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Estimating the Value of Public Health Services & Systems: Evidence, Uncertainties, and Research Needs

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Estimating the Value of Public Health Services & Systems: Evidence, Uncertainties, and Research Needs

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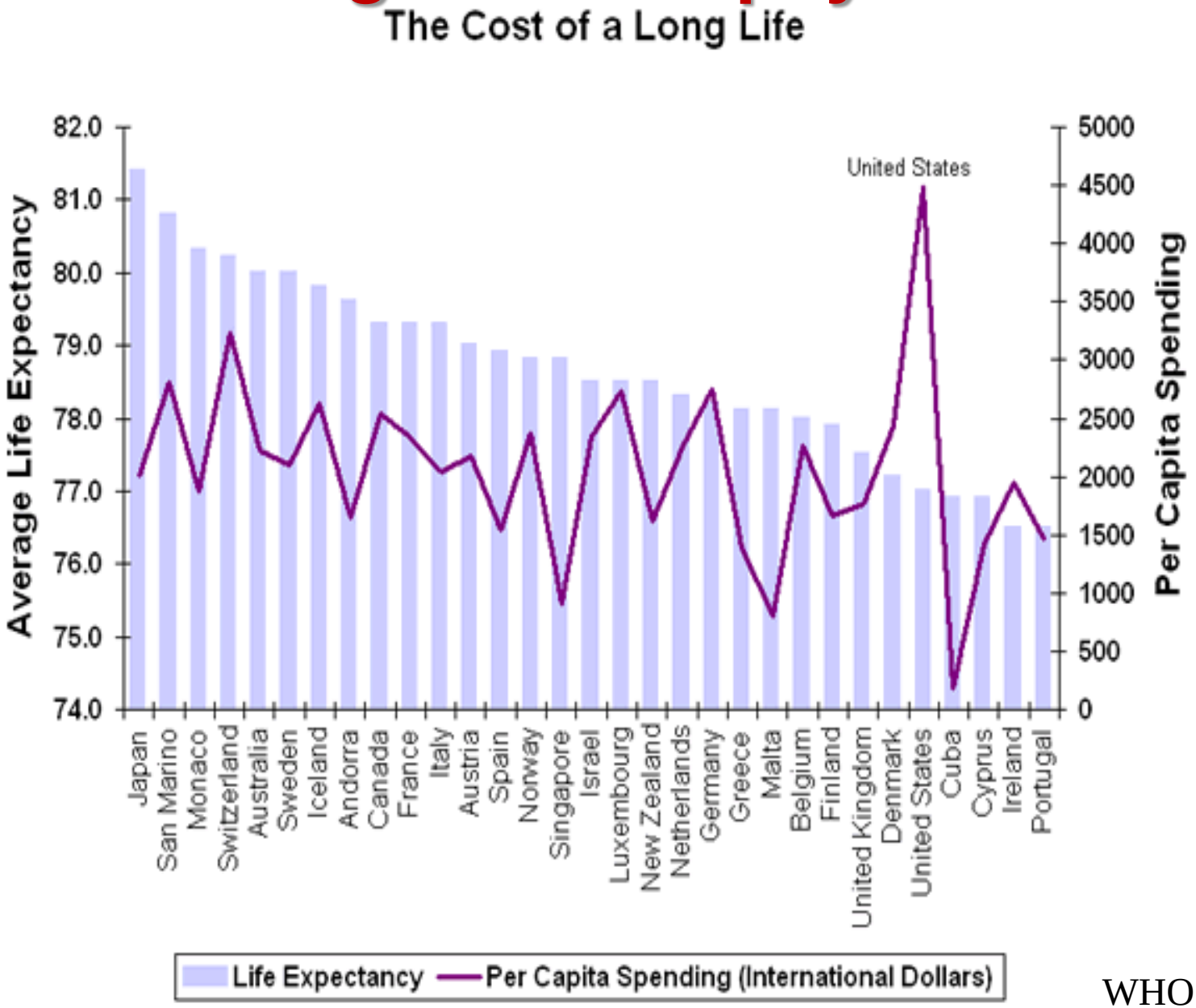
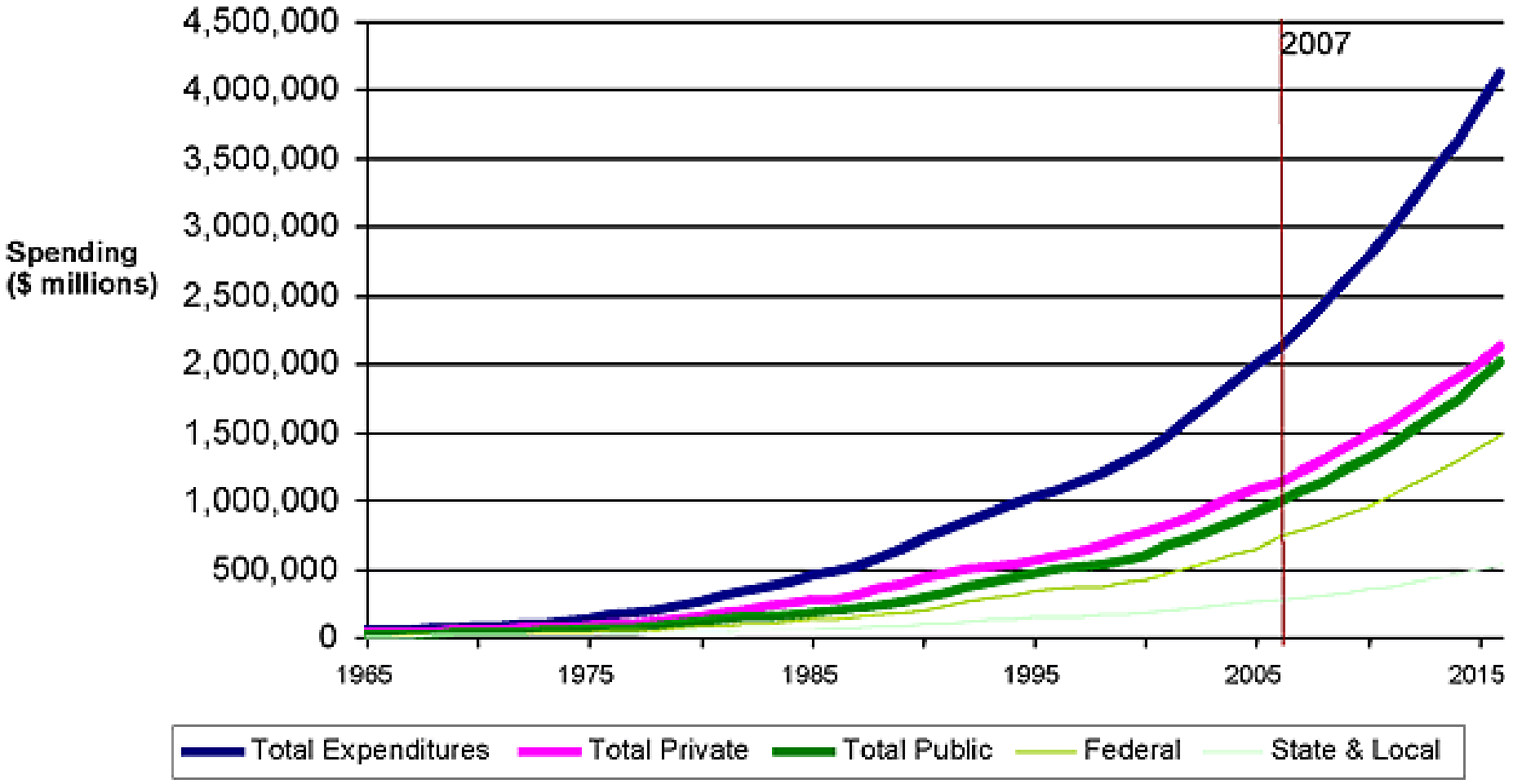
Getting what we pay for?



