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Scale and Scope Effects in Public Health Delivery: Estimating Gains from Regionalization

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Preventable disease burden and national health spending

>75% of national health spending is attributable to chronic diseases that are largely preventable

- 80% of cardiovascular disease
- 80% of diabetes
- 60% of lung diseases
- 40% of cancers

(also injuries, vaccine-preventable diseases)

<3% of national health spending is allocated to public health and prevention

CDC 2011

Public health activities

Organized programs, policies, and laws to prevent disease and injury and promote health on a population-wide basis

- Epidemiologic surveillance & investigation
- Community health assessment & planning
- Communicable disease control
- Chronic disease prevention
- Health education
- 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 legacy of assuring access to medical care
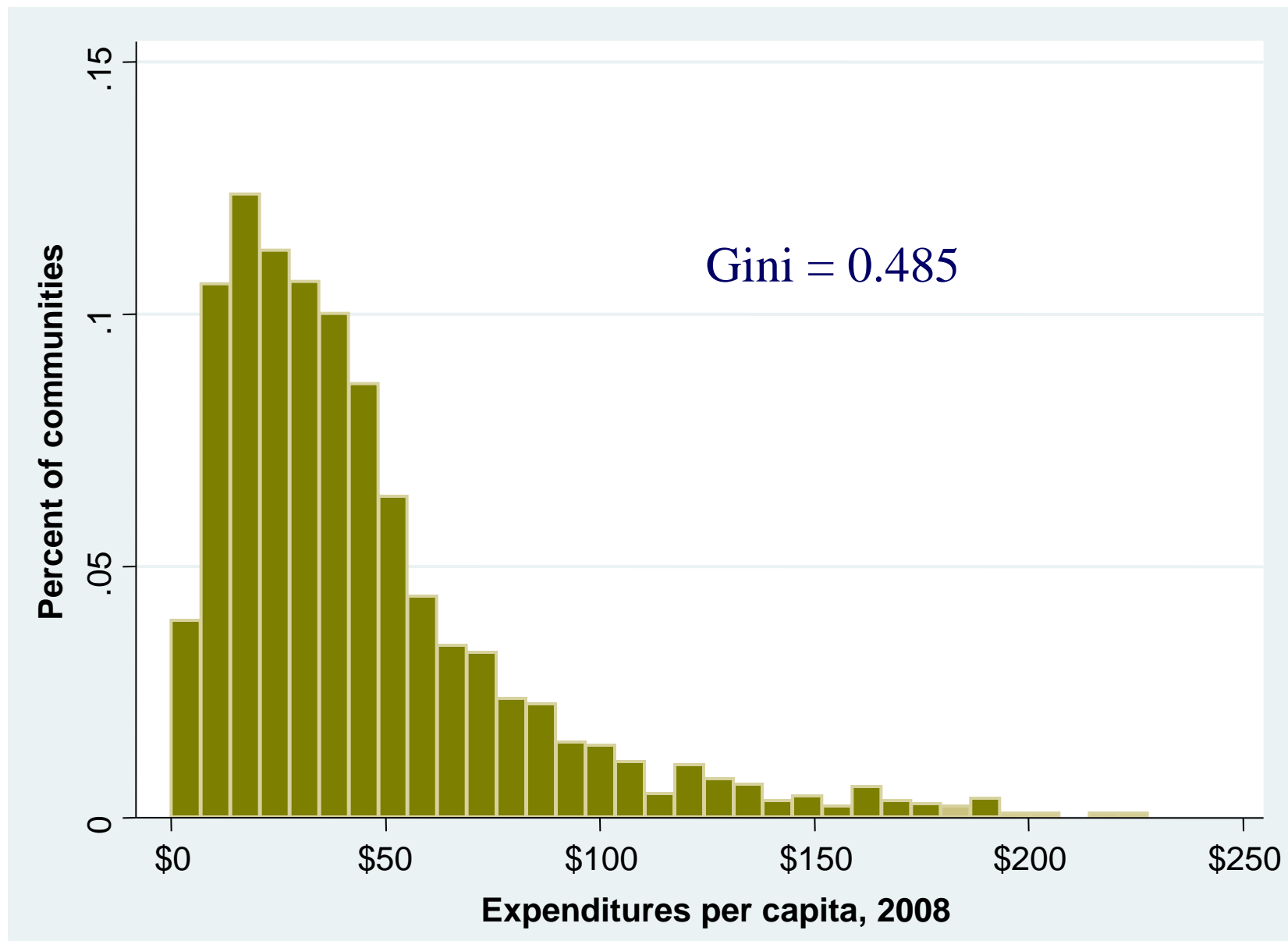
Public Health in the Affordable Care Act

