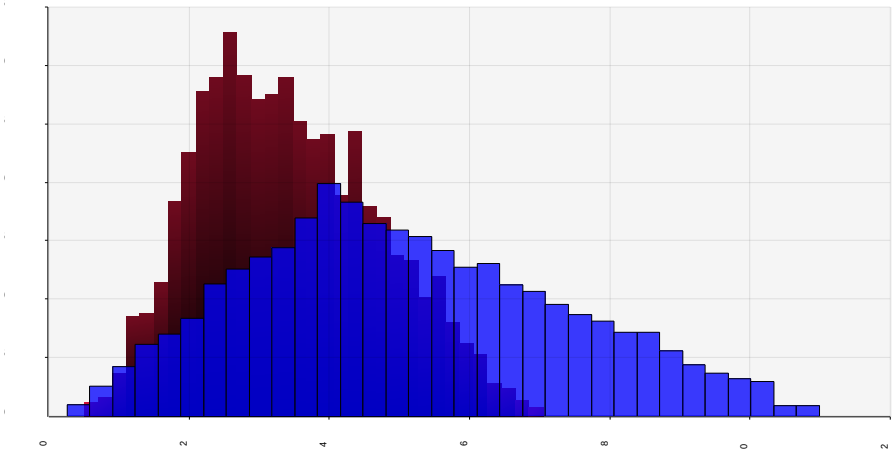



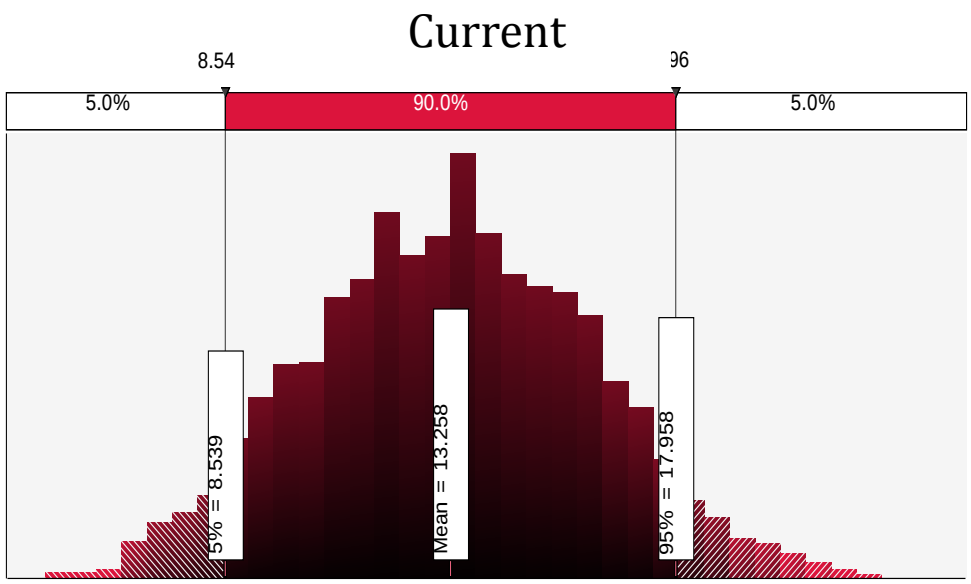
# FC_Community Partnership Development (per capita $)

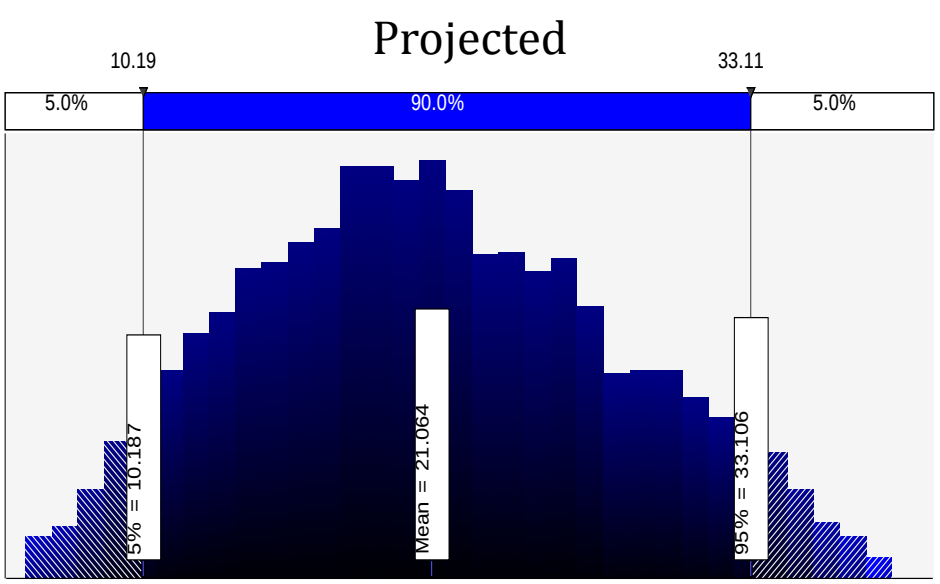


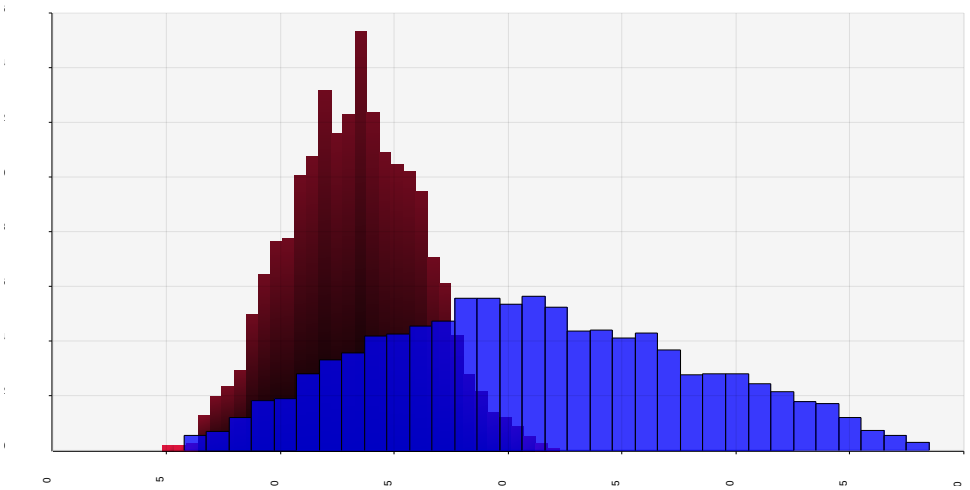



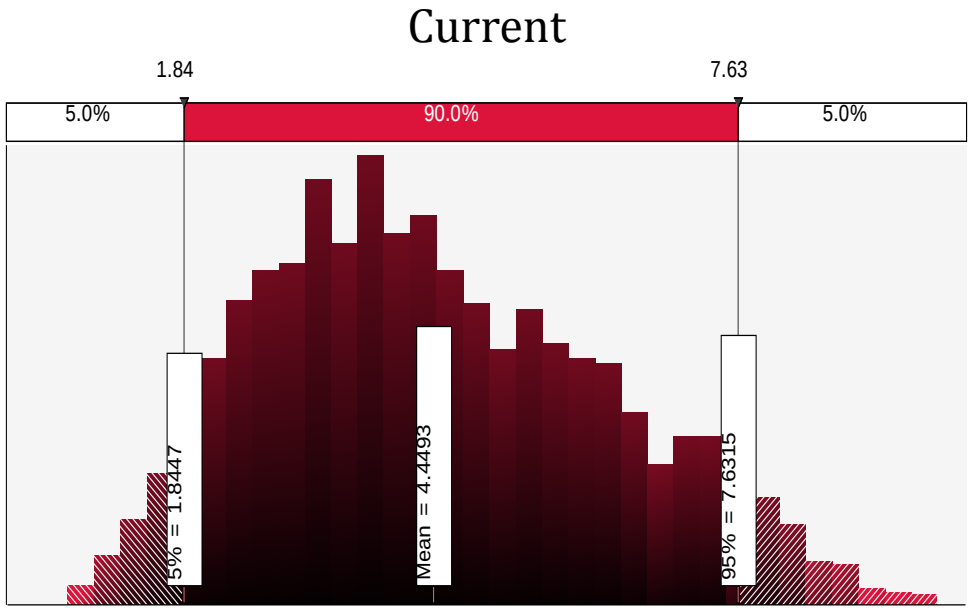
# FC_Organizational Competencies (per capita $)