WHO 2005

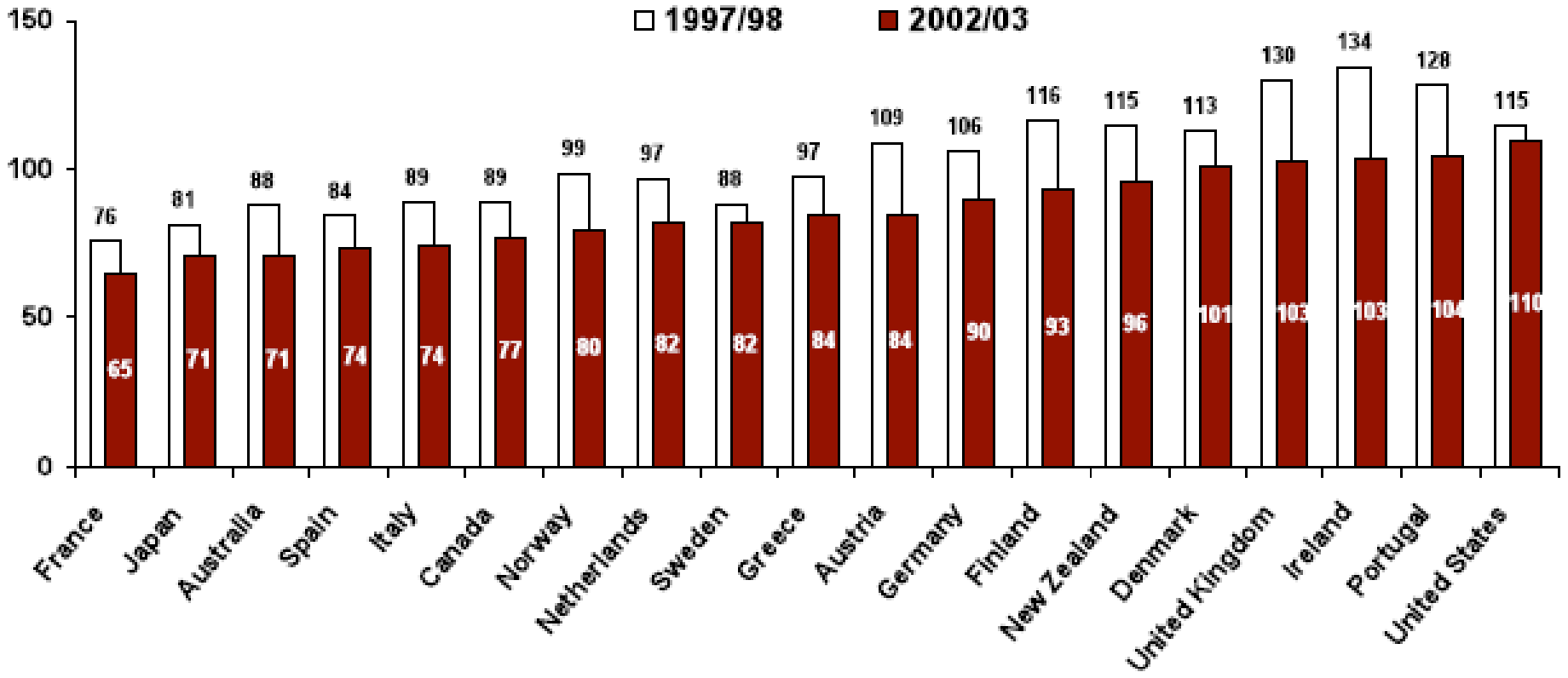
Why we care about the cost curve?



Source: CMS Office of the Actuary 2009

Preventable mortality in the U.S.

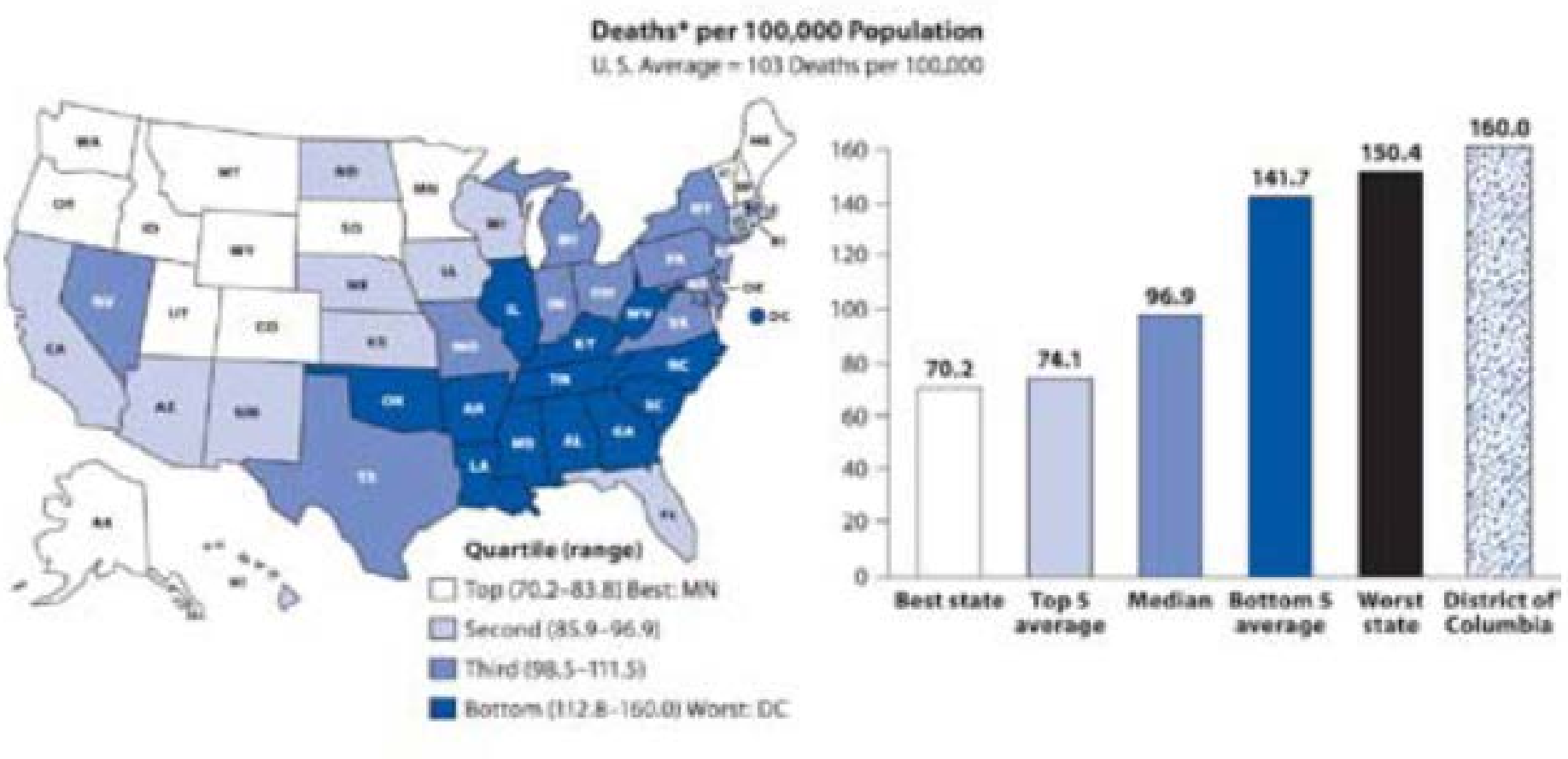
Preventable Deaths per 100,000 population



Countries' age-standardized death rates before age 75; including ischemic heart disease, diabetes, stroke, and bacterial infections.
See report Appendix B for list of all conditions considered amenable to health care in the analysis.