- ◆ $15 billion in new federal public health spending over 10 years (cut by $5B this year)

- ◆ Public Health and Prevention Trust Fund

- ◆ Incentives for hospitals, health insurers to invest in public health and prevention

Local public health delivery systems
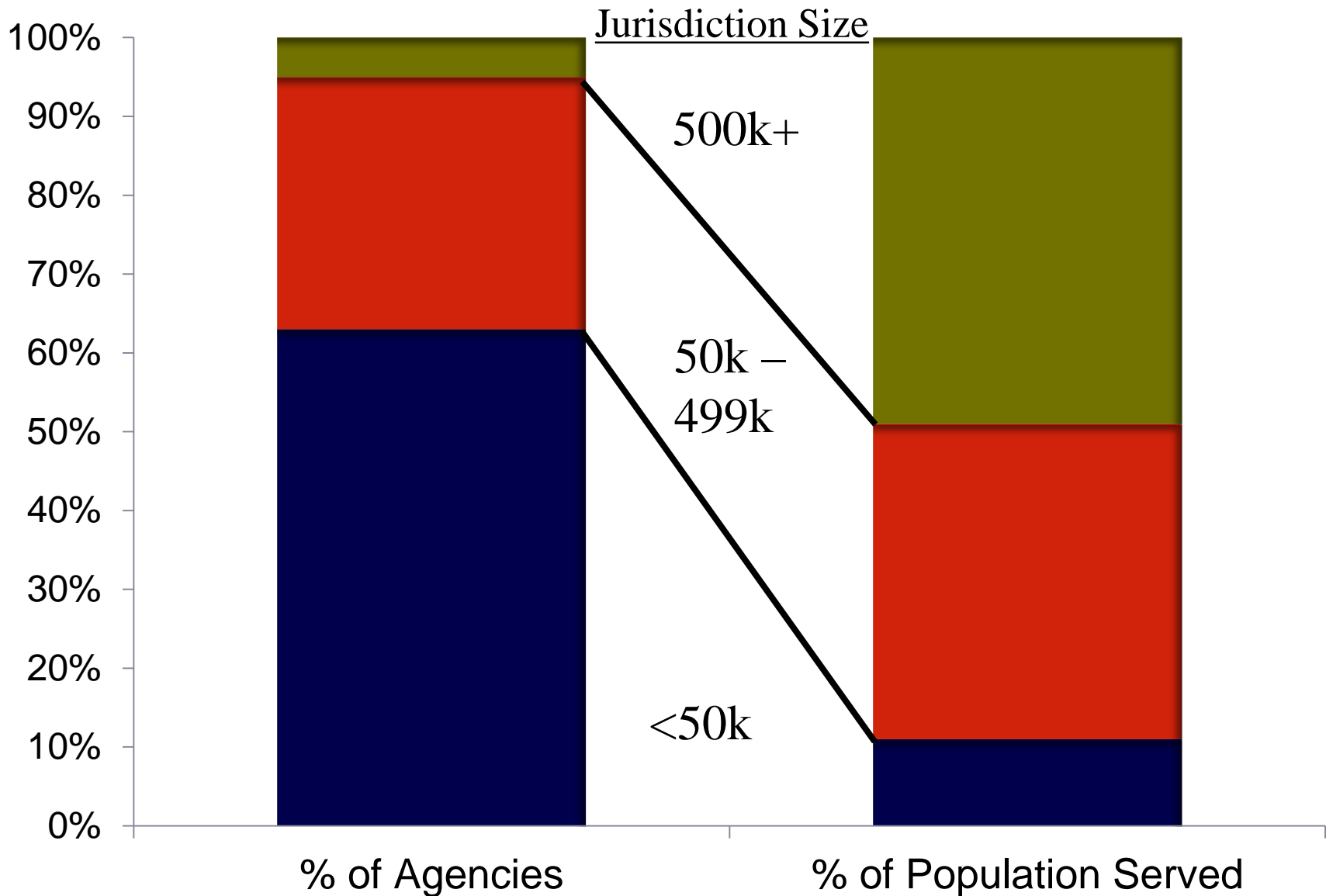
Source: 2010 NACCHO National Profile of Local Health Departments Survey

Variation in Local Public Health Spending

Gini = 0.485

Percent of communities (y-axis: 0, .05, .1, .15)

Expenditures per capita, 2008 (x-axis: $0, $50, $100, $150, $200, $250)

Some questions of interest…

◆ How can we derive greater value from existing and new public health resources?