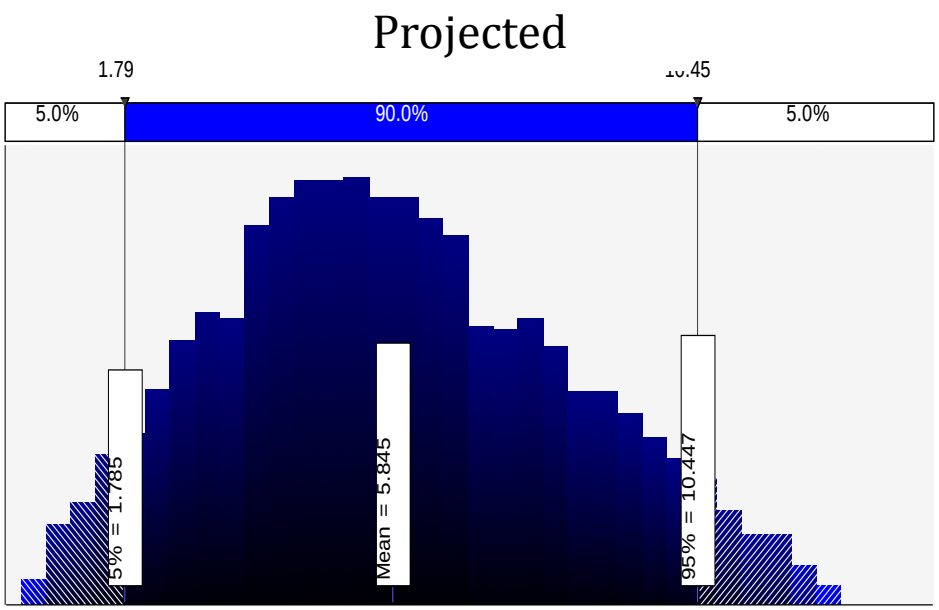


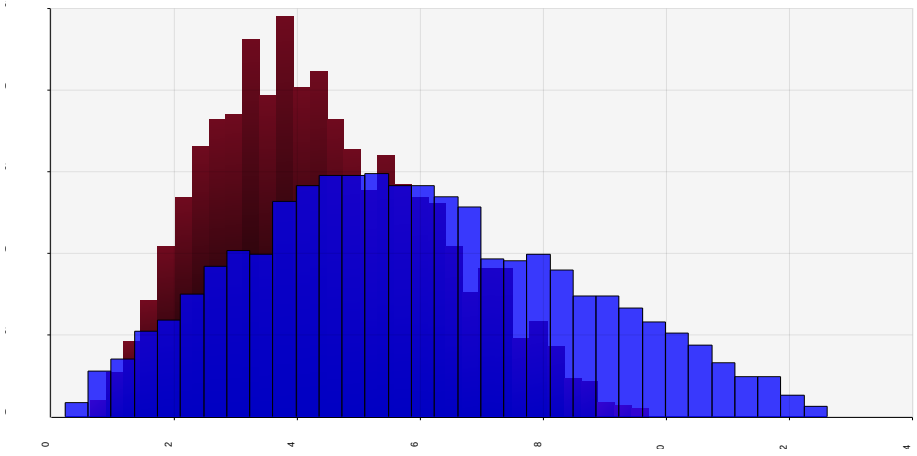



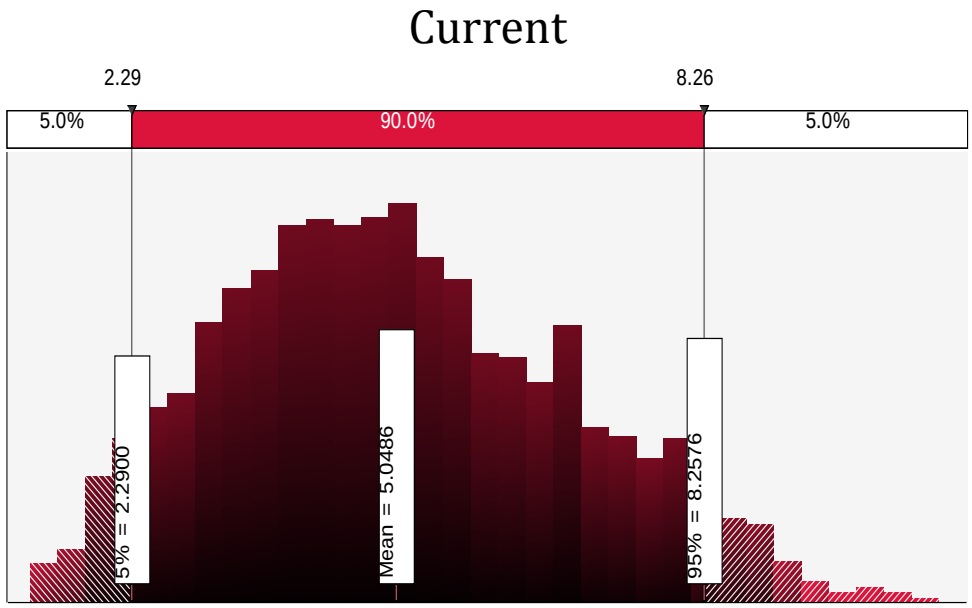
# Foundational Area (FA)_Communicable Disease Control (per capita $)