Source: Commonwealth Fund 2008

Geographic variation in preventable mortality

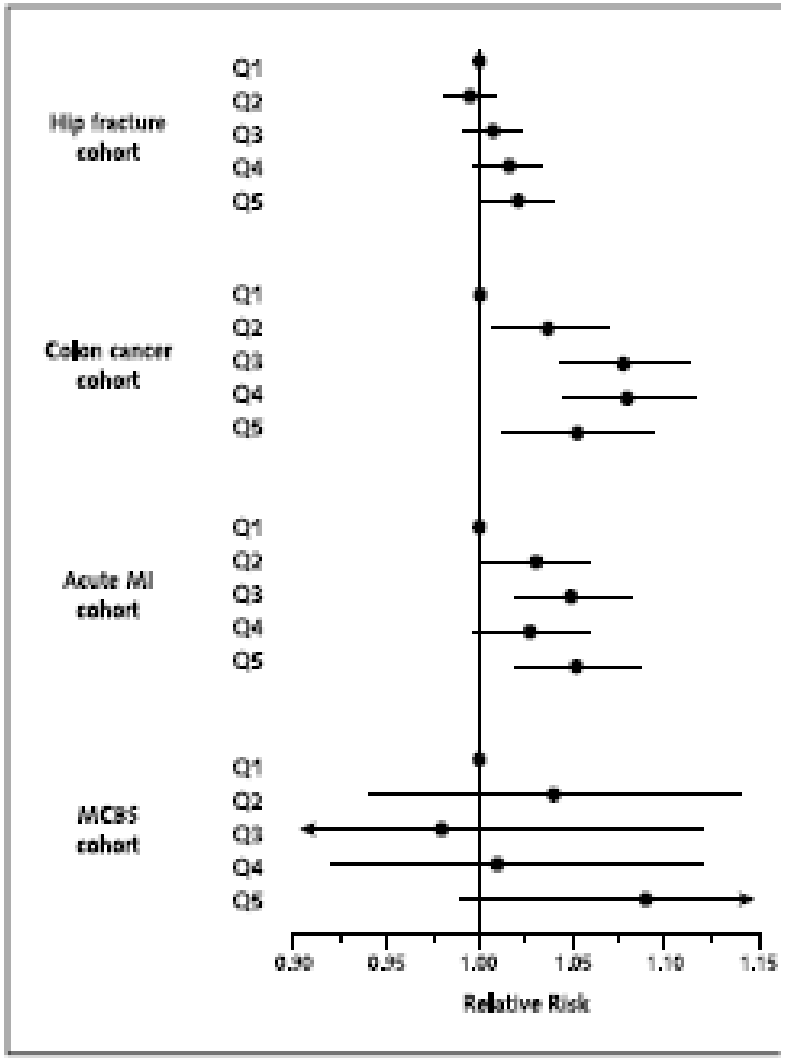


Source: Commonwealth Fund 2008

Geographic variation in medical care spending and mortality

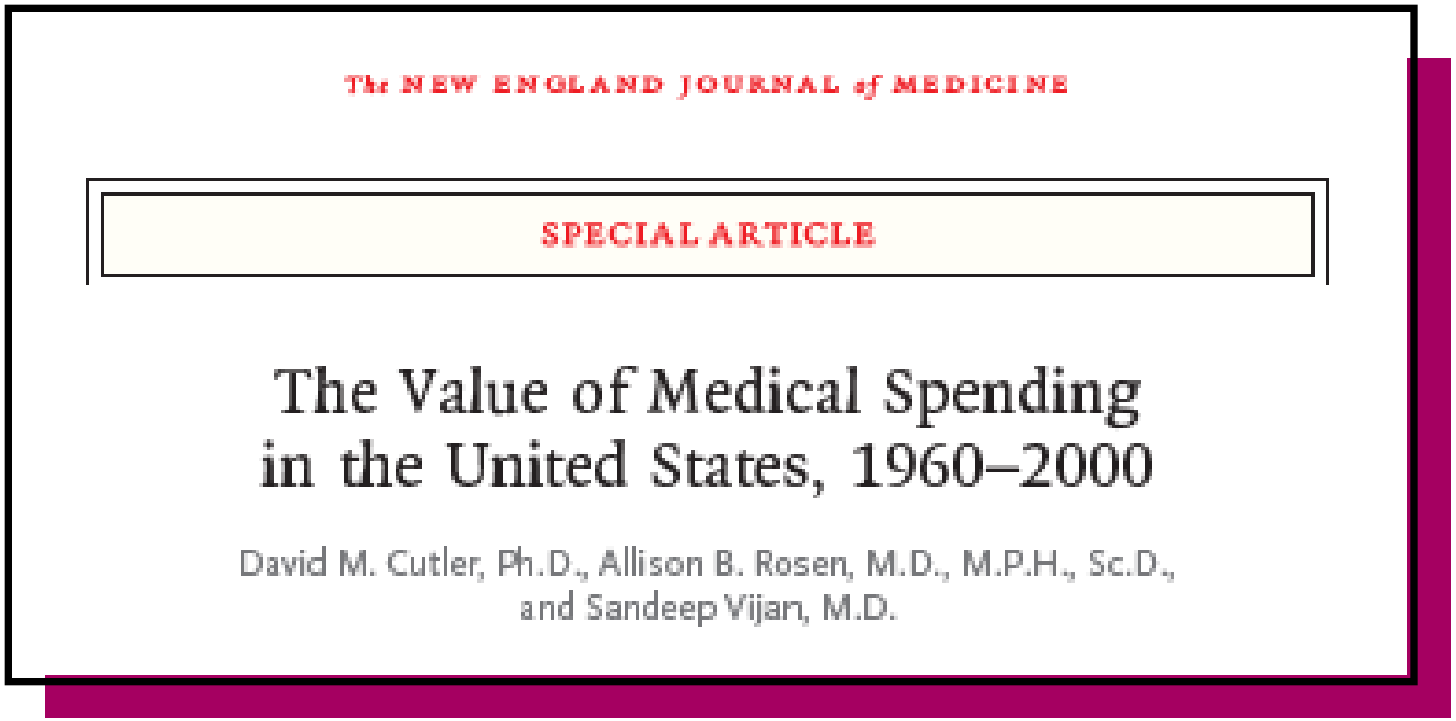
- Medical spending varies by a factor of more than 2 across local areas
- Patients in high-spending regions receive more care but do not experience lower mortality
- What can we say about public health spending?

Figure 1. Adjusted relative risk for death during follow-up across quintiles of Medicare spending.



Fisher et al. Annals 2003

Value of medical spending



The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

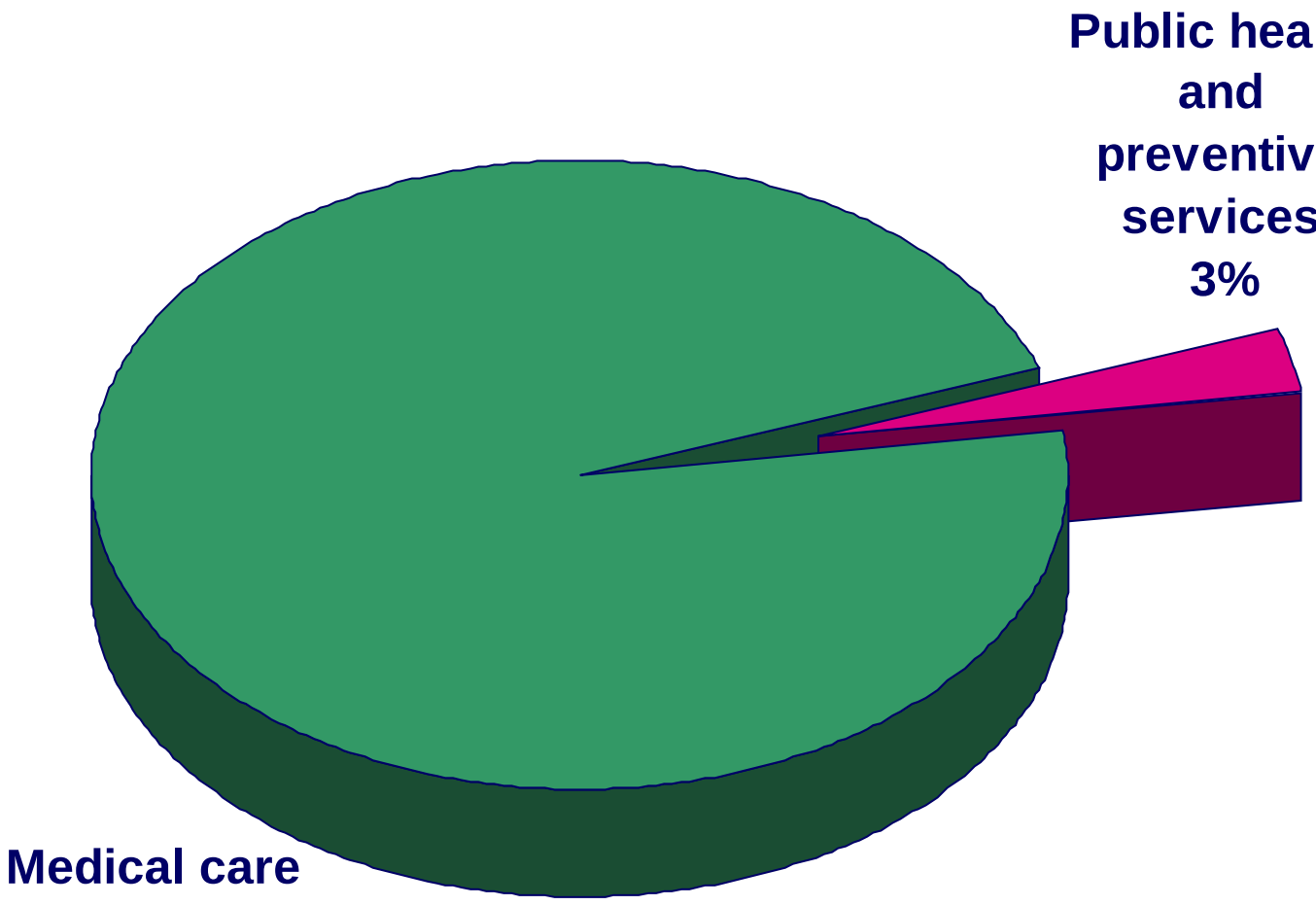
The Value of Medical Spending in the United States, 1960–2000

David M. Cutler, Ph.D., Allison B. Rosen, M.D., M.P.H., Sc.D., and Sandeep Vijan, M.D.

- Half of all gains attributable to medical care
- $36,300 per year of life gained

NEJM 2006

Public health's share of national spending



Batelle 1993, CMS 2005, NASBO 2005

Approaches to Estimating PH Value

- Macro-level studies: geographic variation and change in PH spending
- Micro-level: effects of specific PH strategies
- Value as defined by:
  - Health effects
  - Cost-effectiveness
  - Cost offsets
  - Technical efficiency

Macro questions of interest

- What factors drive variation and change in local PH spending patterns?
- Do variation and change in PH spending influence community-level rates of preventable mortality?
- Do variation and change in PH spending influence medical care spending?
- What are the expected effects of new public health spending under ACA on mortality and medical spending?