◆ Are there economies of scale and scope in the delivery of public health services?

◆ Can regionalization improve availability, efficiency & effectiveness of public health services?
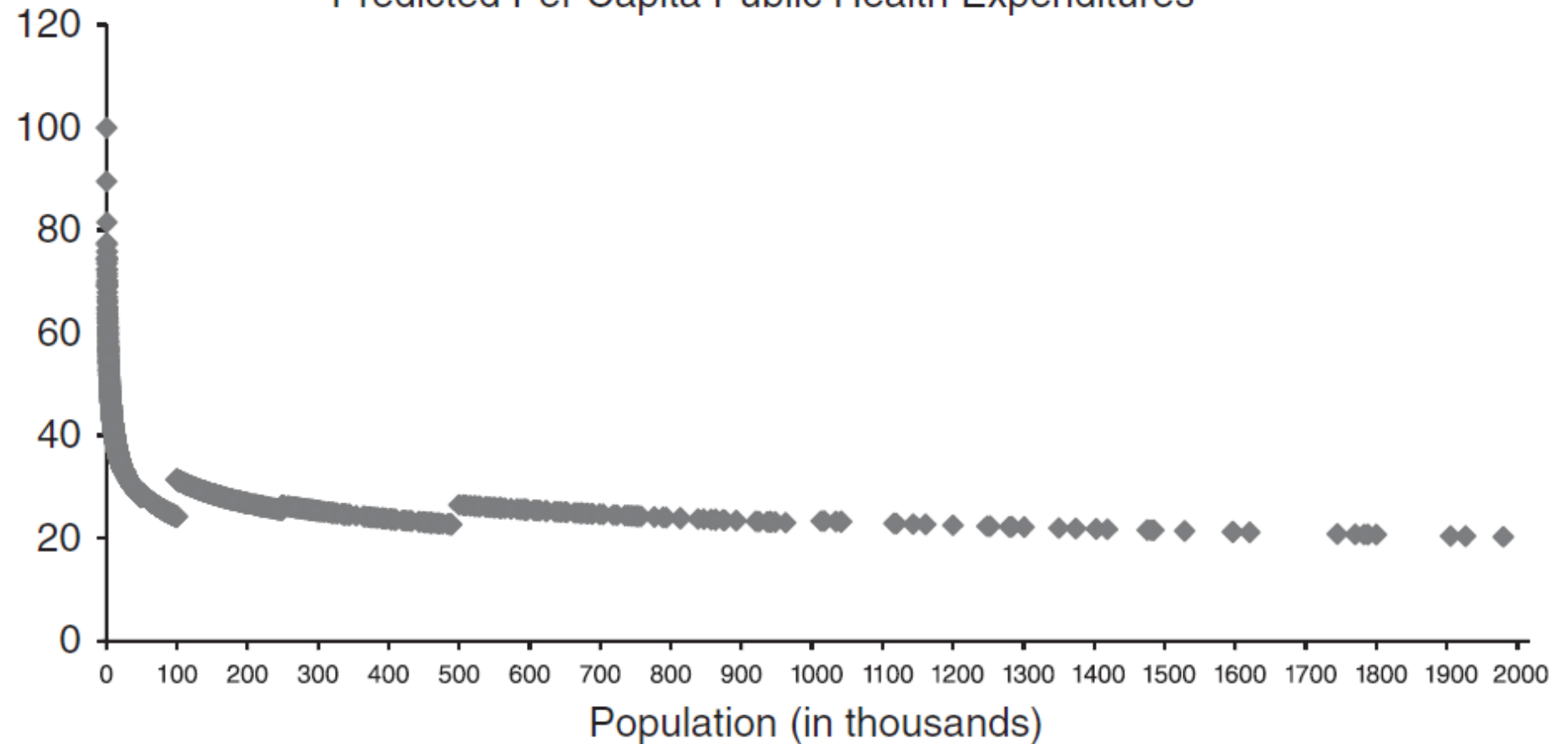
Sources of Scale and Scope Effects