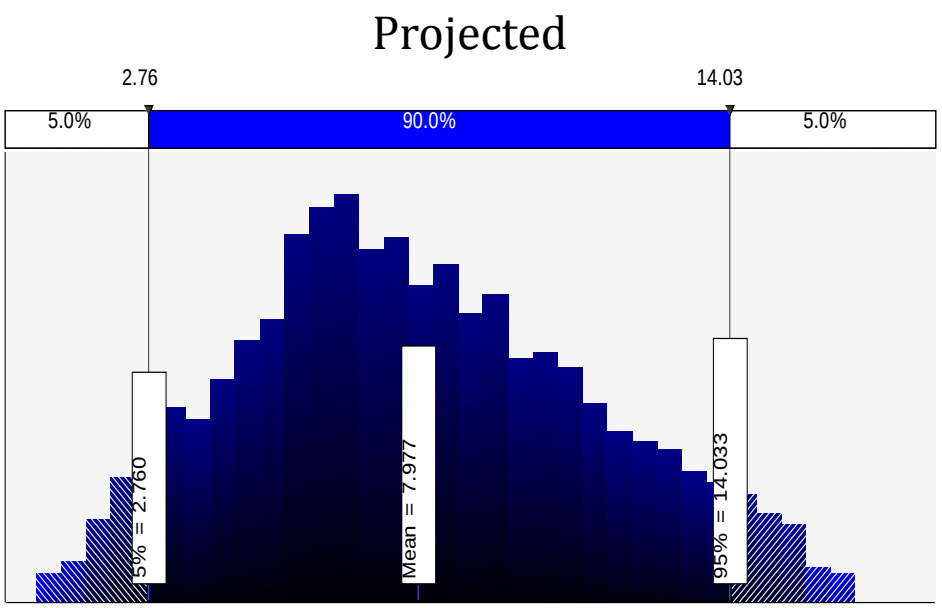


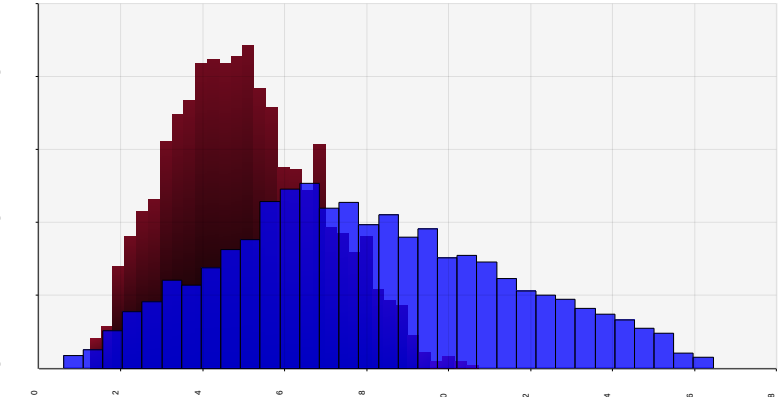



# FA_Chronic Disease & Injury Prevention (per capita $)

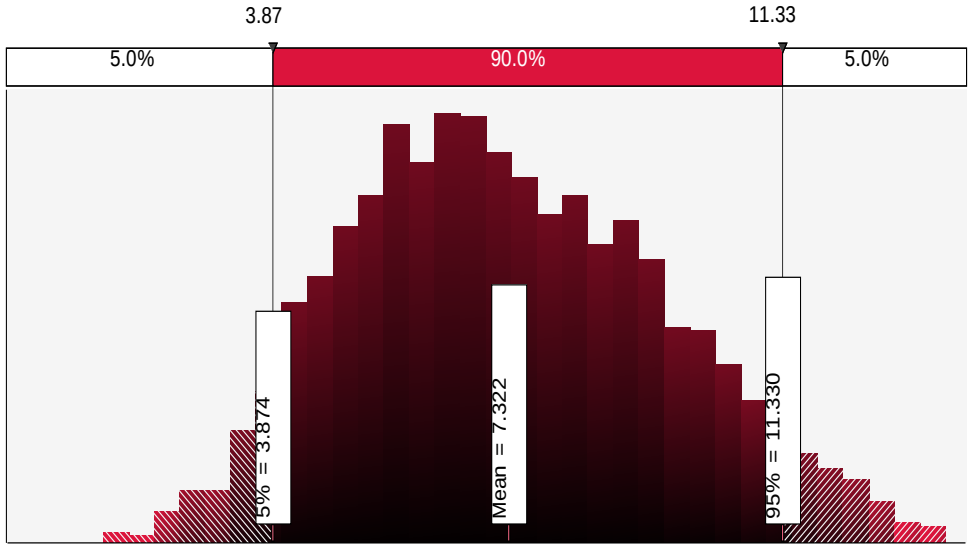


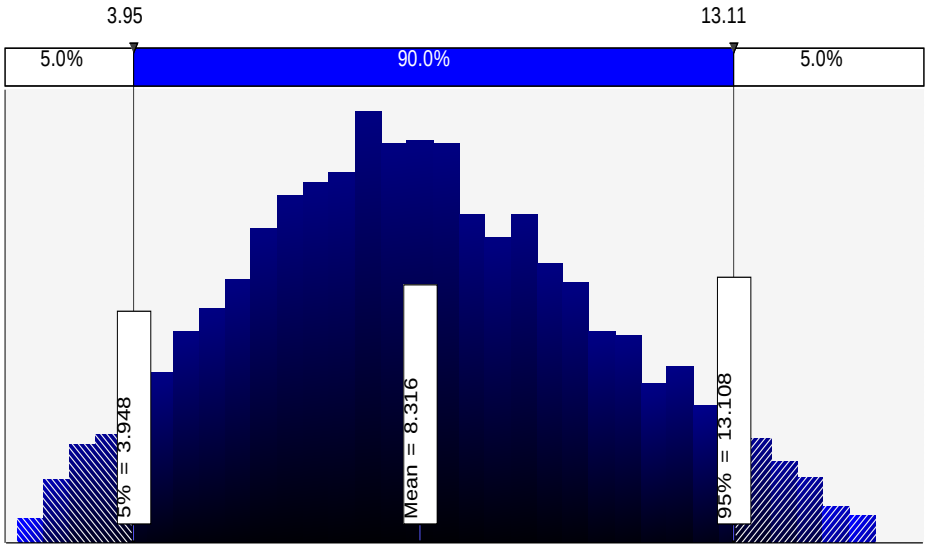



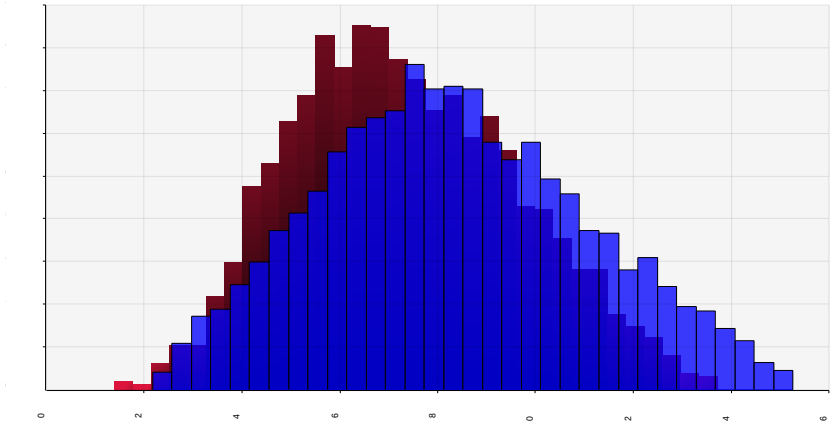
# FA_Environmental Public Health (per capita $)