…But a plethora of empirical challenges

- Wide variation in how public health agencies are organized and what they do
- Few existing methods for measuring public health agency performance
- Spending data are scarce, imperfect, and infrequently used
- Confounding and selection issues exist in associations between spending and outcomes

Data used in empirical work

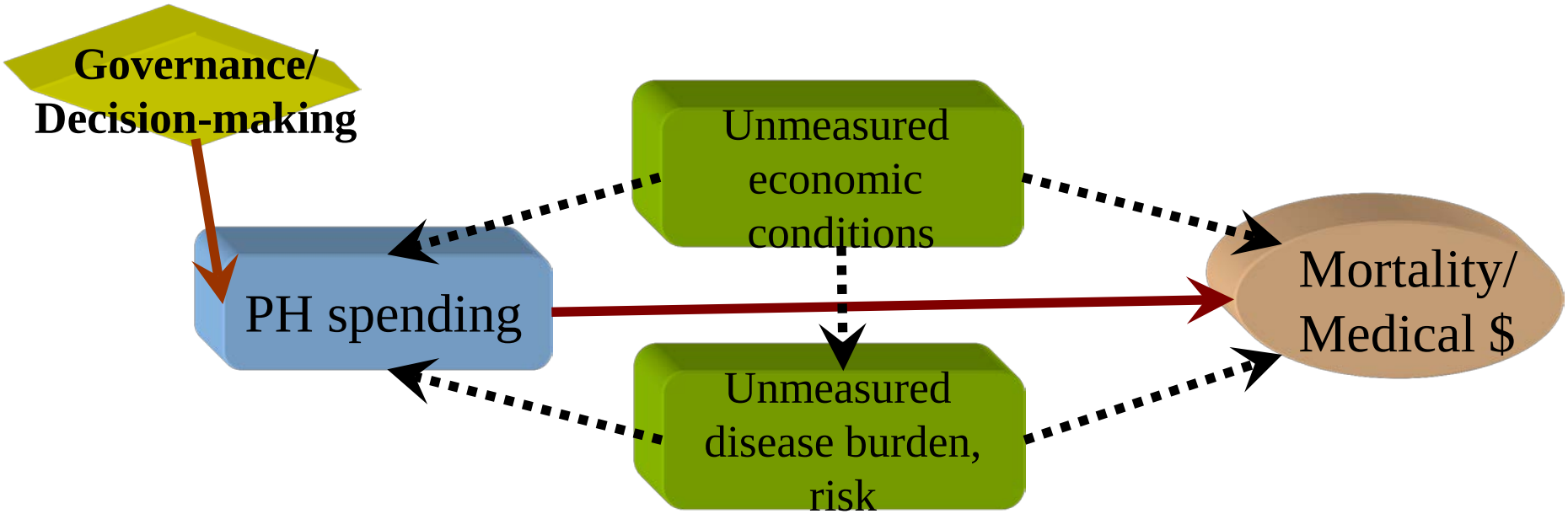
- NACCHO Profile: financial and institutional data collected on the national population of local public health agencies (N≈3000) in 1993, 1997, 2005, 2008
- Residual state and federal spending estimates from US Census of Governments and Consolidated Federal Funding Report
- Community characteristics obtained from Census and Area Resource File (ARF)
- Community mortality data obtained from CDC's Compressed Mortality File
- ***HSA-level*** medical care spending data from CMS and Dartmouth Atlas (Medicare claims data)

Analytical approach

- Dependent variables
  - Age-adjusted mortality rates, conditions sensitive to public health interventions
  - Medical care spending per recipient (Medicare as proxy)
- Independent variables of interest
  - Local PH spending per capita, all sources
  - Residual state spending per capita (funds not passed thru to local agencies)
  - Direct federal spending per capita
- Analytic strategy for panel data: 1993-2008
  - Fixed effects estimation
  - Random effects with instrumental variables (IV)

Analytical approach: IV estimation

- Identify exogenous sources of variation in spending that are unrelated to outcomes
  - Governance structures: local boards of health
  - Decision-making authority: agency, board, local, state
- Controls for unmeasured factors that jointly influence spending and outcomes

