



# The Impacts of Local Health Department Consolidation on Public Health Expenditures: Evidence From Ohio

John Hoornbeek, PhD, MPA, Michael E. Morris, PhD, MPH, Matthew Stefanak, MPH, Joshua Filla, MPA, Rohit Proadhan, PhD, MPA, and Sharla A. Smith, PhD, MPH

We examined the effects of local health department (LHD) consolidations on the total and administrative expenditures of LHDs in Ohio from 2001 to 2011.

We obtained data from annual records maintained by the state of Ohio and through interviews conducted with senior local health officials and identified 20 consolidations of LHDs occurring in Ohio in this time period. We found that consolidating LHDs experienced a reduction in total expenditures of approximately 16% ( $P=.017$ ), although we found no statistically significant change in administrative expenses.

County health officials who were interviewed concurred that their consolidations yielded financial benefits, and they also asserted that their consolidations yielded public health service improvements. (*Am J Public Health*. 2015; 105:S174–S180. doi:10.2105/AJPH.2014.302450)

## LOCAL HEALTH DEPARTMENTS

(LHDs) play a central role in providing public health services. However, since the turn of the 21st century, pressure has mounted on state and local government budgets, forcing LHDs to make hard decisions regarding resource allocation. The LHD workforce (in full-time equivalents)

decreased by an estimated 12% from 2008 to 2013, with nearly one half (48%) of all LHDs reducing or eliminating services in at least 1 program area in 2012.<sup>1,2</sup> The options that many LHDs around the country are considering to ameliorate fiscal pressures include cross-jurisdictional sharing and organizational redesign, including LHD consolidation.

Recent studies have supported the idea that consolidating LHDs may increase efficiency and improve the effectiveness of public health services. Santerre<sup>3</sup> suggested that economies of scale achieved through health department consolidation may improve cost-effectiveness of service provision. Mays et al. analyzed public health performance information from multiple states and concluded that consolidation “may hold promise for improving the performance of essential services.”<sup>4(p523)</sup> More recently, Hoornbeek et al.<sup>5</sup> reported evidence of cost savings, as well as other perceived benefits, associated with the consolidation of LHDs in northeastern Ohio.

Ohio has witnessed at least 20 consolidations of LHDs serving more than 2.6 million Ohioans since 2001. Most consolidations came about from voluntary agreements between cities and counties. The number of

consolidations in Ohio, and statewide reporting systems documenting LHD finances, provide an opportunity to improve our understanding of the impacts of LHD consolidation. Do consolidations lead to positive financial impacts, including lower expenditures, as one might expect? Using a mixed-methods approach, we address this question by presenting a quantitative analysis of data on Ohio LHDs and findings from interviews with local health officials (LHOs) from these consolidated LHDs.

Our study contributes to the literature on LHD consolidation in at least 3 ways. First, previous studies have suggested that LHD consolidations may result in cost efficiencies,<sup>3</sup> but none of those studies reviewed evidence from multiple LHD consolidations over an extended period of time. Second, because consolidations in Ohio took place over a number of years, we were able to model the independent effects of time on the outcome variables, thus controlling for the impact of external trends on LHD expenditures. Third, we focused our study on multiple LHDs in a single state. Because states differ in their economic, political, and legislative landscapes, cross-state comparisons of LHDs may not always be appropriate. By focusing on a single state, we captured

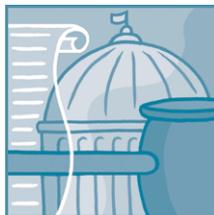
potentially idiosyncratic features that influence LHD consolidation in Ohio and their impact on our expenditure-related outcome variables. Thus, unlike past studies, this research enables scholars and practitioners to look at the temporal evolution of multiple LHD consolidations in a single-state setting.