Economies of Scale

◆ Spread fixed costs of public health activities

◆ Allow specialization of labor and capital

◆ Enhance predictability of infrequent events

◆ Pool surge capacity

◆ Learn by doing

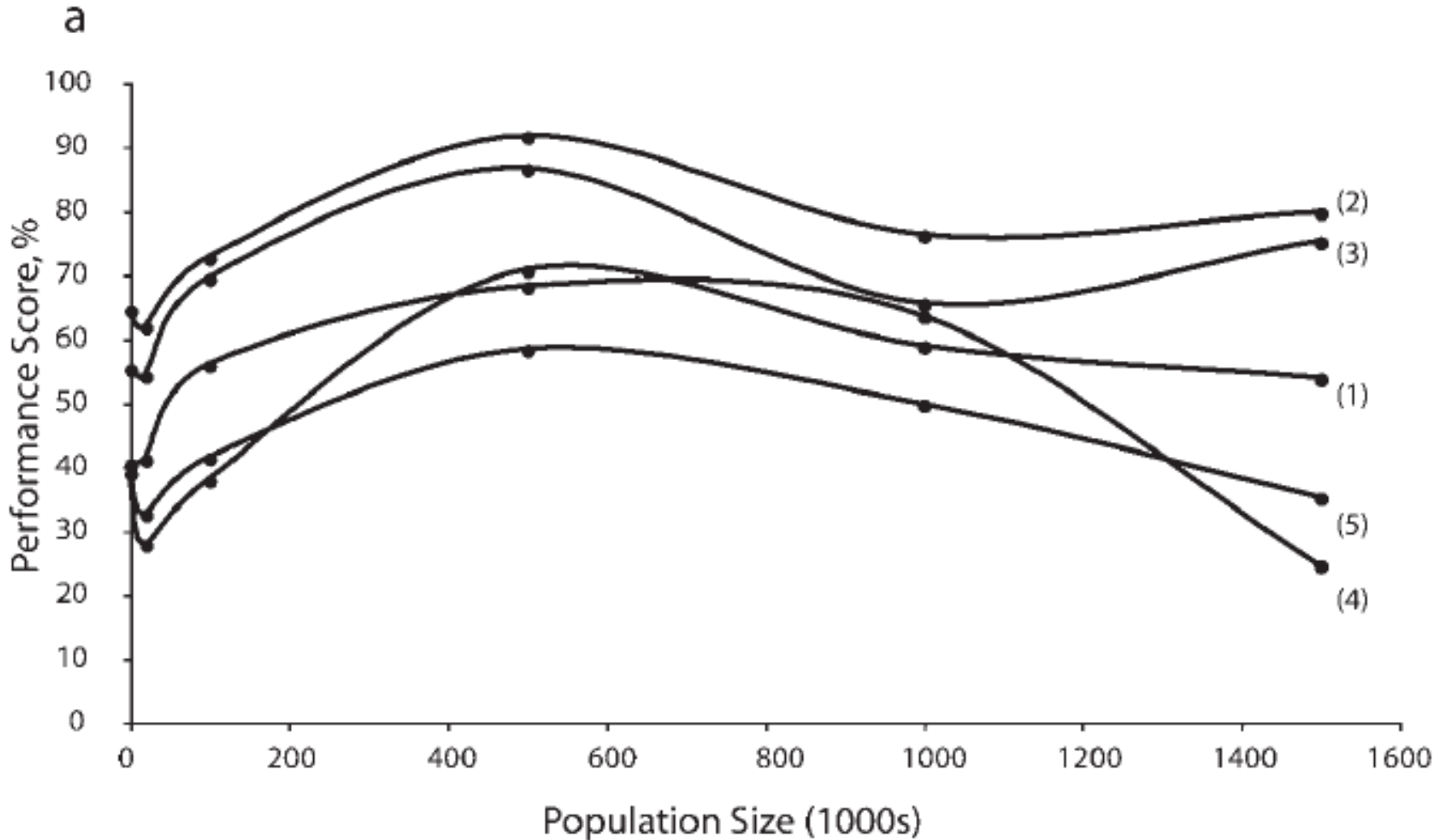◆ Internalize spill-over effects

◆ Network effects

Economies of Scope

◆ Use common infrastructure for multiple activities

◆ Cross-train workforce

◆ Realize synergies across activities

◆ Network effects

Sources of Scale and Scope Effects

Predicted Per Capita Public Health Expenditures

Sources of Scale and Scope Effects

Source: Mays GP et al; 2006

Analytic Approach

◆ Estimate the effects of *scale* (population served) and *scope* (array of activities delivered) on:
  – public health expenditures
  – health outcomes (preventable mortality)