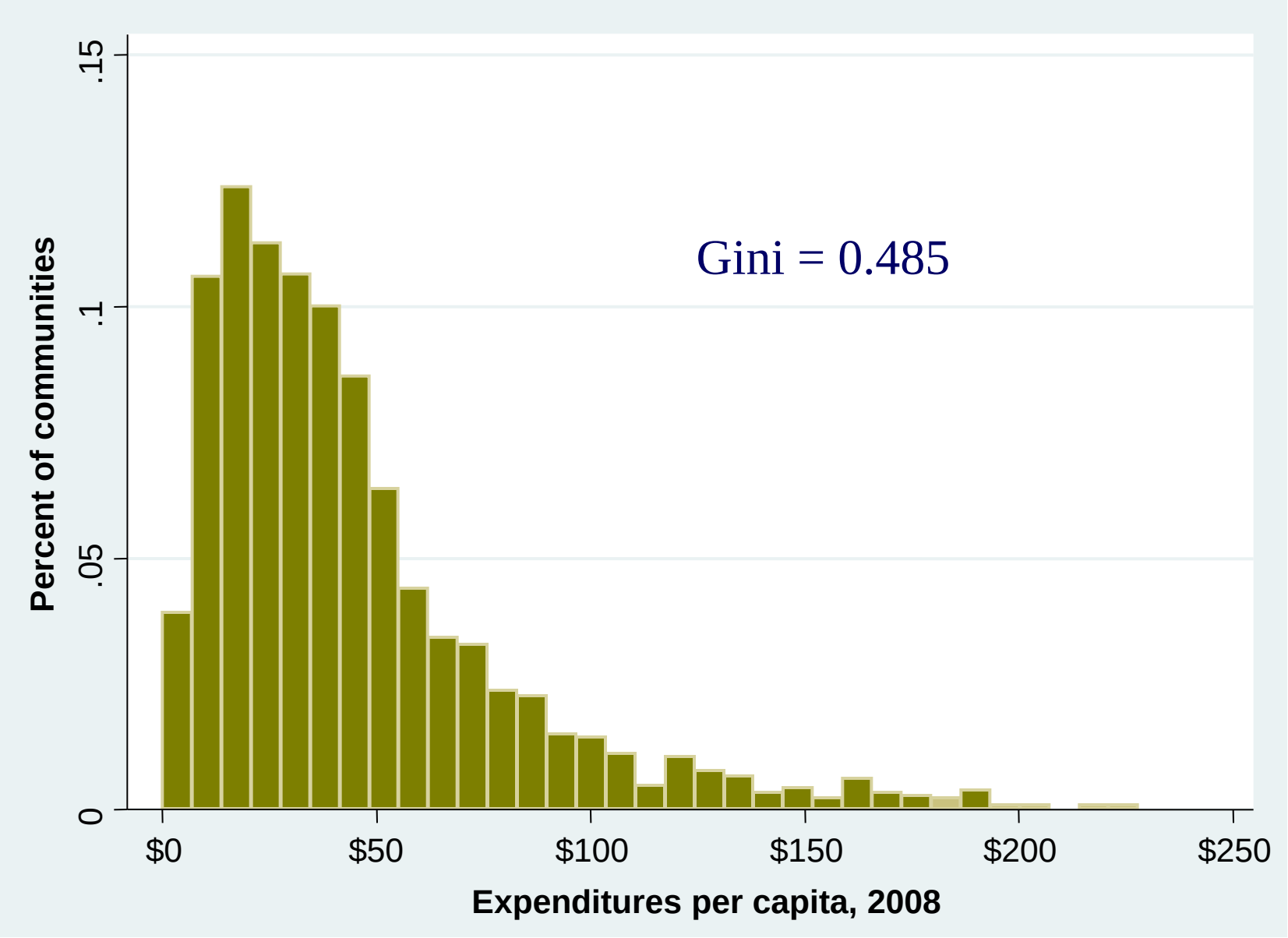


Analytical approach

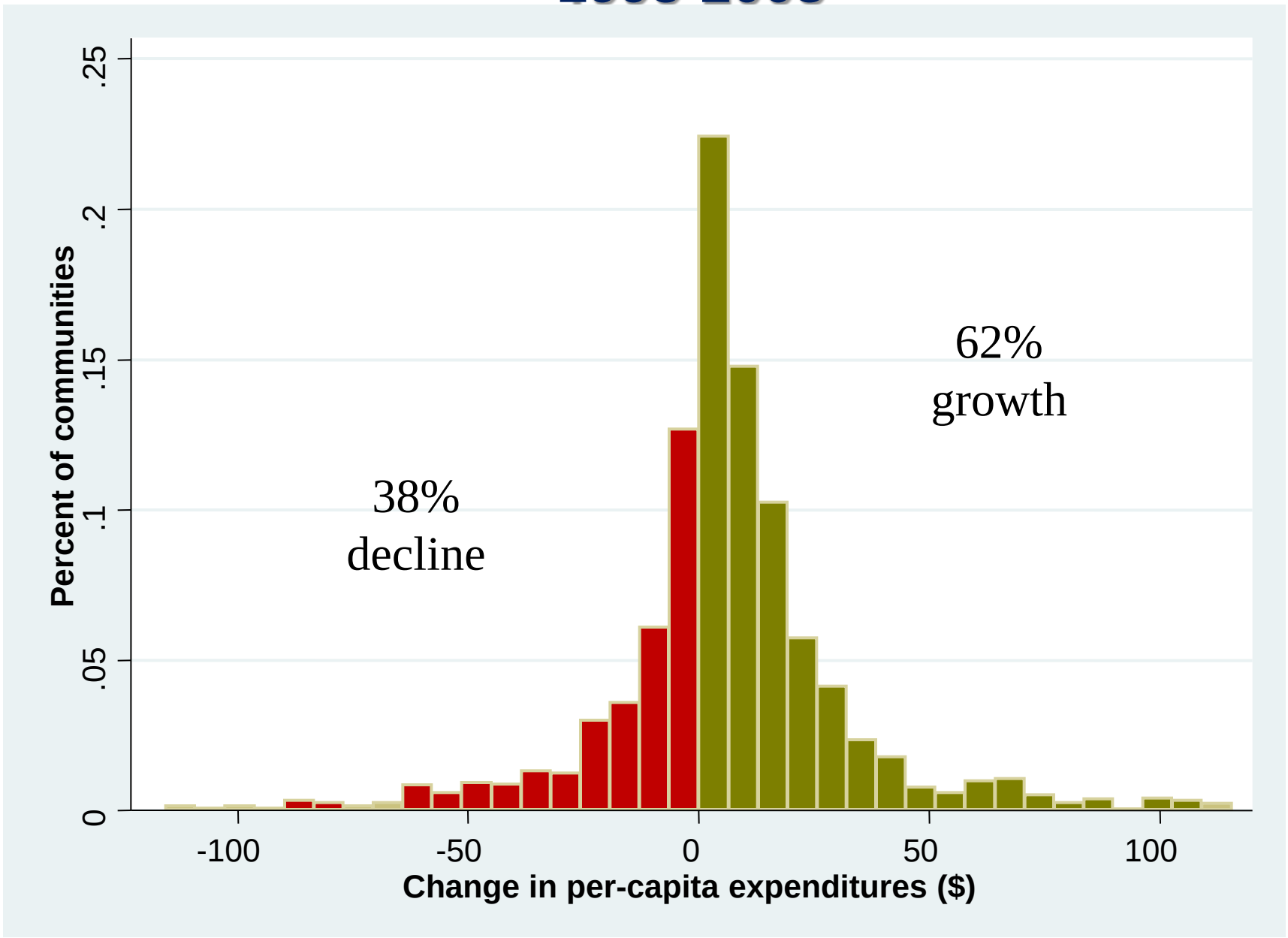
Other Variables Used in the Models

- ***Agency characteristics***: type of government jurisdiction, state-local administrative relationships, ***local governance and decision-making structures***
- ***Community and market characteristics***: population size, rural-urban, poverty, income per capita, education attainment, unemployment, age distributions, physicians per capita, CHC funding per low income, health insurance coverage, local health care wage index

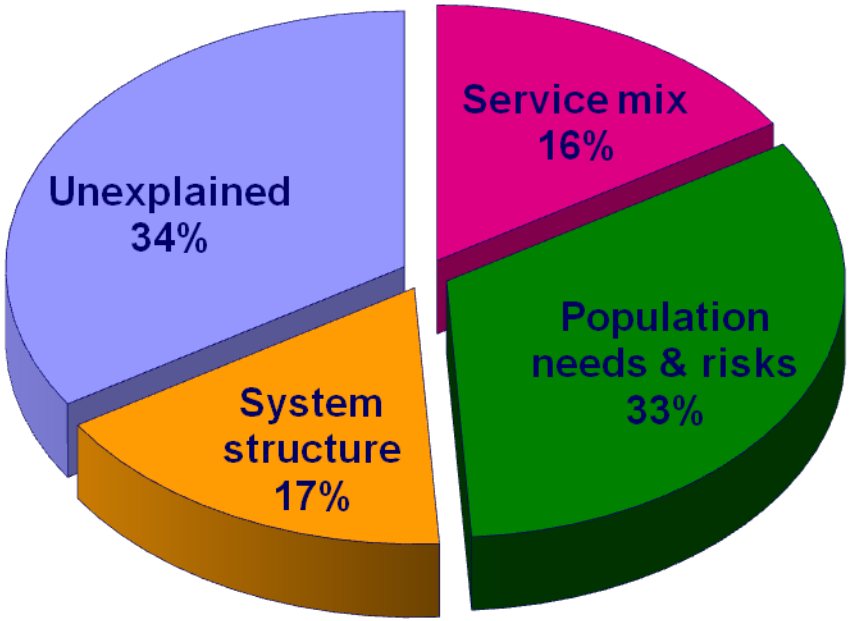
Variation in Local Public Health Spending



Changes in Local Public Health Spending 1993-2008



Drivers of geographic variation in public health spending



- Delivery system size & structure
- Service mix
- Population needs and risks
- Efficiency & uncertainty

Mays et al. 2009

Drivers of Local Public Health Spending Levels

Governance/Decision Authority	Elasticity Coefficient	95% CI
Local board of health exists	0.131**	(0.061, 0.201)
State hires local PH agency head†	-0.151*	(-0.318, 0.018)
Local govt approves local PH budget†	-0.388***	(-0.576, -0.200)
State approves local PH budget†	-0.308**	(0.162, 0.454)
Local govt sets local PH fees†	0.217**	(0.101, 0.334)
Local govt imposes local PH taxes†	0.190**	(0.044, 0.337)

Semi-log regression estimates controlling for community-level and state-level characteristics. *p<0.10 **p<0.05 ***p<0.01

†As compared to the local board of health having the authority.

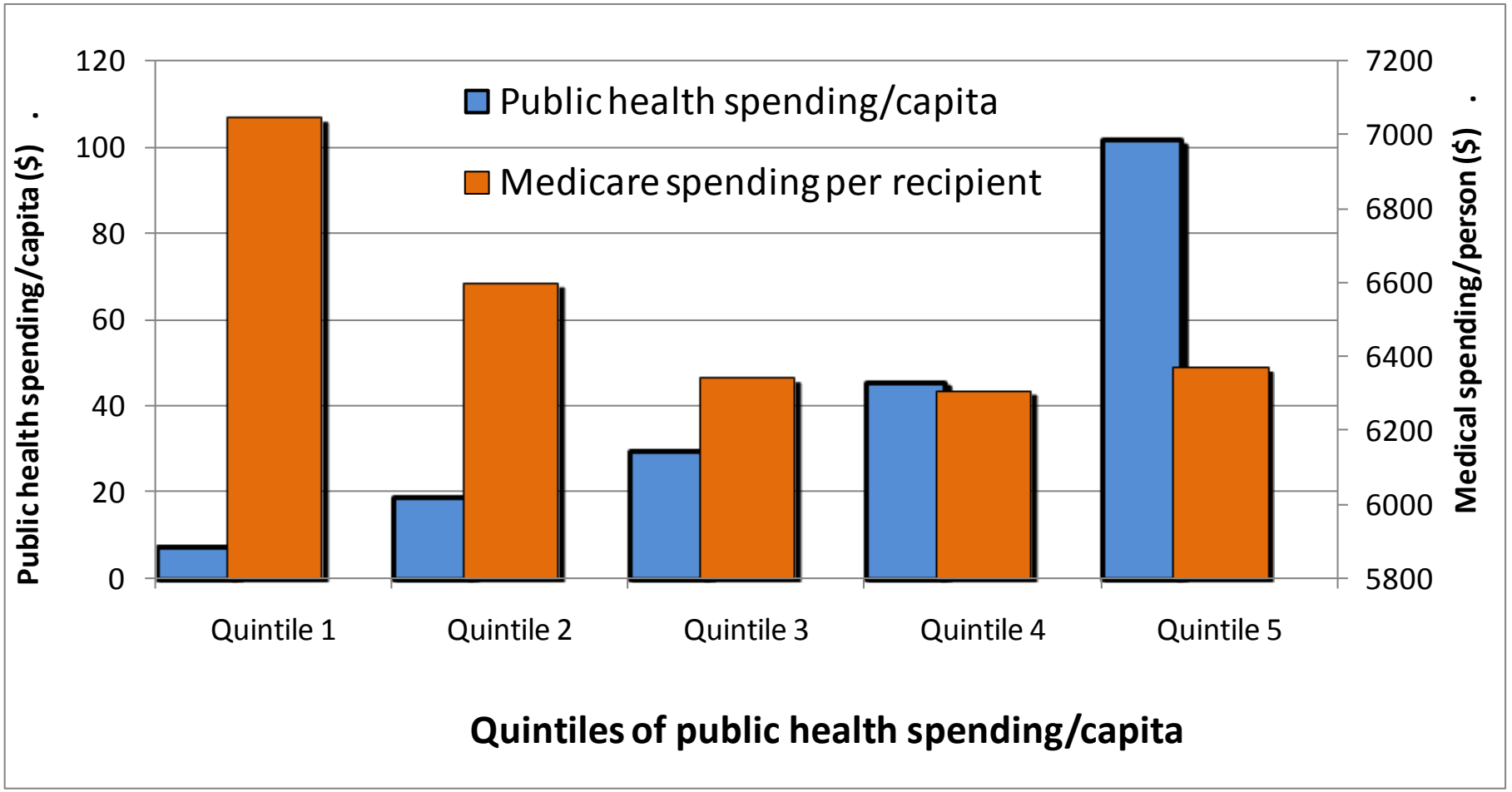
Multivariate estimates of public health spending effects on mortality 1993-2008