## METHODS

We used a mixed-methods data collection and analysis approach. We used quantitative data compiled by statewide organizations in Ohio to investigate 2 hypotheses: (1) LHD consolidation yields reductions in total expenditures, and (2) LHD consolidation yields reductions in administrative expenditures. We also interviewed 17 LHOs involved in Ohio LHD consolidations occurring between 2001 and 2011.

## Data

Our data came from 5 major sources: (1) annual financial reports submitted by LHDs to the Ohio Department of Health, which were used for outcome measures in the expenditure analyses (J. Mazzola, BA, Local Health Department Liaison, Office of Local Health Department Support, Ohio Department of Health, unpublished data, August 15, 2012); (2)



**TABLE 1—Local Health Department (LHD) Expenditures Pre- and Postconsolidation: Ohio, 2001–2011**

Time Period	Total Expenditures per Capita		Administrative Expenditures per Capita	
	Consolidating LHDs <sup>a</sup>	Nonconsolidating LHDs <sup>b</sup>	Consolidating LHDs <sup>a</sup>	Nonconsolidating LHDs <sup>b</sup>
Preconsolidation year, \$	30.09	45.32	4.97	7.64
Postconsolidation year, \$	25.96	46.15	4.95	7.40
Change pre-post consolidation, %	-13.7	1.8	-0.4	-3.1

Source. Annual financial reports of Ohio LHDs.

<sup>a</sup>LHD consolidations (n = 12) between 2001–2011 for which 1 y of pre- and postconsolidation data were available.

<sup>b</sup>LHDs (n = 56) in 22 counties with more than 1 LHD.

the Ohio State Auditor’s office, which provided city and government financial data<sup>6</sup>; (3) the Ohio Municipal League, which collects information on local government structures<sup>7</sup>; (4) the US Census Bureau for demographic information that might influence the delivery of public health services<sup>8</sup>; and (5) interviews with LHOs of recently consolidated Ohio LHDs.

Although we present this information on our data sources in as much detail as available space allows, we invite readers to contact us if they have additional questions about the data sources used.

**Samples**

Drawing information from the Ohio Department of Health and experienced LHOs, we identified 20 voluntary LHD consolidations occurring in Ohio between 2001 and 2011. Of these consolidations, 18 occurred in a time period (2002–2010) that would allow for use of at least 2 years of preconsolidation data and 1 full year of postconsolidation data. After exclusions for data limitations and other factors, the necessary financial data were available

for 11 consolidated city–county LHDs.

Our control group included all city and county LHDs from counties that had at least 1 independent city LHD. We limited controls to this population because nearly all of the consolidations in our sample frame involved city and county LHDs. After factoring in limitations on data availability, our sample included 78 city and county LHDs tracked over the 12-year study period. We excluded LHDs from an analytical sample of 144 LHDs that existed in Ohio in 2001 on the basis of the following criteria: (1) county LHDs with no city LHD within their borders (59 county LHDs), and (2) city and county LHDs for which data sufficient to run our models were not available from the annual financial reports (7 LHDs, including 5 city LHDs and 2 county LHDs).

We conducted interviews during the first half of 2013 with LHOs involved in 17 of the 20 consolidations in our sample to ascertain their perceptions of the motivations for, and impacts of, LHD consolidation (85%). We used an interview script developed with public health

practitioners and researchers in Ohio, and we interviewed senior-level LHOs—health commissioners, former health commissioners, and LHD administrators. Because our interview sample was not limited by data availability, we spoke with LHOs from a larger proportion of the identified consolidations than were included in our quantitative analyses.

