RWJF Proposal: Causes and Consequences of Change in Public Health Spending

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CAUSES AND CONSEQUENCES OF CHANGE IN LOCAL PUBLIC HEALTH SPENDING

A. STUDY RATIONALE AND OBJECTIVES

A growing body of evidence indicates that the availability and quality of public health services varies widely across communities, but relatively little is known about the factors that give rise to this variation.\(^{1-6}\) One likely source of this variation is governmental spending on public health services. Public health activities in the U.S. are supported through a patchwork of funding streams that vary considerably across states and communities. The most recent national data indicate that local public health agency spending ranged from less than $1 per capita to more than $200 per capita across communities.\(^7\) Many communities depend heavily on local tax bases to support public health, indicating that economically disadvantaged communities may face considerable challenges in delivering a full array of public health services. Wide disparities in local public health agency spending also suggest that gaps in public health service delivery are likely to exist in communities where spending is limited. Most recently, the economic downturn of 2001-03 and the infusion of new federal funding for bioterrorism and emergency preparedness are likely to have precipitated significant changes in local public health agency spending levels and in the allocation of funds across public health activities.\(^8\)

We propose to conduct a national, longitudinal study of the causes and consequences of change in local public health agency spending. The study will focus on four overarching research questions:

1. How have local public health spending levels and funding sources changed over the past decade?
2. How have disparities in spending levels changed among communities defined by population size, rural/urban location, socioeconomic and racial/ethnic composition, and structural characteristics of the public health system?
3. To what extent have economic, demographic, and policy-related factors—such as the infusion of federal bioterrorism funding—precipitated change in local public health spending levels and funding sources over this period?

4. To what extent are changes in local public health spending associated with changes in local population health status and disease burden?

The proposed study focuses on spending at the local level because local public health agencies—rather than their state and federal counterparts—carry out the bulk of the governmental responsibility for directly implementing public health activities.† Most federal and state funding for public health activities—and significant amounts of private philanthropic funding for these activities—are channeled through local public health agencies. As such, these agencies provide valuable settings for studying cross-sectional variation and longitudinal change in public health spending levels and funding sources.

The proposed study will provide policy-makers and public health administrators with a better understanding of the adequacy and equity of the nation’s current investments in local public health services. Findings from the study will be used to identify those communities that are most likely to experience disparities in local public health spending so that strategies for addressing these disparities can be developed. Perhaps most importantly, this study will provide an initial exploration of the ways in which local public health spending may influence population health, thereby offering insight into the possible returns realized from governmental investments in local public health services. Although estimating the long-run economic returns from investments in local public health services is beyond the scope of the proposed study, this study will set the stage for such an estimation by examining the shorter-run causes and consequences of change in local public health agency spending.

† We include in our definition of local public health agencies those agencies that operate as centralized units of state health agencies.
B. PRIOR RESEARCH ON LOCAL PUBLIC HEALTH SPENDING

Most existing evidence on local public health expenditures is descriptive in nature and reflective of a single point in time, thereby providing relatively little insight into the causes and consequences of change in spending patterns. The National Association of County and City Health Officials (NACCHO) has conducted a series of descriptive studies on local public health agencies that document considerable variation in spending levels and funding sources across agencies. An analysis of data collected by NACCHO in 1992-93 found that local public health agency spending levels varied widely across communities, even when adjusting for the number of residents served by the agency. Spending levels ranged from a low of less than $1 per capita to a high of more than $200 per capita with a median spending level of about $20 per capita. This analysis also identified several agency characteristics that were positively associated with per-capita spending levels, including the population size of the community served by the agency, the number of full-time equivalent staff employed by the agency, and the number of public health programs offered by the agency. A more recent analysis of funding sources, based on data collected in 1999, found that local public health agencies obtained an average of 44% of their funding from local governmental appropriations, with the remainder derived from state government (30%), fee-based revenue (19%), and direct federal appropriations (3%). Agencies serving metropolitan areas were more dependent on local funding sources than were non-metropolitan agencies (58% vs. 34%), whereas non-metropolitan agencies relied more heavily on state government funding than did their counterparts (35% vs. 22%).