◆ Address the potential endogeneity of scope, quality

◆ Simulate the effects of regionalizing jurisdictions that fall below selected population thresholds

    <25,000
    <50,000
    <100,000
    <150,000

Data used in empirical work

◆ National Longitudinal Survey of Public Health Systems

◆ Cohort of 360 communities with at least 100,000 residents

◆ Followed over time: 1998, 2006, 2012

◆ Measures:
  – *Scope*: availability of 20 public health activities
  – *Effort*: contributed by the local public health agency
  – *Quality*: perceived effectiveness of each activity
  – *Network*: organizations contributing to each activity

◆ Linked with data from NACCHO Profile
  – *Scale*: population size served
  – *Cost*: Local public health agency expenditures
  – Agency characteristics

Data used in empirical work

- ◆ Survey data linked with secondary sources of area characteristics (Census, ARF)

- ◆ Small sample of jurisdictions under 100,000 (n=36) used to evaluate prediction accuracy

Analytical approach

Cost Function Model (semi trans-log)

$$Ln(Cost_{ijt}) = \alpha_1 Scale_{ijt} + \alpha_2 Scale^2_{ijt} + \beta_1 Scope_{ijt} + \beta_2 Scope^2_{ijt} + \varphi_1 Quality_{ijt} + \varphi_2 Quality^2_{ijt} + \lambda X_{ijt} + \mu_j + \varphi_t + \varepsilon_{ijt}$$

Instrumental Variables Model

$$Scope_{ijt} = \theta Network_{ijt} + \lambda Agency_{ijt} + \delta Community_{ijt} + \mu_j + \varphi_t + \varepsilon_{ijt}$$

$$Quality_{ijt} = \theta Network_{ijt} + \lambda Agency_{ijt} + \delta Community_{ijt} + \mu_j + \varphi_t + \varepsilon_{ijt}$$