**Analytical Approach**

A significant concern for our analysis was the potential for selection bias. Consolidating LHDs may be substantively different from LHDs that did not consolidate, which could lead to biased results. We used a Heckman 2-step regression model to address this issue. It conceptualizes selection bias as arising from the presence of 1 or more unobserved factors that influence the choice—in our case, the decision to consolidate—and, in turn, the outcomes resulting from that choice. Implementing this modeling approach consisted of running 2 interrelated regression models.<sup>9,10</sup>

The first-stage model uses a probit function to create a measure

of the propensity of an LHD to consolidate on the basis of factors that are thought to be related to the decision to consolidate. The first model’s assessment of the probability of consolidation is then used in the second stage to adjust the estimates produced from a linear regression model to account for the influence of selection bias. To use this approach, we had to develop an understanding not only of factors that influenced the impacts of consolidation (expenditures) but also of factors that would potentially influence the decision to consolidate. Past research has identified a number of organizational characteristics that may influence expenditures and public health service delivery.<sup>11</sup> Although we included in our models data on a number of key variables, data limitations prevented the inclusion of all potentially useful variables in our quantitative analyses. For both models, standard regression diagnostics were applied in determining model selection.

*First-stage model.* We operationalized consolidation as a dichotomous variable reflecting whether the LHD consolidated at any point during the study period. On the basis of discussions with LHOs involved in LHD consolidations, in the first-stage model we focused on city-related factors and their LHDs. (That focus was later verified during our interviews; 12 of the 17 LHOs [71%] interviewed reported that the cities were involved in initiating conversations regarding consolidation.) These discussions identified



**TABLE 2—Heckman Regression Results for Per Capita Expenditure Models, Logged, Controlling for First-Stage Selection: Ohio Local Health Departments; 2001–2011**

Variable	Coefficient (95% CI)	P
<b>Model for hypothesis 1</b>		
Dependent variable: total expenditures per capita (log)		
Postconsolidation	-0.163 (-0.297, 0.029)	.017
Poverty, %	0.034 (-0.004, 0.072)	.081
Minority, %	-0.001 (-0.029, 0.027)	.938
Metropolitan service area	0.045 (-0.101, 0.191)	.546
Population total (log)	0.289 (0.017, 0.561)	.038
Population density	-0.0004 (-0.0006, -0.0002)	≤ .001
Total local government spending (log)	-0.046 (-0.098, 0.005)	.076
Year 2000	-0.614 (-1.433, 0.205)	.142
Year 2001	-0.444 (-1.209, 0.321)	.256
Year 2002	-0.373 (-1.072, 0.326)	.296
Year 2003	-0.255 (-0.602, 0.092)	.151
Year 2004	-0.141 (-0.466, 0.185)	.398
Year 2005	-0.064 (-0.363, 0.236)	.676
Year 2006	-0.026 (-0.285, 0.234)	.845
Year 2007	0.018 (-0.240, 0.276)	.892
Year 2008	0.054 (-0.169, 0.278)	.635
Year 2009	-0.024 (-0.771, 0.724)	.951
Year 2010	0.033 (-0.151, 0.217)	.723
No.	577	—
Δ (Mills ratio)	0.310 (0.000, 0.621)	.05
Wald X <sup>2</sup>	78.09	≤ .001
<b>Model for hypothesis 2</b>		
Dependent variable: administrative expenditures per capita (log)		
Postconsolidation	-0.007 (-0.255, 0.269)	.96
Metropolitan service area	0.077 (-0.205, 0.359)	.594
Population total (log)	-0.415 (-0.865, 0.034)	.07
Population density	-0.0006 (-0.0004, 0.0000)	.768
Year 2000	0.163 (-0.337, 0.663)	.523
Year 2001	0.181 (-0.310, 0.671)	.47
Year 2002	0.293 (-0.207, 0.792)	.251
Year 2003	0.312 (-0.179, 0.803)	.213
Year 2004	0.350 (-0.141, 0.842)	.162
Year 2005	0.367 (-0.115, 0.849)	.136
Year 2006	0.301 (-0.171, 0.773)	.212
Year 2007	0.467 (-0.005, 0.940)	.053
Year 2008	0.217 (-0.234, 0.668)	.346
Year 2009	0.089 (-0.374, 0.552)	.707
Year 2010	0.103 (-0.344, 0.549)	.653

Continued

the following factors as potential drivers of LHD consolidation:

1. LHD financial condition, as defined by the extent to which reserved funds are used over time;
2. Financial condition of city governments within which city LHDs operated, as defined by whether the city had run a negative general fund balance;
3. A “strong mayor” system of city government, a form of government characterized by an elected mayor who has responsibility for city taxes and expenditures;
4. Total population of the LHD jurisdiction; and
5. Population density in the LHD’s jurisdiction.