Current

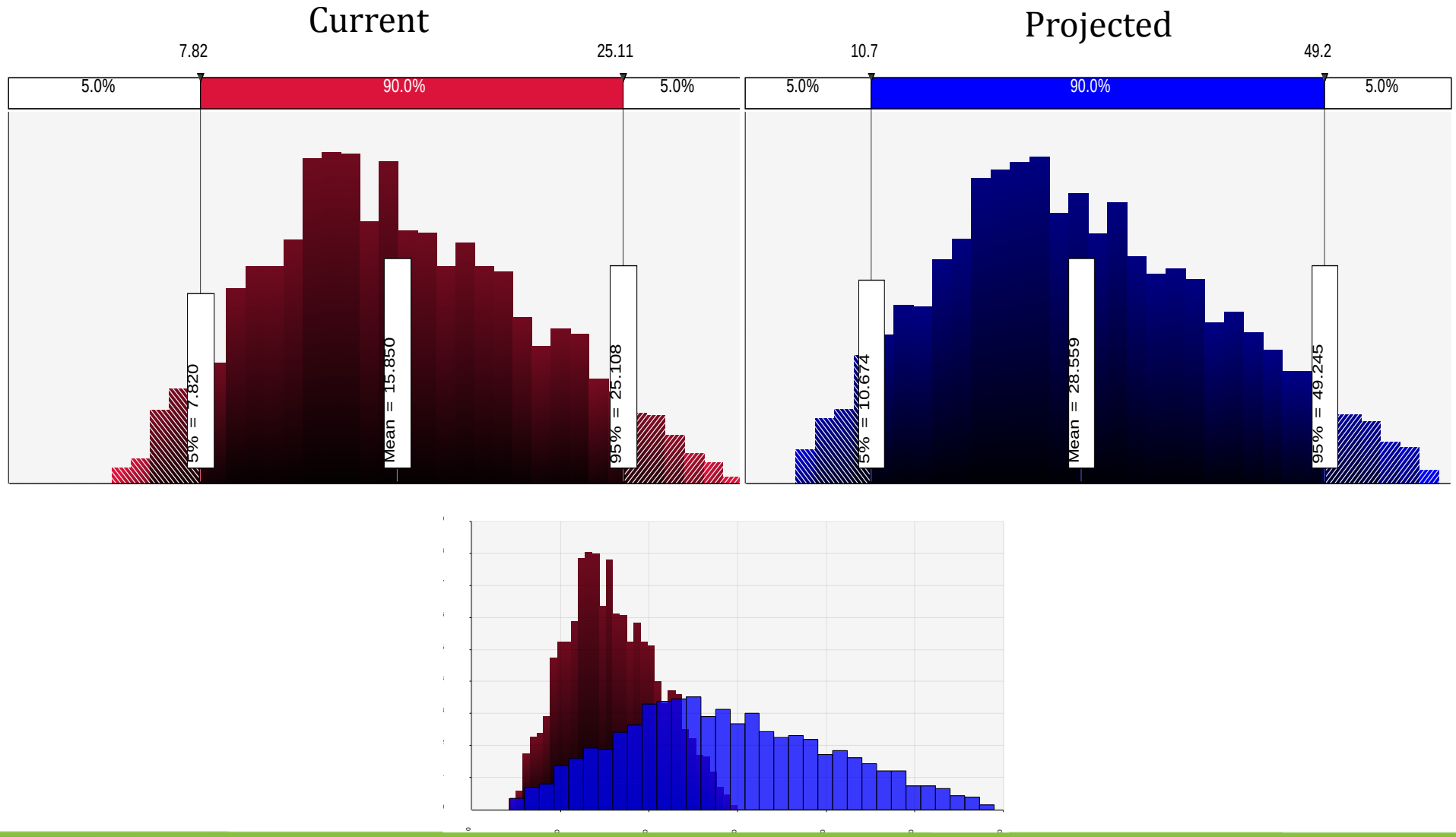



Projected

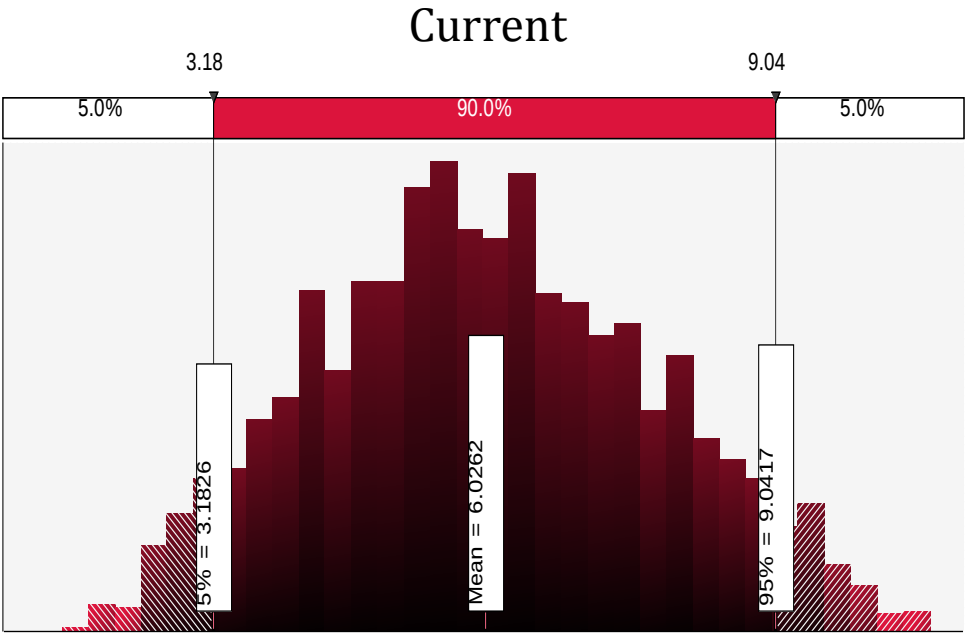


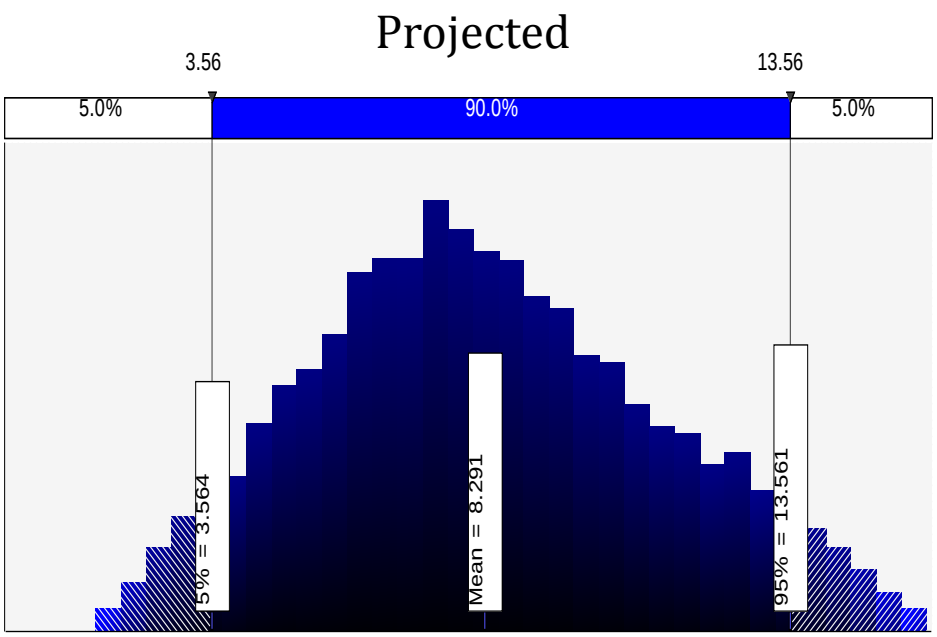



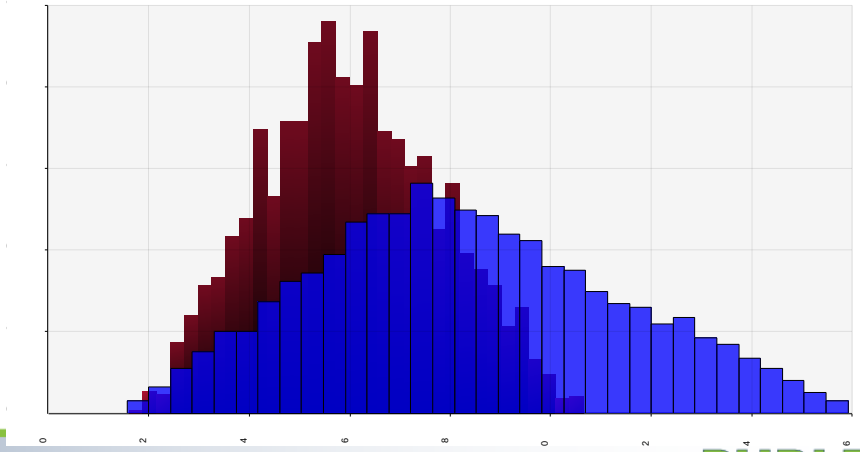
# FA_Maternal Child and Family Health (per capita $)