	Cross-sectional model		Fixed-effects model		IV model	
Outcome	**Elasticity**	**St. Err.**	**Elasticity**	**St. Err.**	**Elasticity**	**St. Err.**
Infant mortality	0.0516	0.0181 **	0.0234	0.0192	-0.1437	0.0589 ***
Heart disease	-0.0003	0.0051	-0.0103	0.0040 **	-0.1881	0.0292 **
Diabetes	0.0323	0.0187	-0.0487	0.0174 ***	-0.3015	0.0633 **
Cancer	0.0048	0.0029 *	-0.0075	0.0240	-0.0532	0.0166 **
Influenza	-0.0400	0.0200 **	-0.0275	0.0107 **	-0.4320	0.0624 **
Alzheimer's	0.0024	0.0075	0.0032	0.0047	0.0028	0.0311
Residual	0.0007	0.0083	0.0004	0.0031	0.0013	0.0086

Semi-log regression estimates controlling for community-level and state-level characteristics

*p<0.10 **p<0.05 ***p<0.01

Cross-sectional association between PH spending and Medical spending



Mays et al. 2009

Effects of public health spending on medical care spending 1993-2008

Change in Medical Care Spending Per Capita Attributable to 1% Increase in Public Health Spending Per Capita

Model	Elasticity	Std. Error
Fixed effects	-0.010	0.002 **
Instrumental variables	-0.088	0.013 **

Semi-log regression estimates controlling for community-level and state-level characteristics

*p<0.10 **p<0.05 ***p<0.01

Projected effects of ACA public health spending

- $15B in **new** public health spending over 10 years:

Deaths averted:	255,000 – 437,000
Medical cost offset:	$2.2B – $6.9B
Cost/life-year gained	$9,800 – $22,400

Conclusions

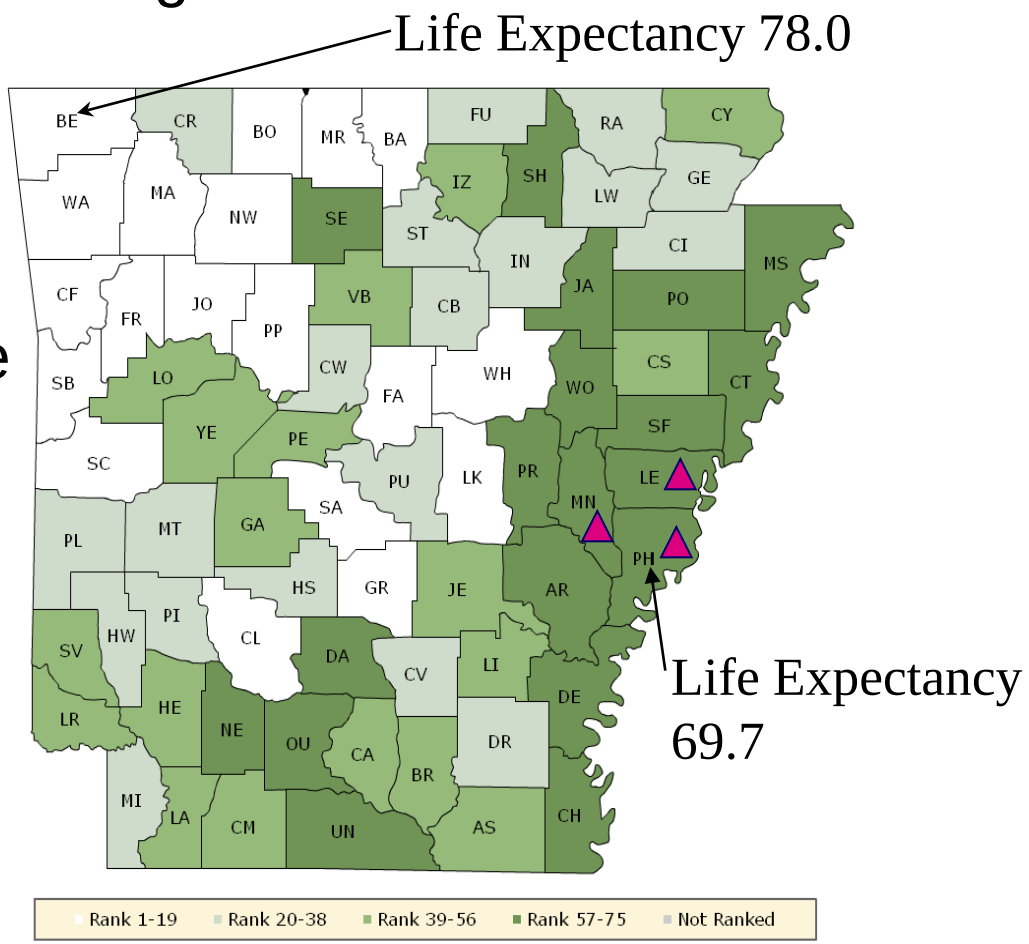
- Local public health spending varies widely across communities
- Communities with higher spending experience lower mortality from leading preventable causes of death
- Growth in local public health spending offsets growth in medical care spending (modestly)

Implications for Policy and Practice

- Mortality reductions achievable through increases in public health spending may equal or exceed the reductions produced by similar expansions in local medical care resources
- Increased federal investments may help to reduce geographic disparities in population health and bend the medical cost curve.
- Gains from federal investments may be offset by reductions in state and local spending

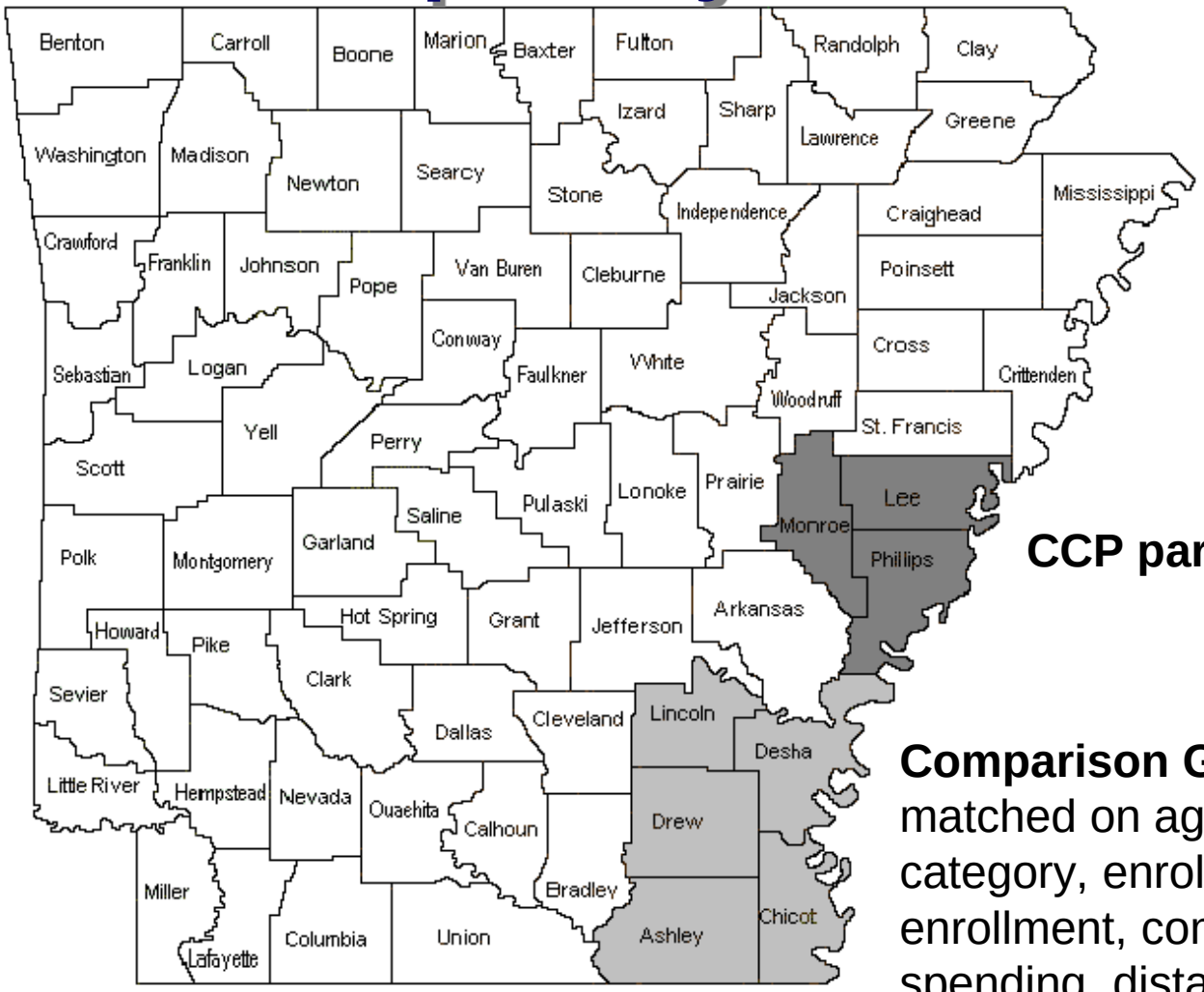
Micro Example: Evaluating Community Connectors