We used probit models, which included measures of these variables, to produce probabilities of consolidation that we incorporated into the second stages of the Heckman models.

*Second-stage model.* In the second-stage models, our outcomes of interest were postconsolidation changes in LHD total and administrative expenditures. Because of the skewed distribution of the outcome variables, we transformed each variable to a natural log scale.

Overall, we used the data to measure the longitudinal impacts of LHD consolidation on expenditures, and we analyzed these data using a 2-stage Heckman regression model with year-level fixed effects. We coded LHDs that consolidated as zero before their consolidation and as 1 in the year of consolidation and thereafter.



TABLE 2—Continued

No.	586	–
<i>A</i> (Mills ratio)	-0.843 (-1.416, -0.271)	.004
Wald $\chi^2$	43.86	≤ .001

Note. CI = confidence interval; LHD = local health department. Reference categories are the micropolitan service area and the year 2011. Total expenditures, administrative expenditures, total population, and total local government spending are natural log-transformed to improve model fit. First-stage variables (results not shown) included whether the city government was run by a strong or a weak mayor system, the presence of a city government deficit, the LHD's financial condition, the total population of the service area, and the population density of the service area. The mayoral system was dichotomized on the basis of whether a municipality had an elected mayor who was empowered to perform the executive functions of government. The city government deficit variable was dichotomized on the basis of whether the city had a deficit any year (before consolidation) during the study period. The LHD financial condition variable was defined on the basis of the extent to which reserved funds were used over time (measured as a weighted propensity over time). Total local government spending, found in the second stage of the model, is a continuous variable indicating the dollar expenditures of the city or county government (city government for city LHD and county government for county LHD) for all agency and program areas. Total local government expenditures is included as an indicator of local government spending patterns. Dummy variables were created for each year in the study period to account for changes expected to occur with time.

City and county LHDs that did not consolidate at any point during the study period were also coded as zero. In any given year, the LHDs coded as zero served as the control group against which we compared the consolidated jurisdictions. Technically, the unit of analysis was the LHD service area, which was served by 2 LHDs before consolidation and 1 LHD after consolidation. Our coding also denoted the year of consolidation as the first postconsolidation year.

In the model for total expenditures, the control variables included proxies for community need for public health services, including total population size, population density, proportion of African American and Hispanic residents in the community, and poverty rate. We used a dichotomous variable to control for influences associated with LHDs being located in either a metropolitan or a micropolitan area. We included total local government expenditures as a proxy for the tendency of the local area to spend on community services. For city LHDs, we used total city

government expenditures in this capacity. For county LHDs, we used total county government expenditures as the marker of local government's willingness to spend. We incorporated dummy variables into the model to address trends associated with the influence of time (e.g., the tendency of LHDs to economize on resources over time).

The model examining administrative expenditures used control variables targeted more at the organizational characteristics of the LHD itself: a dichotomous variable for the LHD serving a metropolitan versus a micropolitan area, whether the LHD was a city or county organization, the total population (population figures used in the models reflected US Census estimates for each year), and the population density.

**Collecting and Analyzing Interview Data**

After identifying the LHDs involved in the consolidations in our sample, we contacted and scheduled telephone interviews with LHOs for 17 of the 20 consolidations. We developed our script for

the interviews primarily on the basis of guidance from Ohio public health practitioners, which allowed us to focus on the concerns and experiences of LHOs regarding the motivation for consolidations as well as their impact on expenditures and service delivery.