The wide variation in local public health agency spending levels and funding sources raises concerns that gaps in public health service delivery may exist in communities where spending is limited. Several prior studies conducted by the proposed principal investigator have found significant associations between local agency spending and the performance of essential public health services. In a 1998 study of all U.S. local public health agencies serving populations of at least
100,000 residents, we found that a 10% increase in per-capita agency spending was associated with a 0.7% increase in the availability of essential public health services in the community (p<0.01) and with a 0.6% increase in the perceived effectiveness of these services in the community (p<0.10), after controlling for the effects of other agency and community characteristics.\(^1\) A separate study found similar relationships between spending and performance using data from both large and small local public health agencies in 7 states that participated in field tests of the National Public Health Performance Standards Program during 2001-02.\(^9,11\) Further analyses revealed significant associations between per-capita public health spending levels and selected measures of population health status, including infant mortality rates and infectious disease case rates, indicating that communities with higher public health spending experience lower rates of adverse health events.\(^12\) These associations persisted after controlling for the effects of other community characteristics and health resources, and after adjusting for unobserved factors that jointly affect spending and population health.

These cross-sectional studies demonstrate that differences in local public health spending are associated with differences in the availability and perceived adequacy of public health services. As such, these studies indicate that spending levels may be an important determinant of and marker for local public health agency performance. However, these studies offer no information on the degree to which local spending levels change over time, or on the factors that precipitate these changes.\(^\dagger\) Similarly, the body of existing evidence is silent on whether changes in public health spending precipitate changes in population health status. The proposed study is designed to explore these important unanswered questions and their policy implications.

\(^\dagger\) To our knowledge the only previous study to examine longitudinal changes in local public health spending focused on the relatively brief period from 1990-93 and did not include an in-depth examination of the causes or consequences of this change.\(^13\) This study found that almost half of the local agencies studied experienced reductions in spending during the 3-4 year period.
It is also important to recognize the possibility that variation in public health agency spending may result from factors that have little if any impact on the performance of public health services. For example, in some communities state agencies and nongovernmental organizations play important roles in performing selected public health activities, potentially reducing the need for local governmental spending. These communities may enjoy a high level of public health service delivery despite relatively limited local governmental spending. Conversely, local public health agencies in some communities provide a broad range of services beyond population-based public health activities, such as the delivery of selected medical and social services. In such communities, high levels of local public health agency spending may not guarantee that resources are allocated appropriately to population-based public health activities.

Finally, local public health agencies may vary considerably in how efficiently resources are used, resulting in widely different spending levels required to produce the same basic set of public health services. For example, large agencies may realize economies of scale in performing public health activities requiring large fixed costs, such as surveillance systems and laboratory capacities. Conversely, agencies serving rural jurisdictions with low population densities may spend more on a per-capita basis to perform epidemiological investigations and public health education campaigns than agencies serving larger and more geographically concentrated populations. More generally, some agencies may perform better than others in allocating and managing resources efficiently and in leveraging local funds to attract nongovernmental contributions. These possibilities suggest that higher spending may not always signal higher performance in public health. The longitudinal design of the proposed study will allow us to examine these important, unanswered questions and their policy implications in more detail than has been possible through prior, cross-sectional analyses.
C. PROJECT APPROACH AND METHODOLOGY

**Data Sources and Measures:** The National Association of County and City Health Officials (NACCHO) has collected data on local public health agency spending and funding sources periodically through a national survey of these agencies known as the National Profile of Local Health Departments. Although the data collected to date have been used for a variety of descriptive, cross-sectional analyses, so far they have not been used to support longitudinal, inferential analyses of the causes and consequences of change in public health agency spending. These data were collected through census surveys of all U.S. health departments in 1989, 1993, and 1996, and they are being collected again through a 2005 census survey that is currently in the field. The response rates for each of the previous census surveys have been adequate for analytical purposes, ranging from 72% to more than 88% of the nation’s approximately 2900 agencies. For the 2005 survey NACCHO anticipates achieving at least an 80% response rate. As an additional data point, NACCHO surveyed a stratified random sample of 1100 agencies (38%) in 1999 and obtained expenditure information and related data from the 63% of agencies that responded.\(^7\)

In all five of these surveys, agencies were asked to report their total expenditures for the most recently completed fiscal year and to report the corresponding fiscal year. Additionally, the surveys conducted in 1993, 1999, and 2005 collected information on agency funding sources, including the percentage of funding derived from municipal, county, state, federal, private, and fee-based sources. Within these funding categories, respondents reported information on clinical revenue obtained from Medicaid, Medicare, private insurers, and patient fees. In addition to spending information, all five of the NACCHO surveys collected information on other agency characteristics including staffing levels, services provided, population served, and type of governmental agency.