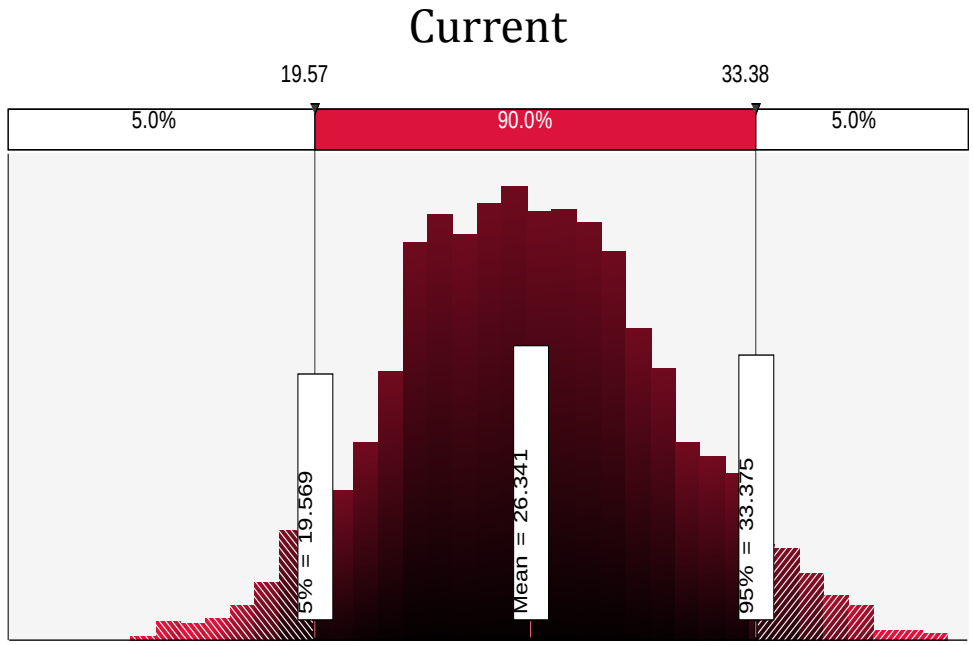
# FA_Access to & linkage w/ Clinical Care (per capita $)

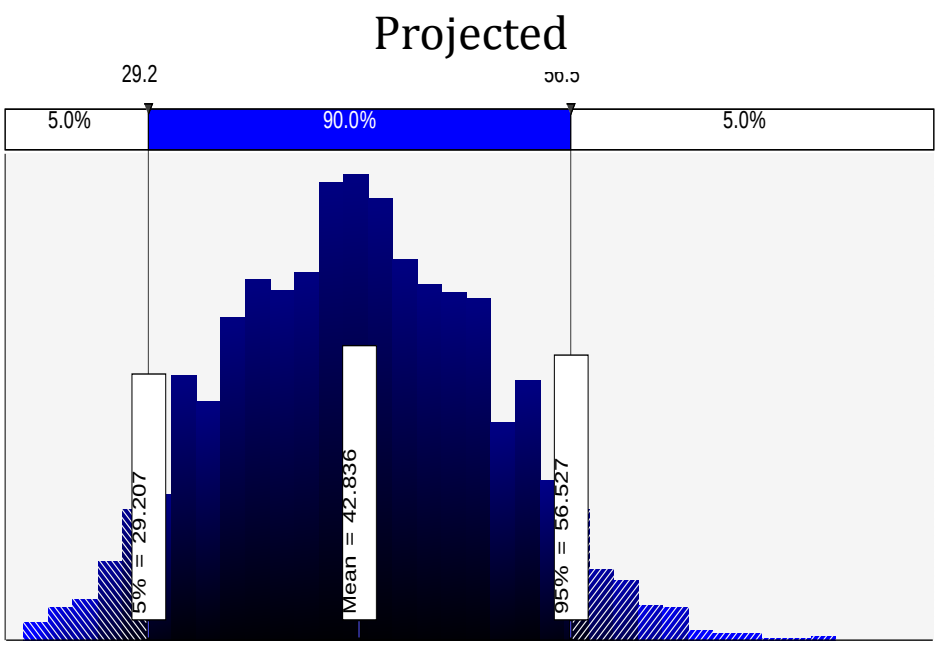


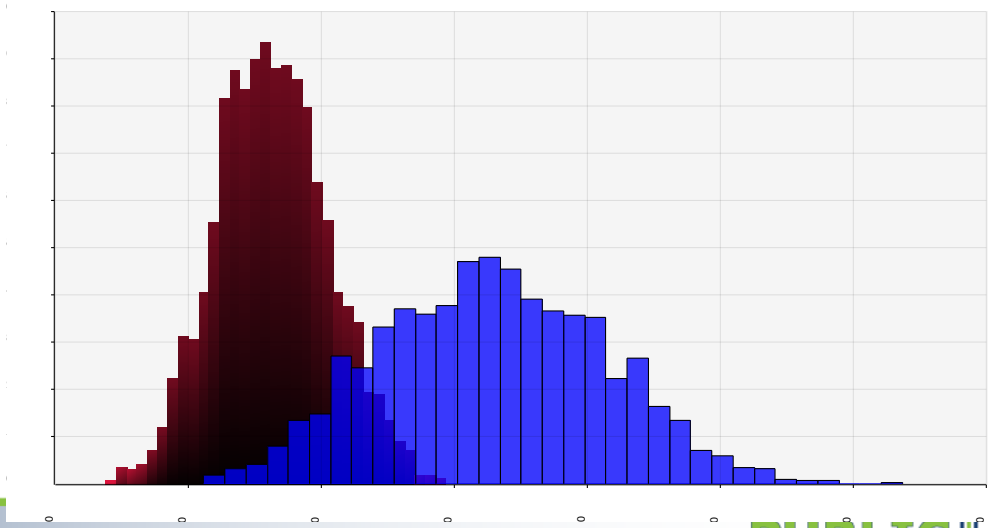



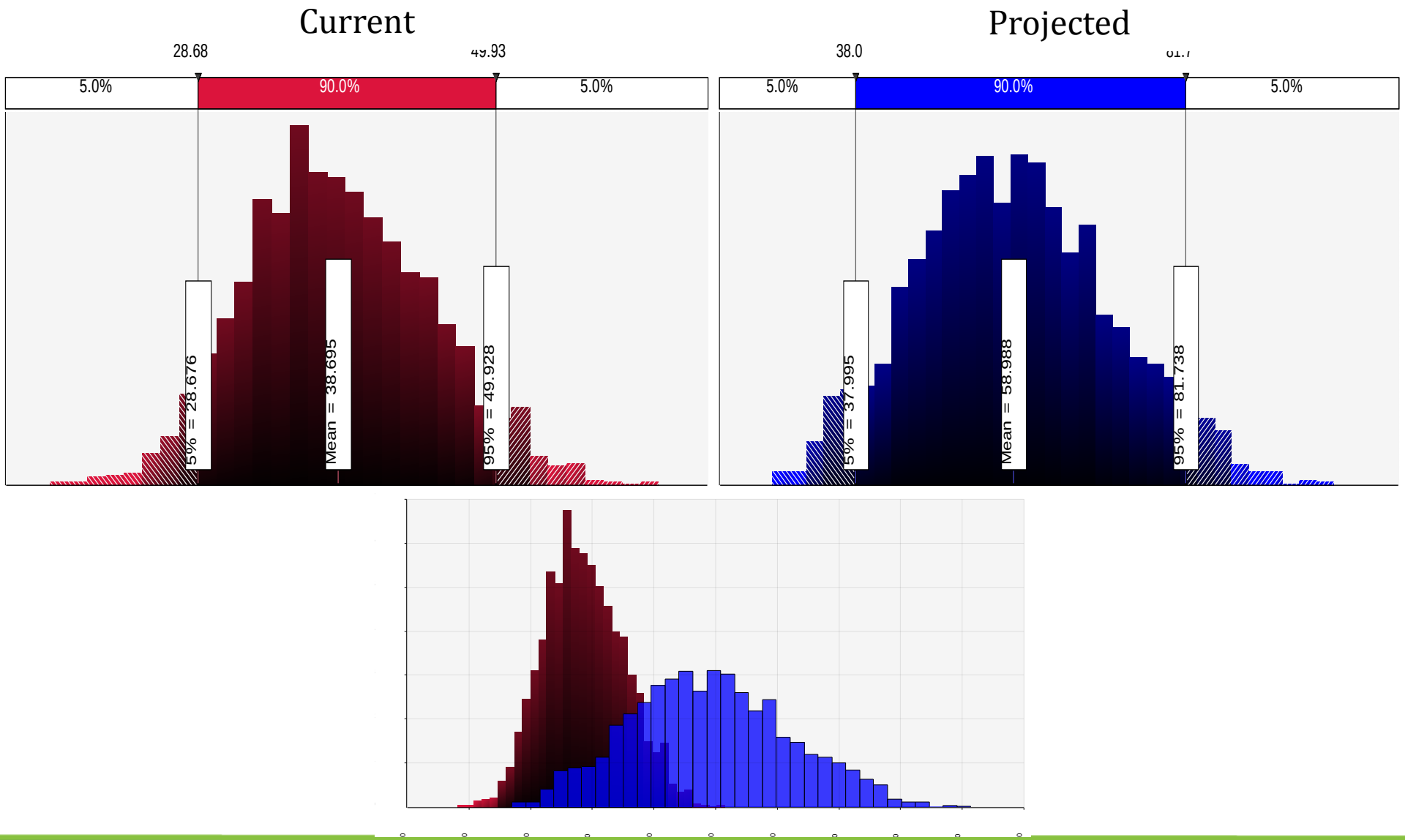
# Foundational Capability – Total Costs per capita (Current & Projected)