We used a structured questionnaire format for the interviews and took notes. Those interviewed had the opportunity to comment on our notes in typed form. We completed our interviews with LHOs between January and May 2013. (We also conducted interviews with several individuals who were employees or representatives of the cities involved in the consolidations, adding to the total number of interviews conducted.) We then summarized the data by question. Although many of the responses were quantifiable, we received and recorded other insights and ideas in the narrative form presented in this article.

**RESULTS**

We present descriptive findings comparing consolidating and

nonconsolidating LHDs the year before and the year after consolidation, the results of our multivariate Heckman models, and information from our interviews with LHOs.

**Descriptive Findings on Local Health Department Expenditures**

Table 1 presents expenditure data for consolidating and nonconsolidating LHDs between 2001 and 2011, based on a comparison of expenditure levels the year before and the year after consolidation. Nonconsolidating LHDs had higher per capita total and administrative expenditures than consolidating LHDs. Per capita total expenditures decreased 13.7% in consolidated LHDs from the year before to the year after consolidation, and per capita total expenditures increased 1.8% in nonconsolidating LHDs during the same period. Interestingly, per capita administrative expenditures decreased in both groups of LHDs, with a greater decline in nonconsolidating LHDs (3.1%) than consolidating LHDs (0.4%). However, these bivariate comparisons do not control for other influences on expenditures, as do the results from the multivariate Heckman models.

**Multivariate Findings on Local Health Department Expenditures**

Our multivariate results suggest that LHD consolidations in Ohio yielded reductions in total expenditures, but we did not find statistically significant results for the relationship between



**TABLE 3—Local Health Officials’ Perceptions of the Financial Benefits of Consolidation Over Time: Ohio, 2001–2011**

Consolidation of Public Health Services Yielded Financial Benefits and Savings	Responses of Senior County Health Officials					
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	I Don’t Know or Nonresponse
Within 1 y	8	4	2	1	0	2
After 2 y	6	5	3	1	0	2
After 5 y	5	3	0	0	0	9

consolidation and administrative expenditures.

The second stage of our Heckman models focused on expenditures (Table 2). On the basis of these findings, the consolidations examined were associated with a statistically significant decrease in total per capita expenditures of approximately 16%, controlling for other factors in the model. Although increases in total population were associated with a statistically significant increase in total per capita expenditures, increases in population density were associated with a small but statistically significant decrease in these expenditures. These results suggest that consolidations reduce postconsolidation per capita

expenditures, and they support the idea that consolidation is a source of monetary savings and financial benefit. The results thus support our first hypothesis.

Our second hypothesis suggested that 1 area in which savings may accrue from consolidation is through reductions in administrative expenditures. To test for changes in administrative expenditures, we examined pre- and postconsolidation per capita expenditures for administrative functions. Table 2 also presents findings from that analysis.

The results from the 2-stage regression model indicated that consolidation is not associated with a statistically significant change in per capita administrative expenditures. The findings

regarding the impact of consolidation on administrative costs are thus inconclusive. Although the negative coefficient associated with the postconsolidation variable—controlling for other variables—is consistent with expectations, the variable did not achieve statistical significance. The lack of significance could mean that consolidation does not have predictable impacts in lowering administrative costs. However, we believe further research in this area is appropriate.

**Local Health Officials’ Perceptions of Consolidation**

Our interviews with LHOs from consolidated LHDs provided additional evidence regarding the

impact of consolidation on finances, as well as insights into opportunities that consolidation may provide for public health service improvements. Of 17 LHOs we interviewed, 14 (82%) indicated that cost savings were a stated goal of consolidation. Importantly, 13 of these 14 LHOs (93%) indicated that cost savings were achieved after consolidation.

Table 3 summarizes responses to a question concerning whether consolidation yielded financial benefits and savings over several distinct time frames. The responses revealed that most LHOs interviewed believed that consolidating LHDs yielded financial benefits and savings, and they indicated that these benefits accrued quickly—within 1 year in most cases. (Although the LHOs did believe that the consolidation yielded financial benefits in most cases, they also revealed the existence of transition costs in some cases. These transition costs should be taken into account by LHDs seeking to consolidate with other LHDs.)

