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## Economies of scale and scope in public health: An analysis of food hygiene services provided by local health departments in Florida

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## Economies of scale and scope in public health: An analysis of food hygiene services provided by local health departments in Florida

### Abstract

Local health departments (LHDs) across the United States deliver a range of essential public health services, yet little is known about the costs that LHDs incur in providing these services and the factors that may cause costs to vary both within and across health departments. This report first describes the variations in the costs of one core public health activity commonly provided by LHDs: food hygiene services. It then analyzes the factors that drive LHDs' cost of service provision focusing on the role of economies of scale and economies of scope. Using data for all LHDs in Florida for 2008 and 2010, the study found that the costs of providing food hygiene services varied substantially across LHDs. Economies of scale are demonstrated in multivariate analysis findings as providing greater volumes of services was associated with lower per unit costs. Providing a greater scope of public health services, on the other hand, does not appear to affect the costs of food hygiene services. An in-depth understanding of their cost structure presents an opportunity for LHDs to communicate to policymakers information about the resources needed to provide core public health services. Moreover, it allows public health practitioners to engage in activities aimed at increasing the efficiency of service provision. This study is a first step in the search for evidence of economies of scale that may help to lower costs and increase efficiency.

### Keywords

Public health service delivery, food hygiene services, cost, economies of scale, economies of scope

### Cover Page Footnote

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Surprisingly little is known about the costs that local health departments (LHDs) incur in providing public health services.<sup>1</sup> Many LHDs have limited capacity and expertise to collect and analyze cost information. In addition, the lack of a standard chart of accounts complicates cost comparisons and benchmarking across health departments. As a result, the factors that drive variation in LHDs' cost of service provision have received little attention. Without an understanding of the factors that drive the costs of providing public health services, however, public health policymakers lack important information about the resources needed and used by LHDs. Moreover, public health practitioners are flying blind when deciding how to use their scarce dollars most efficiently so as to achieve the best possible health outcomes for their communities. This report aims to shed light on the cost of one commonly provided public health activity – food hygiene services – and some of the factors that drive variation in the costs of providing these services across LHDs. To this end, the report first documents the wide variation in the cost of food hygiene services across LHDs. It then outlines a cost model that attempts to explain this variation. Finally, the report explores empirically factors that drive the costs of food hygiene services using data for LHDs in Florida focusing on the importance of economies of scale and scope.

## METHODS

Data for this study came from the Florida Department of Health (FDOH). For each LHD in Florida, the FDOH provided information on the number of services provided, personnel employed, and expenditures incurred, by service line. These data were supplemented with data on LHD and community characteristics from the NACCHO Profile Study and the Area Resource File. Our sample included all 67 Florida LHDs for the years 2008 and 2010. We focused our analysis on the study of food hygiene services.

Our analysis included two steps: First, we estimated the cost per service and the cost per capita by dividing the total costs of each service line by the total number of services produced in the respective service line and the total population served, respectively. In a second step, we used multivariate analysis to explore the factors that drive LHDs' cost of service provision. First, we estimated a translog cost model to identify the factors that drive LHDs' total cost of service provision (Equation 1).<sup>2</sup> For the purpose of this analysis, we focused on the role of economies of scale and scope in predicting LHDs' cost of service provision. To model economies of scale, we identified two volume measures – the total number of services and the square of the total number of services provided in a service line. To model economies of scope, we identified six scope indicators – percent of clinical preventive services, medical care services, specialty services, population-based services, regulatory and licensing services, and environmental health services provided by a LHD. Formally,

$$\text{Cost} = \alpha + \beta_1 * \text{Volume} + \beta_2 * \text{Volume}^2 + \beta_3 * \text{Scope} + \beta_4 * \text{X} + \varepsilon \quad (1)$$

where Cost is the logarithm of total costs, Volume is the total number of services provided in a service line, Volume<sup>2</sup> is the square of the total number of services provided in a service line, Scope is a vector of six indicators of the scope of services provided by a LHD, X is a list of LHD and community characteristics.<sup>3,4</sup> We then estimated our model again, using cost per service and cost per capita as the dependent variable, respectively. In all models, we estimated robust standard errors.

## RESULTS

In 2010, LHDs in Florida spent an average of \$107,910 on food hygiene services. LHDs' cost per service and cost per capita, however, varied widely across health departments. In 2010, the median cost per service in food hygiene was \$104. The 25 percent of LHDs with lowest costs per service, however, spent less than \$74 per service, while the most costly 25 percent of LHDs spent over \$133 per service. Likewise, the median cost per capita was \$0.40 in 2010, yet the 25 percent of LHDs with lowest costs per capita spent less than \$0.30 per capita while the most costly 25 percent of LHDs spent more than \$0.60 per capita.

Multivariate regression analysis found that all three cost measures employed in our analysis were driven by the volume of services provided (Table 1). Although larger numbers of services provided were associated with higher total costs, the negative coefficient on the services squared variable indicates that costs increased less than proportionately, hinting at possible economies of scale. Further confirming economies of scale, our results showed negative relationships between the volume of services provided and both cost per service and cost per capita. Again, the impact of volume on unit costs diminished with increases in volume.