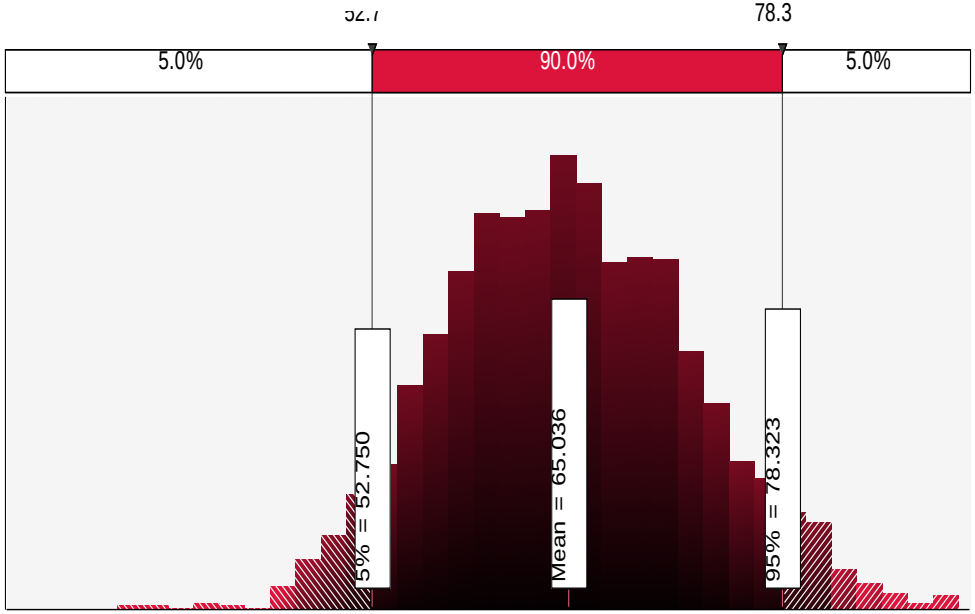



# Foundational Areas_Total Costs per capita (Current & Projected)

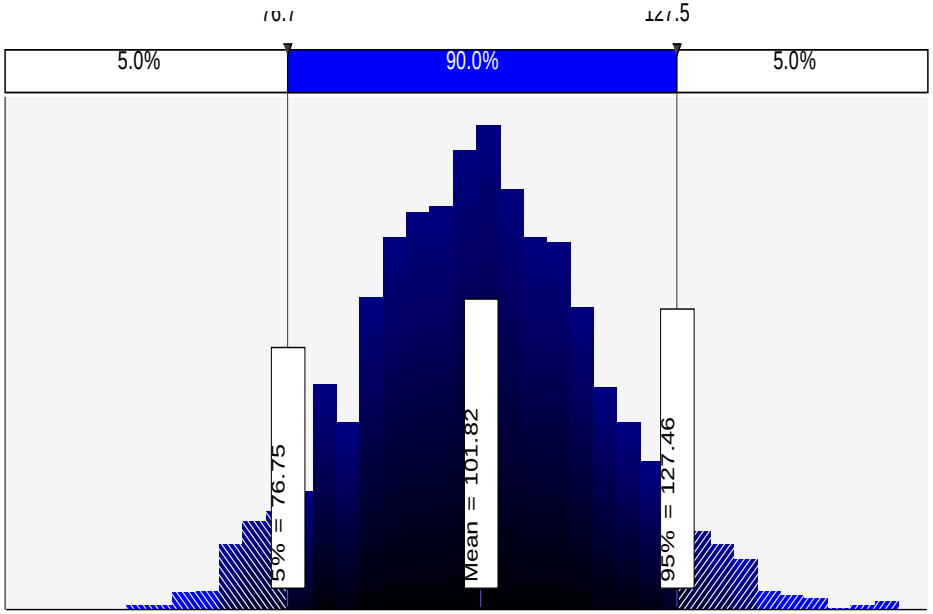


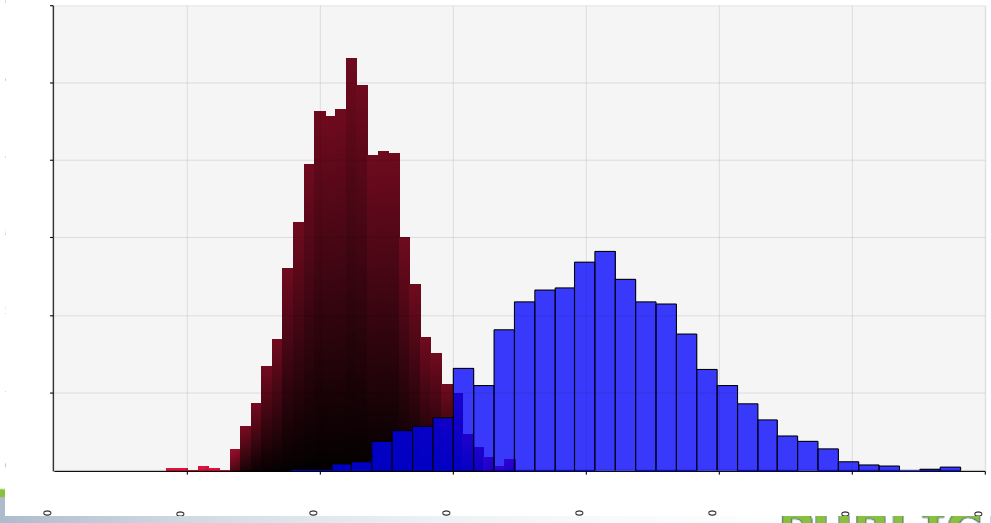
# Total Local Per Capita Cost Estimates: Current and Projected