We also asked about trends in tax burdens on local citizens for public health services in the year after the consolidation. Of the 16 LHOs, 15 (94%) who responded to a question about postconsolidation tax burdens for public health services indicated that tax burdens for public health services did not increase for residents of the city involved in the consolidation. All 16 (100%) respondents said that the county jurisdiction involved in the consolidation experienced no increase in tax burdens for public health services as a result of the consolidation.

**TABLE 4—Local Health Officials’ Perceptions of the Effects of Local Health Department Consolidation on Public Health Services and Impacts Over Time: Ohio, 2001–2011**

Perception	Those Agreeing or Strongly Agreeing		
	During the First Year of Transition, <sup>a</sup> No. (%)	2 Years After the Transition, <sup>a</sup> No. (%)	5 Years After the Transition, <sup>a</sup> No. (%)
Public health services were at least maintained at existing levels	16/17 (94)	17/17 (100)	9/9 (100)
Public health services were improved	12/16 (75)	14/17 (82)	8/8 (100)
Increased positive impacts on public health	14/15 (93)	15/16 (94)	9/9 (100)

<sup>a</sup>Totals in the numerators reflect the number of direct responses in which the respondent strongly agreed or agreed. Differences in the denominators reflect variations in the number of local health officials who responded to each inquiry.



The interviews also suggested particular financial benefits accruing to cities involved in the consolidations. Overall, 11 of 15 LHOs (73%) said that tax burdens for public health services were reduced for residents of cities involved in the consolidations. All 11 of these LHOs attributed these reductions in tax burden to cost savings associated with the consolidation.

LHOs did not always identify the sources of these perceived financial benefits, but several of them indicated that consolidations were followed by reductions in staff. In most cases, however, reductions in staffing levels appear to have resulted from attrition rather than layoffs; only 3 of 17 LHOs indicated that consolidation was followed by layoffs.

We also collected information from LHOs about their perceptions of the impact of consolidation on public health services. Of the 17 LHOs, 11 (65%) asserted that service improvement was a stated goal of consolidation; 3 of 11 (27%) suggested that it was the key goal for consolidation. All 11 LHOs (100%) who asserted that service improvement was a goal of consolidation believed this goal was achieved after consolidation.

LHOs also commented on the impact of consolidation on the maintenance of existing public health services, public health service improvement, and the perceived impacts of public health efforts over time. Table 4 reports the extent to which LHOs agreed or strongly agreed that public health services were maintained, improved, and positively affected 1 year, 2 years, and 5 years after

consolidation took place. The results suggest that perceived service benefits of consolidation accrued relatively quickly in most cases.

These findings suggest that most LHOs perceived that LHD consolidation had positive net effects on public health services in their jurisdictions, even as they also suggested that consolidation yielded positive financial benefits. A common perception reported was that small-city LHDs were having difficulty providing the full range of needed services and that consolidation enabled county LHD expertise and resources to be applied to service provision in the cities, which—in at least some cases—appear to have been operating without sufficient staff.

## DISCUSSION

This study has a number of limitations. First, our sample size was limited by both the relatively small number of consolidations that occurred recently in Ohio and the availability of data on those consolidations and the LHDs involved in them, which limited the power of the study to detect impacts associated with consolidation. Second, the LHDs for which we were unable to obtain annual financial report data may possibly have been substantively different from the LHDs included in our analysis. However, we were able to consider community-level factors such as total population, and there appeared to be no striking differences between groups. Third, the Heckman 2-step model is a well-known approach for dealing with omitted-variable situations that result in potential

selection bias. However, it does not address other potential endogeneity issues. Future work should involve enhancing the analytical methods used here—possibly by introducing instrumental-based approaches and more sophisticated latent class modeling. Finally, although we believe that our results provide a useful picture of the impacts of recent LHD consolidations in Ohio on public health expenditures, conducting similar research in other states is advisable because variations in the structure of LHDs among the states create inherent difficulties in generalizing results across state lines. In general, however, the combination of small-city LHDs and larger county LHDs in our Ohio sample suggests that our results here may be most applicable to cases in which smaller LHDs combine with larger ones.