- 3 year demonstration serving three rural counties in Arkansas' Mississippi Delta region
- Rural, predominantly African American, low SES population
- Targets Medicaid eligible elders and adults with physical disabilities
- Uses lay health workers to identify persons with unmet LTC needs and link them to HCBS



Source: RWJF University of Wisconsin County Health Rankings 2010

Defining Comparison Group Using Propensity Score Matching



CCP participants

Comparison Group: statistically matched on age, gender, race, eligibility category, enrollment duration, waiver enrollment, comorbidities, prior-year spending, distance to services

Felix, Mays et al. Health Affairs 2011

Comparison groups and years

Group	FY2005	FY2006	FY2007	FY2008	FY2009*
CCP Cohort 1	Pre	Post 1	Post 2	Post 3	Post 4
Comparison Group 1	Pre	Post 1	Post 2	Post 3	Post 4
CCP Cohort 2	--	Pre	Post 1	Post 2	Post 3
Comparison Group 2	--	Pre	Post 1	Post 2	Post 3
CCP Cohort 3	--	--	Pre	Post 1	Post 2
Comparison Group 3	--	--	Pre	Post 1	Post 2
CCP Cohort 4	--	--	--	Pre	Post 1
Comparison Group 4	--	--	--	Pre	Post 1

*First 6 months only
Pre = one year period prior to CCP participation
Post = periods following CCP participation

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Estimates of Program Impact

Regression-Adjusted, Difference-in-Difference Estimates

Time Period*	Spending Change from Baseline	95% Conf. Int.
Year 1	-6.0%	(-14.2, 2.3)
Year 2	-21.4%	(-32.8, -10.0)**
Year 3	-22.3%	(-35.4, -9.2)**

After adjusting for baseline and time-varying differences between groups
*Reference year is one year prior to CCP participation
**p<0.05

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Cost Neutrality Estimates

Three Year Aggregate Estimates, FY2006-08

- Combined Medicaid spending reductions: $3.515 M
- Program operational expenses: $0.896 M
- Net savings: $2.629 M
- ROI: $2.92

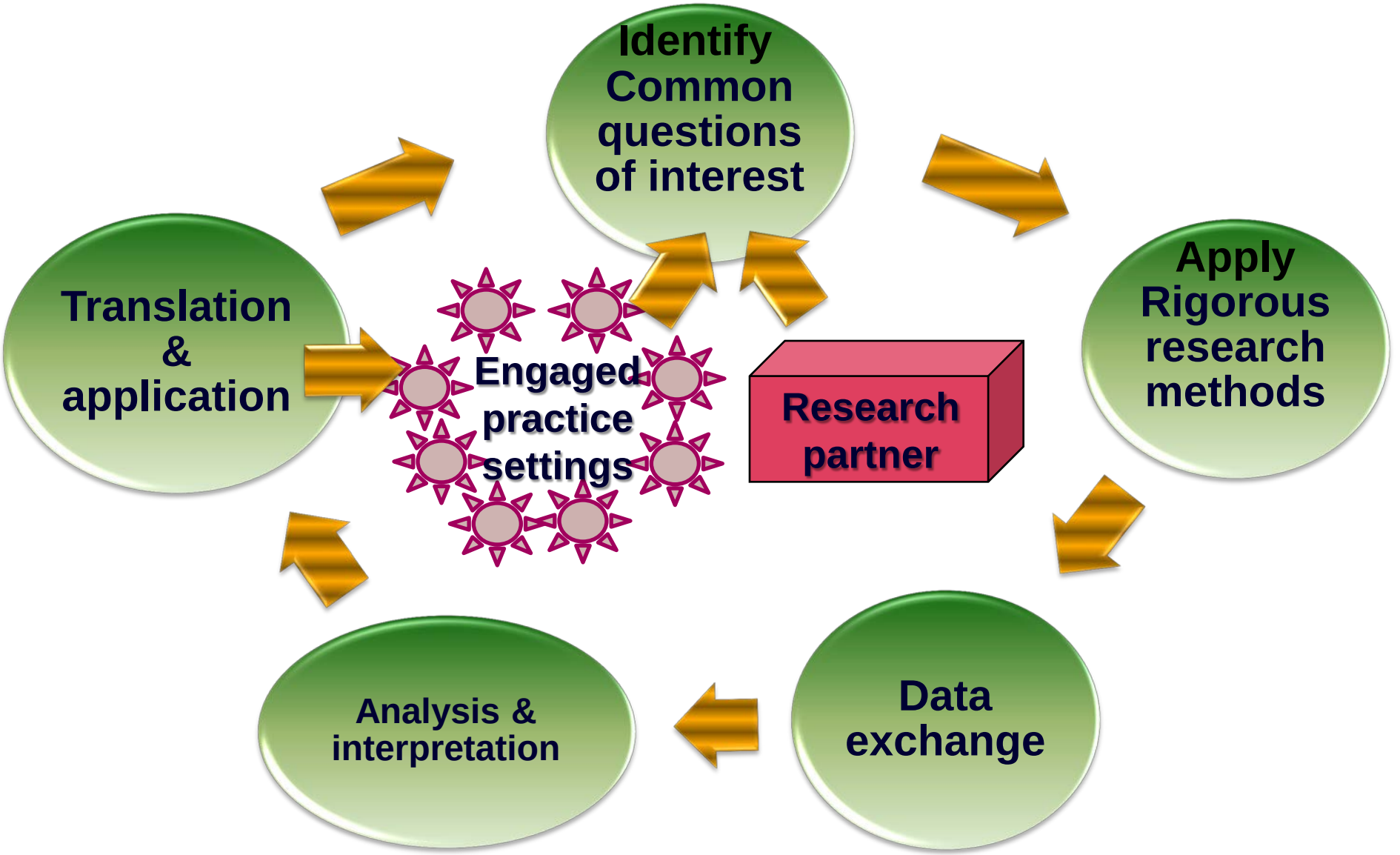
Conclusions and Implications

- Program appears cost saving within 2 years
- Reductions persist for 3.5 years, but longer-run spending effects are unknown
- CCP CHW model appears to be an effective targeting mechanism to achieve cost savings
- Testing in other program areas:
  - High risk pregnancies
  - Obesity/DPP
  - Readmissions

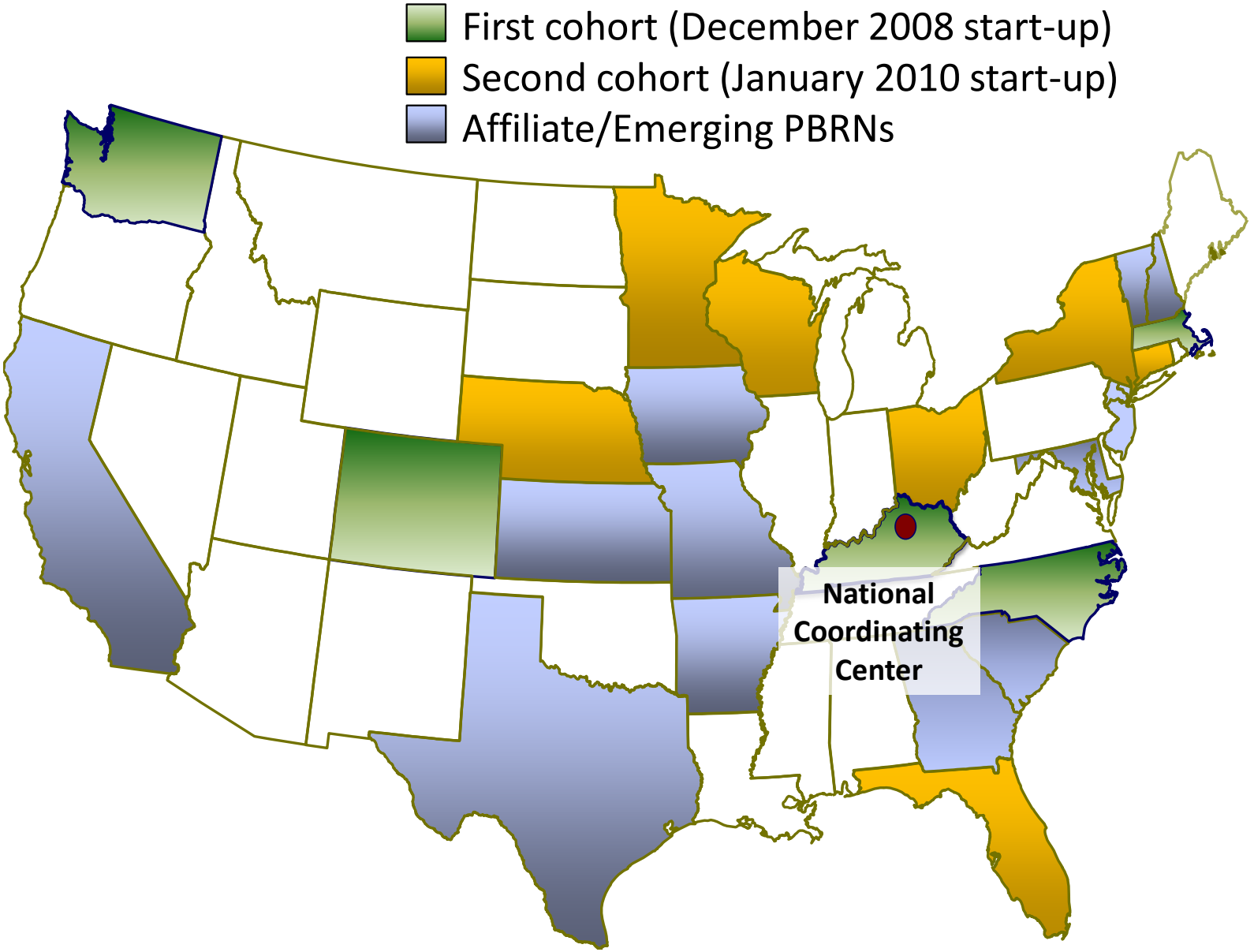
Moving the field forward

We need research that penetrates and elucidates the "black box" of public health agencies and systems