Current

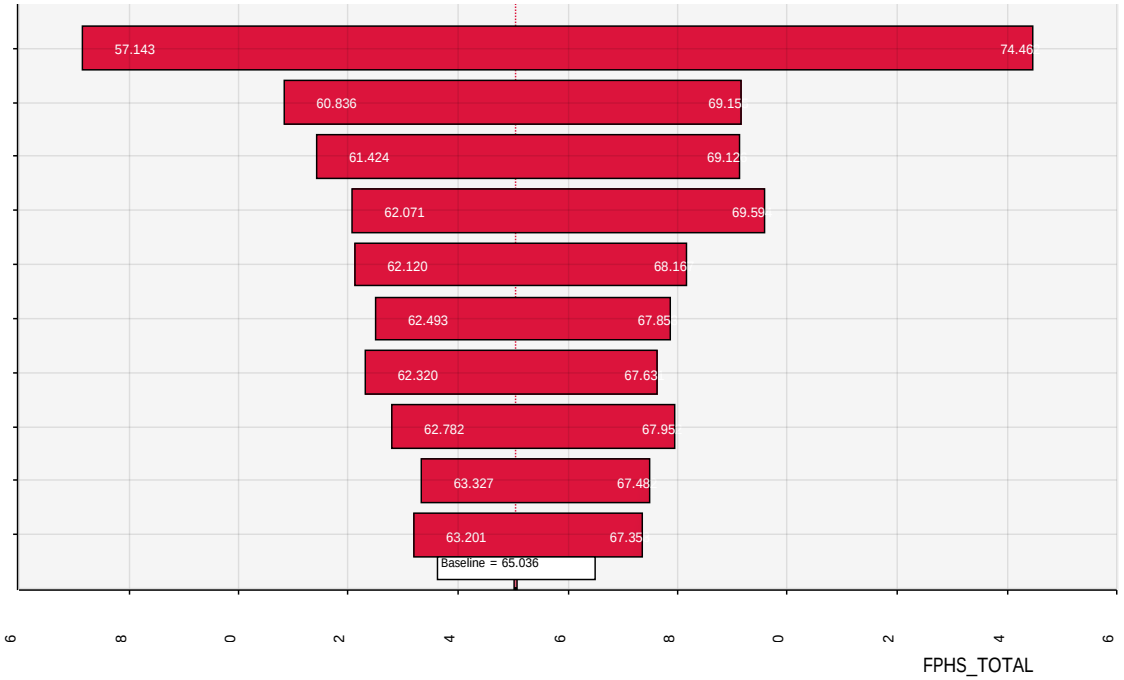



Projected

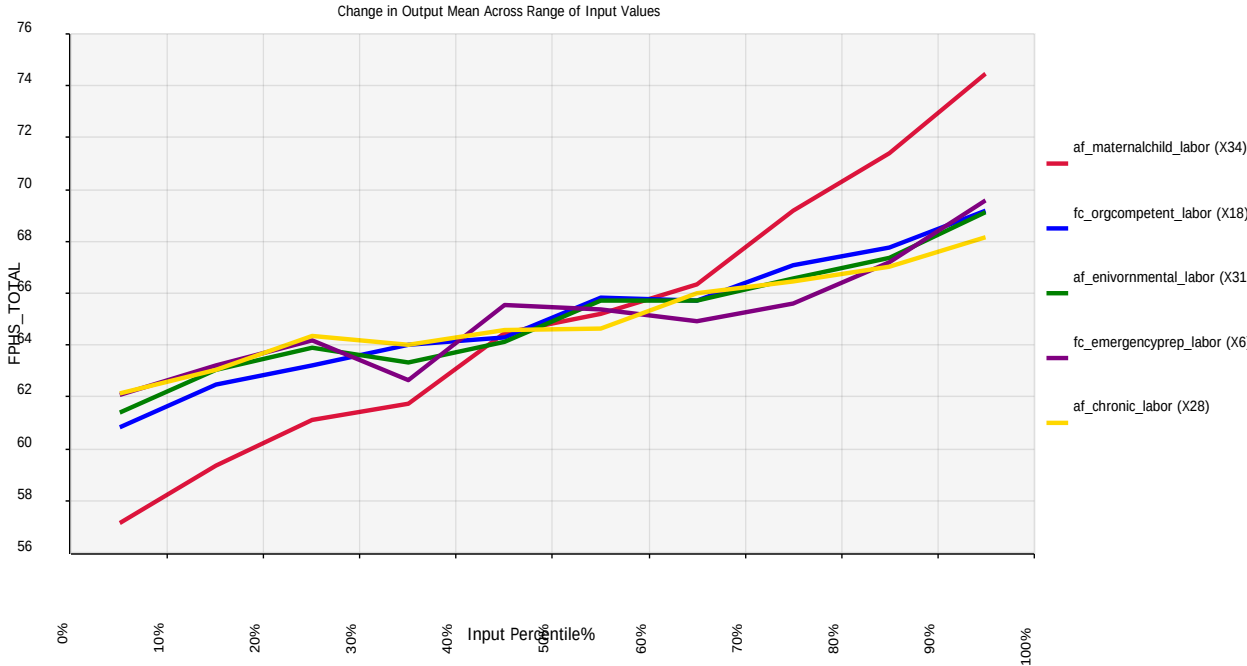


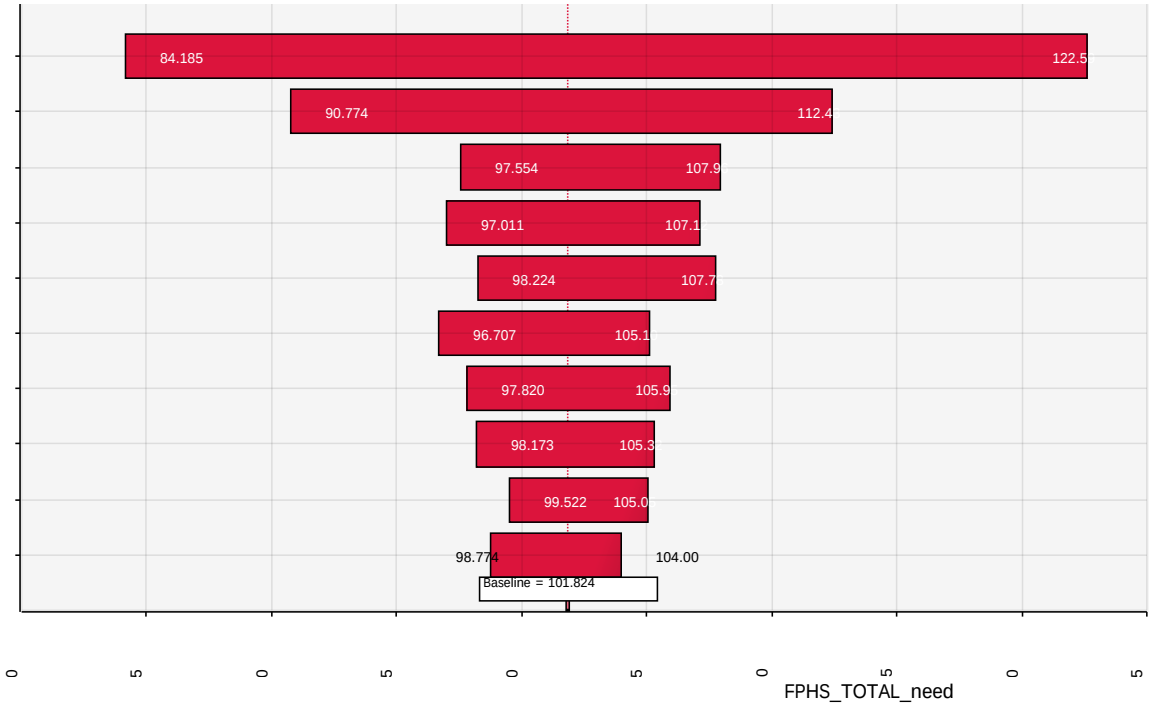
# Drivers of Total Current Costs: Which FCs and FAs are Most Influential?