IVs: Network: degree centrality, average path length

All models control for type of jurisdiction, governance structure, centralization, population density, metropolitan area designation, income per capita, unemployment, racial composition, age distribution, educational attainment, physician and hospital availability
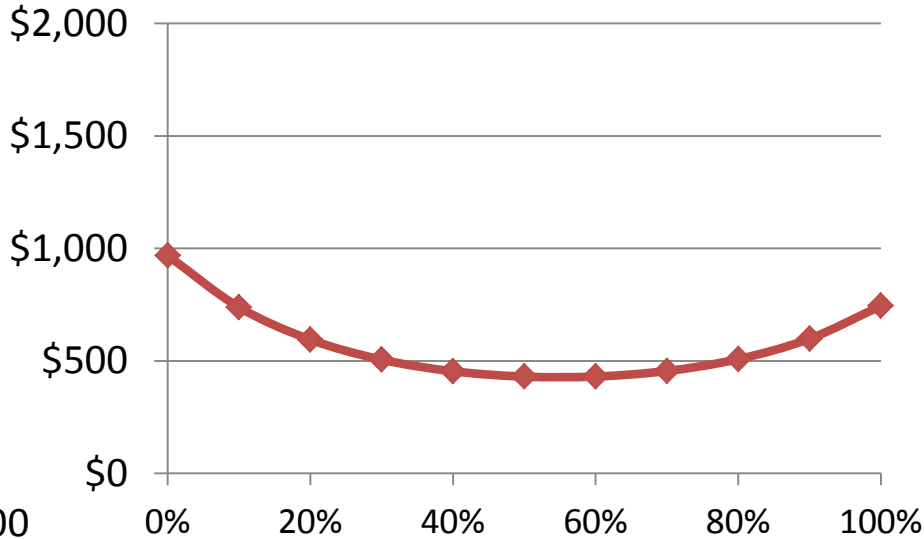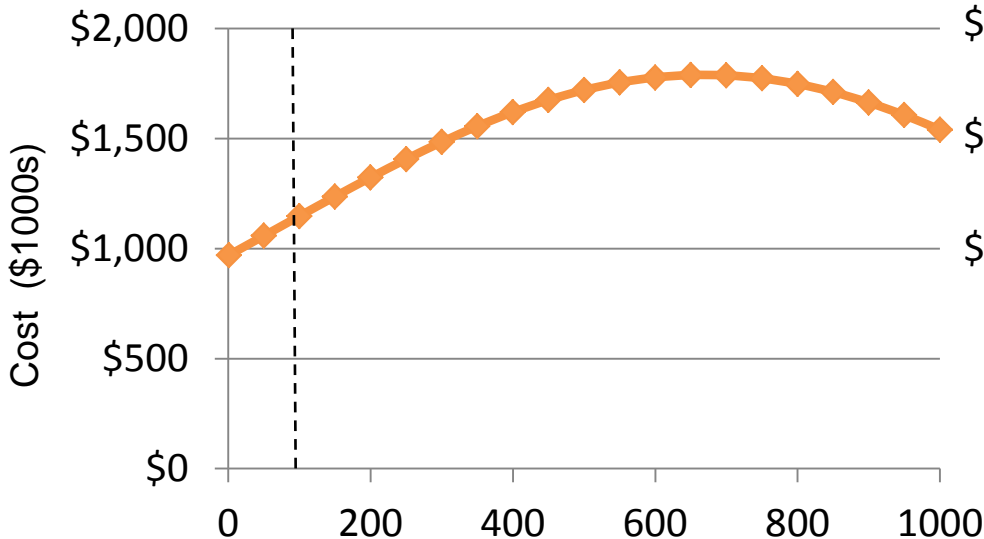
Results: Scale and Scope Estimates

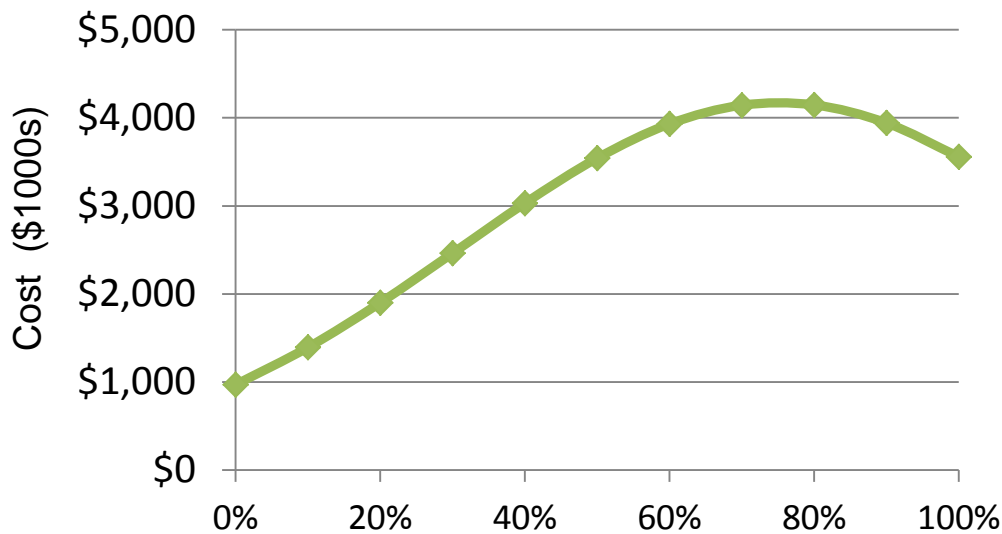| Variable	Partial Elasticity	
	Coeff.	S.E.
Population size	0.0184	0.0029***
Population size squared	-0.0014	0.0002***
Scope	3.89	1.41***
Scope squared	-2.58	0.99***
Quality	-2.98	1.39**
Quality squared	2.72	1.23**