Given the large proportion of costs in a LHD that are fixed (i.e., they do not vary with changes in volume within a defined range), this finding is not surprising: Many public health activities require LHDs to maintain the capacity to both provide services on a day-to-day basis (e.g., regular restaurant inspections) and be able to respond to public health crises (e.g., an outbreak of foodborne illness in a community). The resulting spare capacity allows LHDs to reduce their unit costs by providing more services and thus spreading fixed costs over a greater number of units.

Providing a greater range of services, on the other hand, was not associated with LHDs' total cost of providing food hygiene services (Table 1). Economic theory suggests that producing a range of services has the potential to reduce the costs of providing all, or at least some, of these services, mainly because certain resources (e.g., personnel, equipment) may be used in the production of several services. This study does not provide evidence that LHDs may achieve meaningful economies of scope when providing food hygiene services. Nonetheless, this result is encouraging: While a greater scope of activities thus does not appear to provide LHDs with cost savings, offering a wide range of services does not appear to lead to increases in health departments' total costs either. From a pure cost perspective, LHDs can thus defend their engagement in a wide range of public health services.

While this report outlines a general cost model that practitioners can use to understand the factors that drive variation in the cost of service provision, the empirical findings presented are limited to LHDs in the state of Florida and may not generalize to other states. Moreover, this report only included data for two years (2008 and 2010). During this time, many LHDs experienced substantial budget cuts, which may have affected the findings. Results of this study should be thought of as preliminary findings from a model that will ultimately incorporate quality of service, outcomes, and other LHD characteristics, such as staff size and experience.

**Table 1: Regression estimates of factors associated with the cost of providing food hygiene services**

	<b>Log (Costs)</b>	<b>Cost per service</b>	<b>Cost per capita</b>
<i>Scale indicators</i>			
Services (in 1,000)	1.95** (0.25)	-35.49 (18.68)	-0.17* (0.083)
Services squared (in 1,000,000)	-0.31** (0.57)	9.66* (4.16)	0.045* (0.020)
<i>Scope indicators</i>			
Clinical preventive services (%)	0.59 (0.56)	67.14 (34.72)	0.16 (0.19)
Medical care services (%)	-0.35 (0.53)	48.60 (35.19)	-0.26 (0.17)
Specialty services (%)	-0.22 (0.31)	-43.36* (19.70)	-0.14 (0.10)
Population-based services (%)	0.14 (0.53)	7.18 (33.48)	0.12 (0.17)
Regulatory and licensing (%)	0.52 (0.44)	10.24 (24.57)	0.034 (0.14)
Environmental health (%)	-0.31 (0.32)	-44.76 (26.35)	-0.16 (0.10)
<i>Other public health agency characteristics</i>			
Revenue from local sources (%)	2.39 (1.22)	63.73 (74.96)	0.65 (0.41)
Revenue from state sources (%)	-0.47 (1.10)	26.18 (56.02)	0.039 (0.36)
Revenue from federal sources (%)	1.55 (0.98)	277.11* (119.41)	1.01* (0.46)
Revenue from clinical services (%)	-0.43 (1.02)	54.79 (48.38)	0.28 (0.24)
<i>Population and community characteristics</i>			
Population per square mile	0.00026 (0.00020)	-0.052** (0.018)	-0.00020* (0.000097)
Percent population nonwhite (%)	0.020* (0.0096)	0.33 (0.63)	0.0080* (0.0034)
Percent with college education (%)	4.79 (2.61)	449.28 (234.73)	0.52 (0.89)
Percent 65+ years old (%)	2.39 (1.23)	74.25 (88.20)	1.06* (0.46)
Income per capita (log)	0.30 (0.49)	8.13 (33.96)	-0.043 (0.17)
Percent uninsured (%)	0.024 (0.022)	3.13 (1.62)	0.011 (0.0073)
Adjusted R <sup>2</sup>	0.84	0.32	0.27

*Note:* The logarithm of total costs was used to account for the fact that the distribution of total costs is skewed to the right. Robust standard errors are in parentheses. \* indicates significant at 5%. \*\* indicates significant at 1%.

## IMPLICATIONS

An in-depth understanding of their cost structure presents an opportunity for LHDs to communicate to policy makers information about the resources needed to provide essential public health services. Moreover, it allows public health practitioners to engage in activities aimed at increasing the efficiency of service provision. A greater understanding of economies of scale can inform discussions about partnering or consolidation to help lower costs and increase efficiency.

### SUMMARY BOX:

**What is Already Known about This Topic?** Surprisingly little is known about the costs that local health departments incur in providing public health services. As a result, the factors that drive variation in LHDs' cost of service provision have are not yet well understood.

**What is Added by this Report?** This report first documents the wide variation in the cost of one public health activity – food hygiene services – across health departments. It then outlines a cost model that attempts to explain this variation. Finally, the report explores empirically factors that drive the costs of food hygiene services using data for health departments in Florida.

**What are the Implications for Public Health Practice, Policy, and Research?** An in-depth understanding of their cost structure presents an opportunity for public health practitioners to communicate to policy makers information about the resources needed to provide essential public health services. Moreover, it allows public health practitioners to engage in activities aimed at increasing the efficiency of service provision.

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