Data from each of the five NACCHO surveys will be merged into a longitudinal data set, and observations will be linked across years using identifying information on each public health agency.
We will then link the NACCHO survey data with several other data sources that provide contemporaneous information on demographic, economic, and community characteristics as well as federal and state health spending patterns. These data sources will include: (1) county-level economic and employment information from the U.S. Census Bureau’s County Business Patterns database for years that correspond to the NACCHO surveys; (2) county-level information on area health resources, demographics, and community characteristics from the U.S. Health Resources and Services Administration’s Area Resource File for corresponding years; (3) information on state and local government spending from the U.S. Census Bureau’s Census of Governments fielded in 1992, 1997, and 2002; (4) information on federal health spending (including bioterrorism preparedness funding) from the Census Bureau’s Consolidated Federal Funds Report for corresponding years; and (5) county-level information on birth outcomes, mortality statistics, and preventable infectious and chronic diseases from the CDC’s Vital and Health Statistics databases for corresponding years.

**Descriptive Analysis of Longitudinal Change and Disparities.** We will conduct both descriptive and inferential analyses. The descriptive analysis will document how local public health spending levels and funding sources have changed during the time period covered by the NACCHO surveys, with focus given to the most recent decade from 1996 to 2005. In addition to documenting overall spending trends, the descriptive analysis will assess the degree of variation in spending across different types of communities classified by population size, rural/urban designation, geographic region, racial/ethnic composition, and socioeconomic status. As part of this analysis, we will assess whether disparities in spending across communities have widened or narrowed over time using coefficient of variation measures and inequality indices such as the Gini coefficient.¹⁸

**Inferential Analysis of Determinants of Change.** As part of the inferential analysis, we will use multivariate regression models for panel data to estimate how economic, demographic, and policy-related factors have influenced local public health spending levels and funding sources over
this period. One set of regression models will use agency expenditures as the dependent variable and will employ a semilogarithmic model specification to account for skewness and reduce the influence of outlier observations. A second set of regression models will use the funding source measures as dependent variables, and will employ a series of share equations that reflect the proportion of revenue obtained from each major funding source. The share-equation models will offer the added advantage of controlling for common unobserved characteristics that affect the funding source measures. In each set of models, the independent variables of interest will reflect characteristics hypothesized to precipitate change in local spending levels and funding sources, including both demand-side and supply-side factors as used in our prior cross-sectional models. These factors include will population growth, macroeconomic trends in employment and earnings, trends in health insurance coverage, changes in the scope of public health programs offered, changes in the availability of other health resources in the community, and changes in state and federal public health spending, including new federal funds for bioterrorism preparedness. These latter characteristics will allow us to assess the trickle-down effects of state and federal spending patterns on local public health expenditures. We will use hierarchical model specifications that allow for both local-level and state-level effects, and we will control for auto-correlation by testing both fixed-effects and random-effects specifications and using Hausman statistics to select the best method.

Inferential Analysis of Consequences of Change. A similar set of regression models will be used to estimate the associations between spending levels and population health status while controlling for other characteristics likely to affect community health. We will analyze several measures of population health that are nationally available at the county level and that may be sensitive to local public health programs and services over the period of study. These measures will include infant mortality, maternal smoking, prenatal care use, incidence of communicable diseases,
and selected chronic disease mortality measures. These measures include those that were associated with measures of public health system performance in prior cross-sectional studies. Multivariate regression models for panel data will be used to estimate the association between spending and population health while controlling for other community characteristics likely to affect health, including socioeconomic characteristics, demographics, and health resources. Following the approach we used in a previous cross-sectional analysis, we will use instrumental variables methods to test and control for the possibility that unobserved community characteristics jointly influence public health spending and population health status. Because of the observational nature of the study design, results from these analyses alone will not be sufficient to support unequivocal inferences about causal relationships between spending and population health. However, the longitudinal research design based on nationally representative data will provide much stronger evidence than is currently available about these relationships.