**p<0.05   ***p<0.01

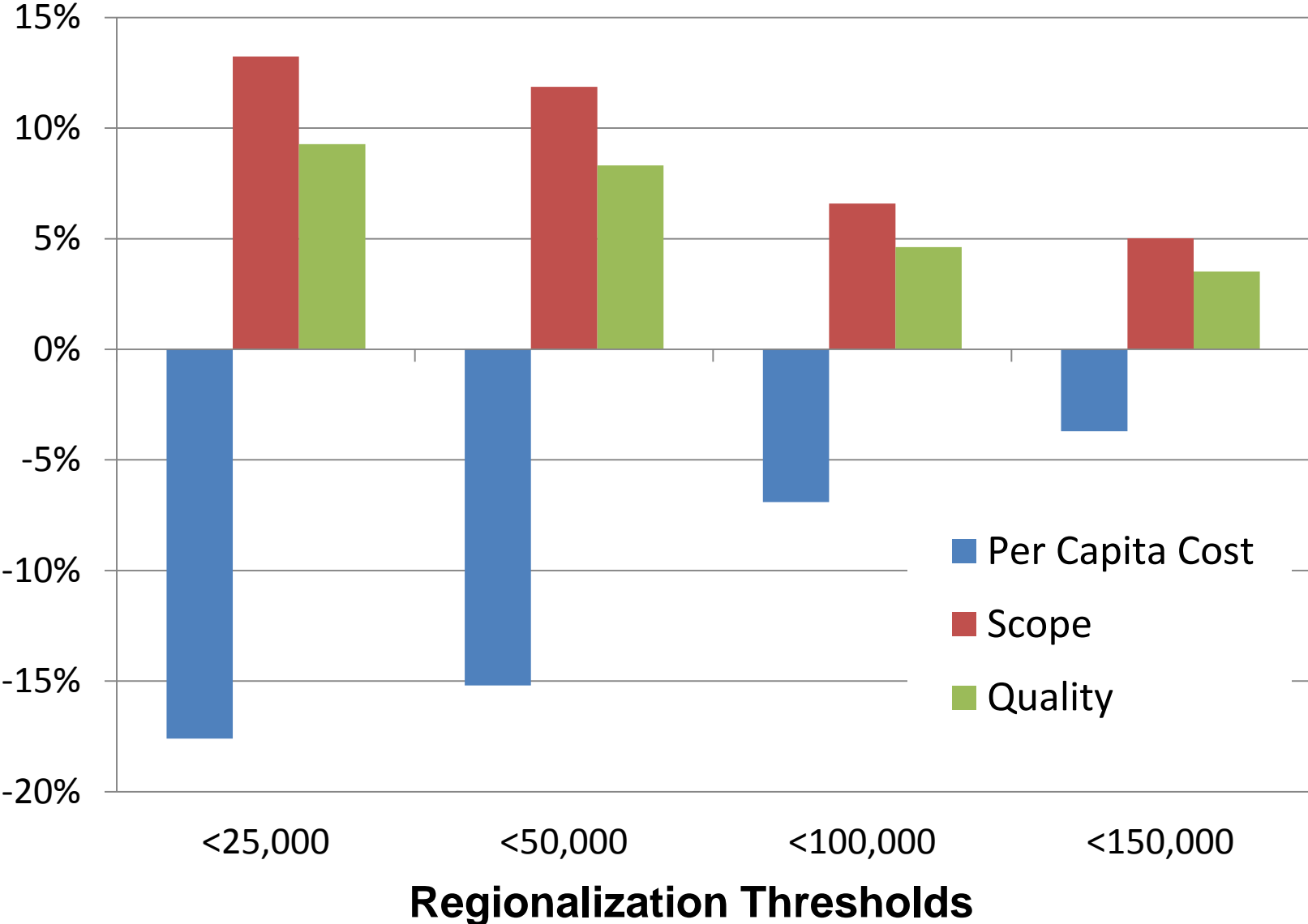# Results: Scale and Scope Estimates

Scale (Population in 1000s)

Quality (Perceived Effectiveness)

Scope (% of Activities)

Simulated Effects of Regionalization

Conclusions

◆ Significant scale and scope effects are apparent in local public health production

◆ Gains from regionalization may accrue through efficiency, scope, and quality

◆ Largest regionalization gains accrue to smallest jurisdictions

◆ If savings are re-invested in public health production, possibility of important health gains

Limitations and next steps

- ◆ Limited data on small jurisdictions

- ◆ Inability to observe existing "shared service" arrangements

- ◆ Aggregated cost data

- ◆ Lack of data on service volume/intensity