Although the scholarly literature has begun to address the impact of size on economic efficiency in public health service provision<sup>3</sup> and the likely effects of health department capacities on the quality of services provided,<sup>4</sup> it has not yet investigated the impact of actual LHD consolidations in a defined universe of health departments over time. As states continue to explore consolidation of LHDs as a means to achieve higher efficiency, this kind of study is valuable because it holds the potential to enable policymakers and practitioners to learn from past LHD consolidations. The results presented here are also consistent with those of other analyses suggesting that consolidation of LHDs may yield financial advantages.<sup>3,5,12</sup>

Recent LHD consolidations in Ohio have resulted in reduced

public health expenditures. LHOs from consolidated LHDs believe that consolidation has enabled them to improve public health services—particularly for the smaller cities involved in the consolidations. Although we caution readers that our results are preliminary and that additional research is appropriate, our findings do suggest that consolidations of city and county LHDs in Ohio reduced LHD expenditures without necessarily sacrificing the ability to provide public health services. The findings are of interest because of the growing interest in consolidating LHDs and because other studies have shown a positive relationship between LHD expenditures and public health services.<sup>13,14</sup> ■

## About the Authors

*John Hoornbeek, Matthew Stefanak, and Joshua Filla are with the Center for Public Policy and Health, Department of Health Policy and Management, College of Public Health, Kent State University, Ohio.*

*Michael E. Morris, Rohit Pradhan, and Sharla A. Smith are with the Fay Boozman College of Public Health, University of Arkansas for Medical Science, Little Rock.*

*Correspondence should be sent to John Hoornbeek, Center for Public Policy and Health, Kent State University, Moulton Hall, Hilltop Drive, Kent, OH 44242 (e-mail: jhoornbe@kent.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.*

*This article was accepted October 28, 2014.*

## Contributors

J. Hoornbeek served as the academic principal investigator of the project and was involved in the development of the study design, qualitative data collection, all data analysis and interpretation of results, and drafting of the article. M. E. Morris was involved in the conceptualization of the project, the development of the study design, administrative data collection, and drafting of the article, and had primary responsibility for statistical modeling



and data analysis. M. Stefanak served as the practitioner principal investigator of the project and was involved in the conceptualization of the project, the development of the study design, qualitative data collection, and interpretation of results, as well as the drafting of the article. J. Filla served as the project coordinator and was involved in the development of the study design, qualitative data collection, interpretation of results, and drafting of the article. R. Pradhan was involved in the development of the study design, administrative data collection, analysis of data, and interpretation of results, as well as drafting of the article. S. A. Smith was involved in the development of the study design, administrative data collection, preparation of data for analysis, and review and editing of the article.

#### Acknowledgments

Funding supporting this project was provided through the Ohio Research Association for Public Health Improvement by the Practice Based Research Network National Coordinating Center at the University of Kentucky College of Public Health and the Robert Wood Johnson Foundation.

We also acknowledge Ken Slenkovich, Michelle Menegay, Scott Frank, Tegan Beechey, and Joe Mazzola of the Ohio Department of Health, all of whom provided key assistance at various points in this project. We also acknowledge and thank the Ohio local health officials who shared their time and insights with us and, in so doing, assisted in critical ways with the research underlying this article.

#### Human Participation Protection

This study was approved by the institutional review boards of Kent State University and the University of Arkansas for Medical Sciences.

#### References

1. National Association of County and City Health Officials. *Local Health Department Job Losses and Program Cuts: Findings From the 2013 Profile Study*. Washington, DC: National Association of County and City Health Officials; 2013.
2. National Association of County and City Health Officials. National Profile of

Local Health Departments. Available at: <http://www.naccho.org>. Accessed October 24, 2014.