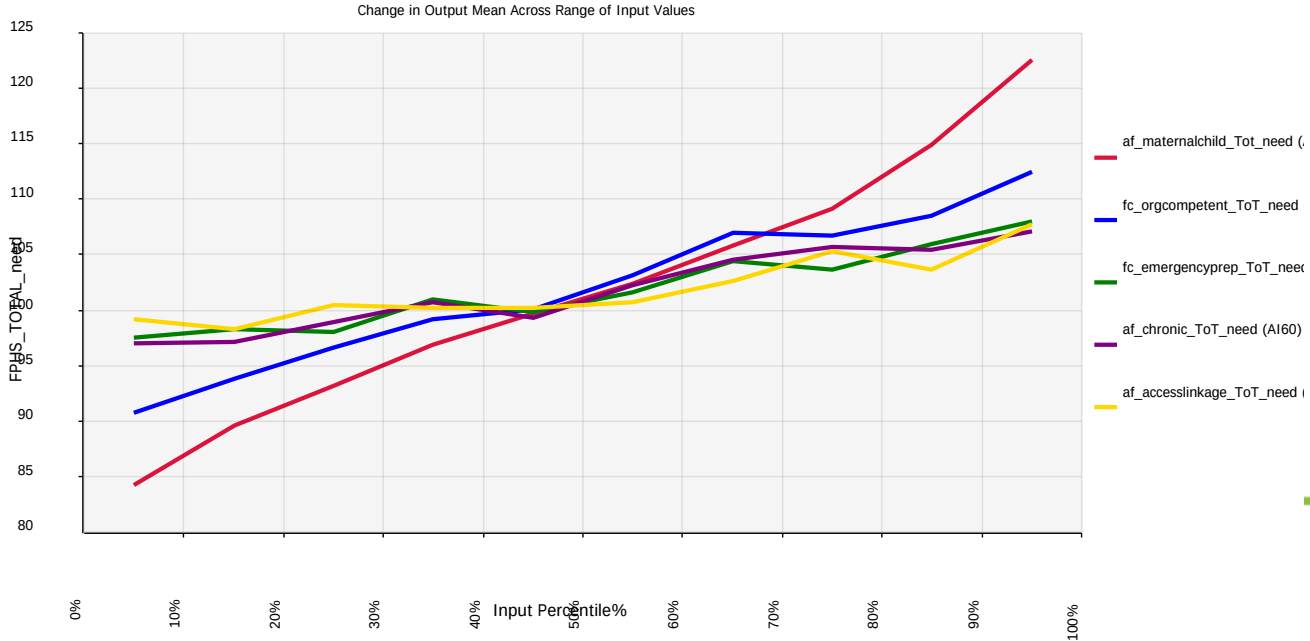

Sensitivity Analysis for Total FPHS Costs per capita (current)



# Drivers of Total Projected Costs: Which FCs and FAs are Most Influential?



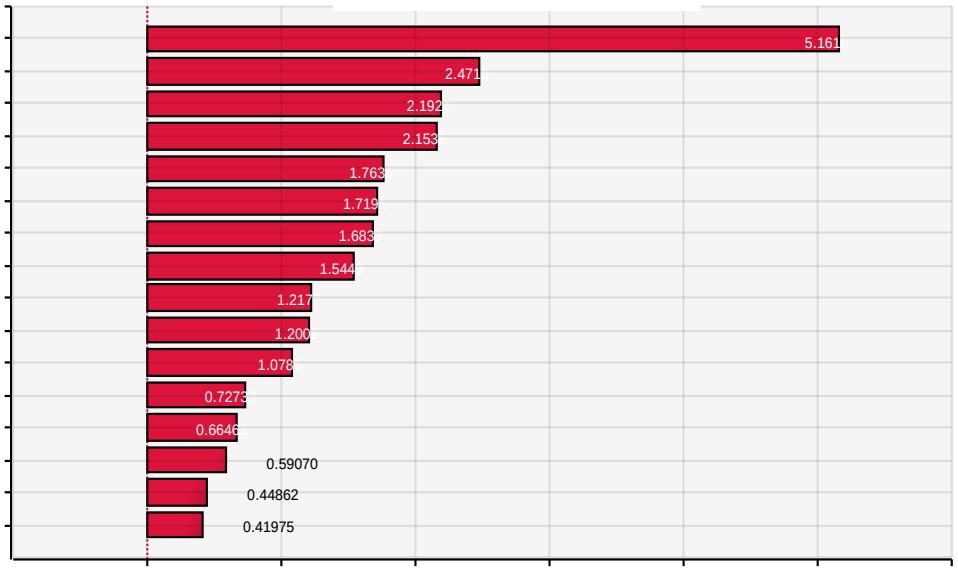

Sensitivity Analysis for Total FPHS Costs per capita (Projected)



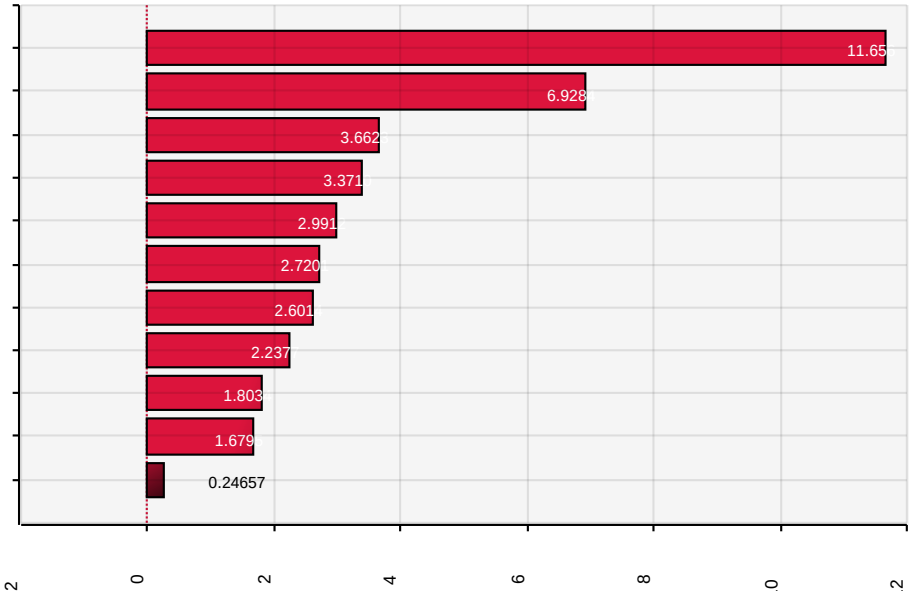
# How Sensitive Are Total Costs to FCs and FAs

Sensitivity Analysis for Total FPHS Costs per capita (current & projected) – standardized beta coefficients

Current




Projected



# Comparison of Cost Estimates

**Washington PHIP - BERK Foundational Cost Report**

- $328 million total annual cost projected (state+local)
- $165 million local annual cost projected
- $47 total per capita cost projected
- $24 local per capita cost projected

**Kentucky Pilot Project Baseline (i.e. most likely)**

- $286 million local annual current cost
- $65 local per capita current cost
- State cost estimates TBD

**Other State Estimates (different definitions & methods)**

- Ohio: $32 local per capita current cost
- Colorado: $37 local per capita current cost

# Next Steps: National Estimates

- National stratified, nested sample of state and local jurisdictions
- Selection of 6 states stratified by administrative structure:
  - Centralized: AR, SC
  - Shared: FL, GA (KY)
  - Decentralized: NY, CA (WA)
- Selection of 3 local jurisdictions in each state, stratified by population: <50k | 50-299k | >=300k
- Supplement data already collected from KY, WA
- Web-based survey administration with telephone support

# For More Information

PUBLIC HEALTH | SERVICES & SYSTEMS RESEARCH
PRACTICE-BASED RESEARCH NETWORKS
National Coordinating Center

**Supported by The Robert Wood Johnson Foundation**

111 Washington Avenue, Suite 201
Lexington, KY 40536
859-218-0113

UK UNIVERSITY OF KENTUCKY

**Email:** publichealthPBRN@uky.edu
**Web:** www.publichealthsystems.org
**Journal:** www.FrontiersinPHSSR.org
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