The Logic of Public Health PBRNs

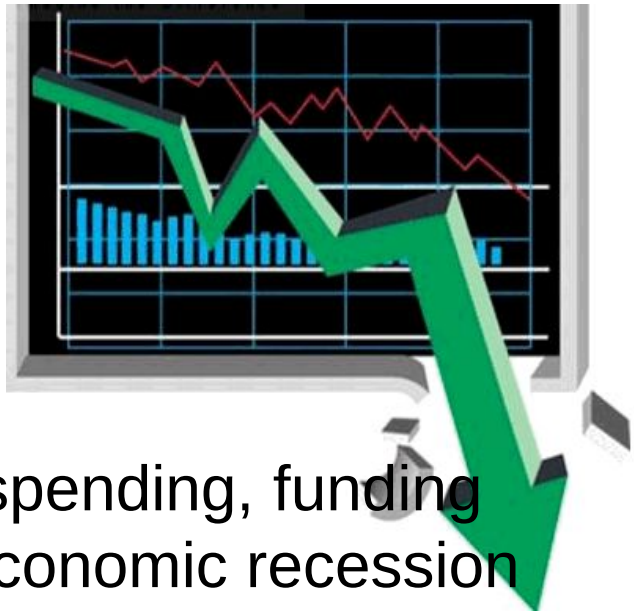


The Robert Wood Johnson Foundation's Public Health PBRN Program



Examples: Economic Shocks and Decisions

- ***Washington:*** Variation in LHD budget reductions during the 2009-10 economic downturn, and how the reductions have affected service delivery and use of evidence-based practices
- ***North Carolina:*** LHD responses to Medicaid maternity case management funding cut, and impact on service delivery
- ***Connecticut:*** Responses to elimination of state subsidies to small LHDs
- ***Ohio:*** LHD enforcement of smoke-free workplace act (magnitude & frequency) in response to economic downturn



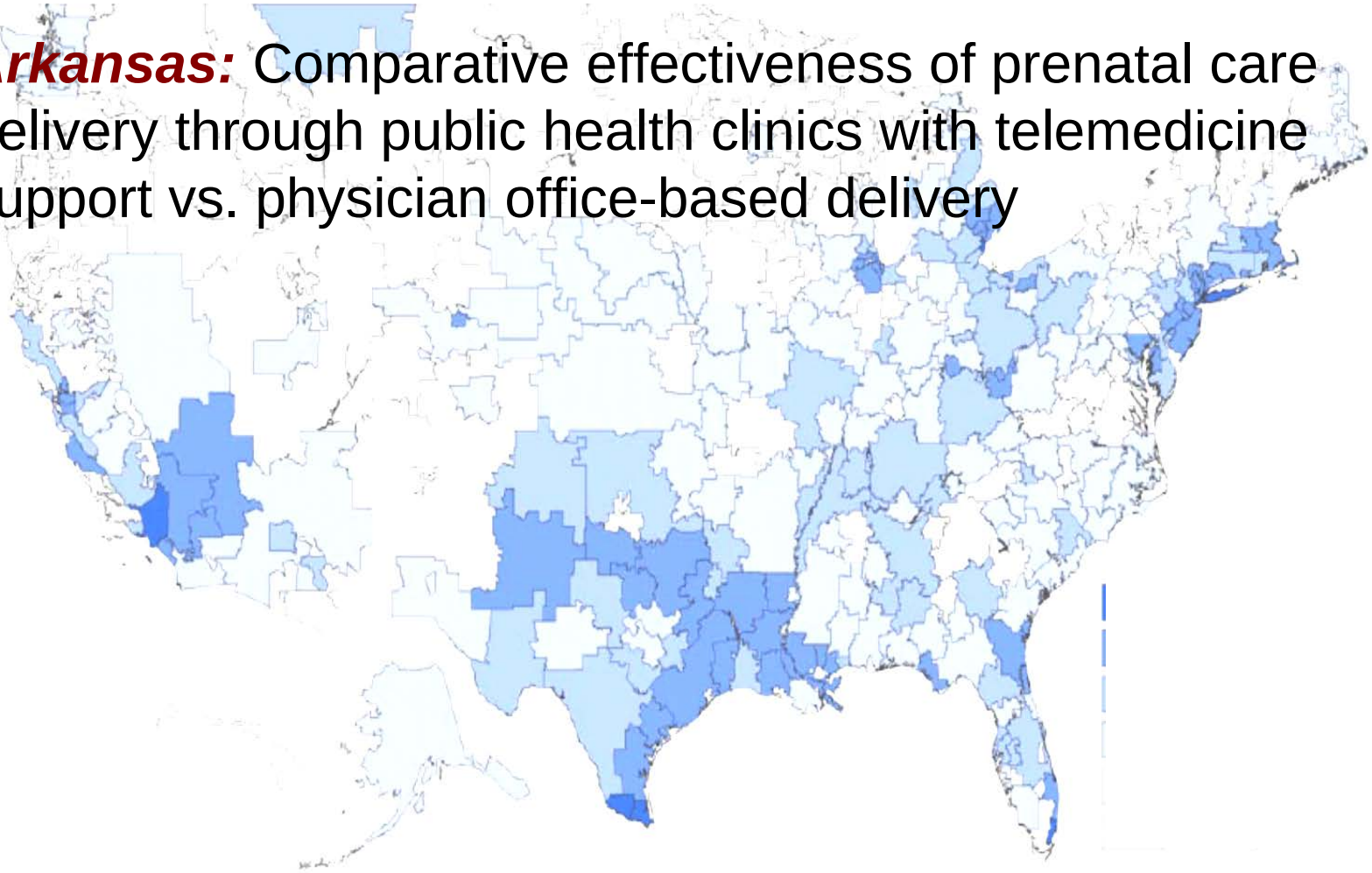
- ***Wisconsin & Florida:*** Changes in LHD spending, funding sources and resource allocation during economic recession

Examples: Regionalized Service Delivery

- ***Massachusetts:*** Local variation in decision-making and implementation regarding regional delivery models
- ***Nebraska:*** How do organizational design and workforce issues affect implementation of regional health department models
- ***Connecticut:*** How do state-mandated services and funding reductions influence decision-making regarding regional models
- ***Colorado:*** Impact of state public health law reform on regional approaches to service delivery; variation in local legal instruments and approaches to regionalization

Examples: Comparative Effectiveness

- ***New York:*** Comparative effectiveness of integrated delivery model for STI and HIV services vs. traditional model
- ***Arkansas:*** Comparative effectiveness of prenatal care delivery through public health clinics with telemedicine support vs. physician office-based delivery



Examples: Studying Production Processes

Estimating the Production Functions for Public Health Services

- ***Production studies:*** Research on production processes for physician services, hospital services, and other medical providers have been conducted since the late 1960s
- ***Public health management issues to be addressed***:
  - Resources and staffing needed to produce a given bundle of public health activities
  - Efficiency and productivity metrics
  - Defining public health underserved areas
  - Forecasting future workforce needs
  - Estimating returns to regionalization, economies of scale, volume-outcome relationships

Examples: Studying Production Processes

Estimating the Production Functions for Public Health Services

Types of Output 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:*** appropriateness, effectiveness, equity of activity
- ***Efficiency:*** resources required to produce given volume of activity

Examples: Studying Production Processes

Estimating the Production Functions for Public Health Services

Measurement Challenges

- Complex, multiple-output production processes
- Units of service unclear
- Multi-organizational production processes
- Modifier/multiplier effects on other production processes
- Existing data sources are scarce, imperfect, non-standard

- PHAST: Public Health Activities and Services Tracking Study (Betty Bekemeier and Washington PBRN)
- Multi-Network Practices and Outcomes Variation Study (MPROVE) – Winter 2011-12

For More Information

PUBLIC HEALTH
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Supported by The Robert Wood Johnson Foundation

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