3. Santerre RE. Jurisdiction size and local public health spending. *Health Serv Res*. 2009;44(6):2148–2166.
4. Mays GP, McHugh MC, Shim K, et al. Institutional and economic determinants of public health system performance. *Am J Public Health*. 2006;96(3):523–531.
5. Hoornbeek J, Budnik A, Beechey T, Filla J. *Consolidating Health Departments in Summit County, Ohio: A One Year Retrospective*. Kent, OH: Kent State University Center for Public Administration and Public Policy; 2012.
6. Ohio State Auditor's Office. Audits of city and county governments. Available at: <https://ohioauditor.gov/auditsearch/search.aspx>. Accessed February 16, 2013.
7. Ohio Municipal League. List of all Ohio municipalities including counties and Ohio municipalities with charters. Available from: <http://www.omloho.org>. Accessed October 26, 2012.
8. US Census Bureau. State and county facts. Available from: <http://quickfacts.census.gov/qfd/states/390001k.html>. Accessed January 20, 2013.

9. Heckman JJ. Sample selection bias as a specification error. *Econometrica*. 1979;47(1):153–161.

10. Cameron AC, Trivedi PK. *Microeconometrics Using Stata*. Vol. 5. College Station, TX: Stata Press; 2009.
11. Mays GP, Smith S, Ingram R, Racster L, Lamberth C, Lovely E. Public health delivery systems: evidence, uncertainty, and emerging research needs. *Am J Prev Med*. 2009;36(3): 256–265.
12. Kodrzycki Y. *The Quest for Cost-Efficient Local Government in New England: What Role for Regional Consolidation?* New England Public Policy Center Research Report 13-1. Boston, MA: Federal Reserve Bank of Boston; 2013.
13. Mays GP, McHugh MC, Shim K, et al. Getting what you pay for: public health spending and the performance of essential public health service. *J Public Health Manag Pract*. 2004;10(5):435–443.
14. Erwin PC, Greene SB, Mays GP, Ricketts TC, Davis MV. The association of changes in local health department resources with changes in state-level health outcomes. *Am J Public Health*. 2011; 101(4):609–615.

# Measuring Public Health Practice and Outcomes in Chronic Disease: A Call for Coordination

Deborah S. Porterfield, MD, MPH, Todd Rogers, PhD, LaShawn M. Glasgow, DrPH, and Leslie M. Beitsch, MD, JD

A strategic opportunity exists to coordinate public health systems and services researchers' efforts to develop local health department service delivery measures and the efforts of divisions within the Centers for Disease Control and Prevention's National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) to establish outcome indicators for public health practice in chronic disease.

Several sets of outcome indicators developed by divisions within NCCDPHP and

intended for use by state programs can be tailored to assess outcomes of interventions within smaller geographic areas or intervention settings.

Coordination of measurement efforts could potentially allow information to flow from the local to the state to the federal level, enhancing program planning, accountability, and even subsequent funding for public health practice. (*Am J Public Health*. 2015; 105:S180–S188. doi:10.2105/AJPH.2014.302238)

**IN 2004, THE CURRENT DIRECTOR** of the Centers for Disease Control and Prevention (CDC) published a commentary sounding an alarm about the lack of activity in and measurement of chronic disease prevention and control in local public health practice.<sup>1</sup> Since then, several small studies have examined practice in local health departments (LHDs) for specific chronic diseases, such as diabetes control and obesity prevention.<sup>2–4</sup> Other large-scale studies

have examined associations between aspects of practice such as health department spending and varying sets of outcome indicators for chronic disease practice.<sup>5–7</sup> More recently, investigators in public health systems and services research (PHSSR) have initiated the development of sets of comprehensive service delivery and activities measures in maternal and child health, infectious disease, and chronic disease for LHDs.<sup>8,9</sup> These activities have evolved within the