**Dissemination Plan.** Products of the proposed project will include a series of four research articles for peer-reviewed health policy journals, and presentations at major health policy conferences. The journal articles, geared for both research and policy audiences, will present major findings and implications from the descriptive and inferential analyses (See Table 1). Findings will also be presented at major conferences such as the AcademyHealth annual research meeting, the APHA annual meeting, and the International Health Economics Association meeting.

**Relevance to Policy and Practice.** Findings from the proposed study will assist policymakers at federal, state, and local levels in crafting desirable strategies for funding local public health services so as to correct existing gaps and disparities in resources. Findings will also allow public health decision-makers to anticipate how changes in economic conditions and demographic characteristics are likely to affect local public health spending so that effective policy interventions can be developed to manage these trends. Finally, findings from the study will provide insight into
the likely effects of changes in public health spending on population health so that policy-makers can make more informed decisions about fiscal policies that impact the public’s health.

**Project Staff and Work Plan.** The proposed study will be conducted by the University of Arkansas for Medical Sciences (UAMS) with access to data provided by NACCHO. The proposed principal investigator at UAMS, Glen Mays, Ph.D., brings to the project considerable expertise in health economics and health policy analysis along with a track record of successful research in the fields of public health and health services research. NACCHO brings to the project extensive content knowledge about the financial and operational issues that confront local public health agencies, as well as extensive experience in using NACCHO survey data. Dr. Mays has also used the NACCHO data in many prior studies and has served as a technical advisor for the 2005 NACCHO survey. This project will require a 12 month period of performance. Table 1 presents the project’s proposed work plan and schedule of products.

**Table 1: Work Plan, Timeline and Products for the Proposed Study**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appoint members of study advisory committee</td>
<td>1/15/06</td>
</tr>
<tr>
<td>Finalize study design and analysis plan and review with advisory committee</td>
<td>2/15/06</td>
</tr>
<tr>
<td>Clean, match, and merge data from 1989-2005 NACCHO surveys</td>
<td>3/31/06</td>
</tr>
<tr>
<td>Clean and merge data from other secondary sources</td>
<td>4/30/06</td>
</tr>
<tr>
<td>Complete descriptive analysis of longitudinal changes in spending</td>
<td>6/15/06</td>
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<tr>
<td>Complete paper #1 on longitudinal changes in spending</td>
<td>7/15/06</td>
</tr>
<tr>
<td>Complete analysis of disparities in spending across communities</td>
<td>7/31/06</td>
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<tr>
<td>Complete paper #2 on spending disparities</td>
<td>8/15/06</td>
</tr>
<tr>
<td>Review first 2 papers with advisory committee and obtain feedback</td>
<td>8/31/06</td>
</tr>
<tr>
<td>Submit first 2 papers for publication</td>
<td>9/15/06</td>
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<tr>
<td>Complete analysis on determinants of spending change</td>
<td>9/30/06</td>
</tr>
<tr>
<td>Complete paper #3 on determinants of spending change</td>
<td>10/15/06</td>
</tr>
<tr>
<td>Complete analysis on effects of spending on population health</td>
<td>10/31/06</td>
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<tr>
<td>Submit abstract for International Health Economics Association Meeting</td>
<td>10/31/06</td>
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<tr>
<td>Present selected preliminary findings at APHA Annual Meeting</td>
<td>11/15/06</td>
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<tr>
<td>Complete paper #4 on effects of spending on population health</td>
<td>11/15/06</td>
</tr>
<tr>
<td>Review second 2 papers with advisory committee and obtain feedback</td>
<td>12/15/06</td>
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<tr>
<td>Submit second 2 papers for publication</td>
<td>12/31/06</td>
</tr>
<tr>
<td>Submit abstract for presentation at AcademyHealth Annual Meeting</td>
<td>1/15/07</td>
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REFERENCES


