

# Public Health Delivery Systems

## Evidence, Uncertainty, and Emerging Research Needs

Glen P. Mays, PhD, Sharla A. Smith, MPH, Richard C. Ingram, MEd, Laura J. Racster, MPH, Cynthia D. Lamberth, MPH, Emma S. Lovely, BA

**Abstract:** The authors review empirical studies published between 1990 and 2007 on the topics of public health organization, financing, staffing, and service delivery. A summary is provided of what is currently known about the attributes of public health delivery systems that influence their performance and outcomes. This review also identifies unanswered questions, highlighting areas where new research is needed. Existing studies suggest that economies of scale and scope exist in the delivery of public health services, and that key organizational and governance characteristics of public health agencies may explain differences in service delivery across communities. Financial resources and staffing characteristics vary widely across public health systems and have expected associations with service delivery and outcomes. Numerous gaps and uncertainties are identified regarding the mechanisms through which organizational, financial, and workforce characteristics influence the effectiveness and efficiency of public health service delivery. This review suggests that new research is needed to evaluate the effects of ongoing changes in delivery system structure, financing, and staffing.

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### Introduction

A growing body of evidence demonstrates that the availability and quality of public health services vary widely across U.S. communities.<sup>1–7</sup>

These services include population-wide efforts to investigate community health threats, promote healthy lifestyles, prevent disease and injury, prepare for emergencies and disasters, and assure the quality of water, food, air, and other resources necessary for good health.<sup>8</sup> Concerns about such gaps in availability and quality have grown rapidly in recent years in response to both new and persistent health risks, including emerging and resurgent infectious diseases, the threat of bioterrorism, large-scale natural disasters, and the advance of obesity and related chronic diseases. Closing these gaps will require better evidence about how best to organize, finance, and deliver effective public health services to populations at risk.

In the U.S., public health services are delivered through the collective actions of governmental and private organizations that vary widely in their resources, missions, and operations.<sup>9–11</sup> Thus, the systems that

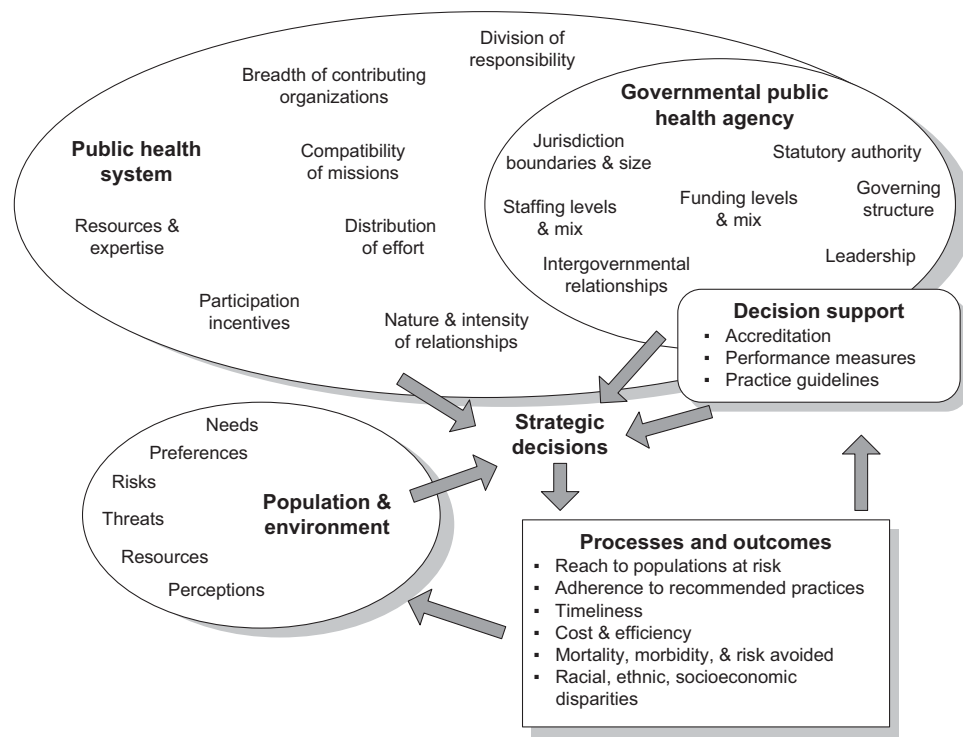
produce public health services are complex and adaptive, consisting of the interactions of multiple heterogeneous actors.<sup>12,13</sup> Although they are rarely portrayed as dynamic organizations, public health agencies have changed markedly in recent decades in response to shifts in economics, policy priorities, and public health threats.<sup>7,10,14–16</sup> Understanding how the changing characteristics of these agencies influence the availability and effectiveness of public health services is a critical step in elucidating pathways for improving public health service delivery and population health.

The objectives of this article are to (1) summarize what is currently known about the attributes of public health systems that influences their performance and outcomes, and (2) identify important unanswered questions that highlight the need for new research. Public health systems can be defined from multiple perspectives, including that of governmental systems, service delivery systems, and causal systems. The governmental-system perspective focuses on the actions generated through public-sector efforts to assure the conditions necessary for society's health, including the provision of public goods and the regulation of private behavior. The delivery-system perspective encompasses the services that both governmental and private organizations perform to protect and promote health at the population level. Finally, the causal-system perspective includes the full array of institutions and individuals whose actions influence population health—including both beneficial and harmful actions and interactions.

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From the Department of Health Policy and Management, Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences (Mays, Smith), Little Rock, Arkansas; and College of Public Health, University of Kentucky (Ingram, Racster, Lamberth, Lovely), Lexington, Kentucky

Address correspondence and reprint requests to: Glen P. Mays, PhD, Professor and Chair, Department of Health Policy and Management, University of Arkansas for Medical Sciences, 4301 W. Markham Street, #820, Little Rock AR 72205. E-mail: [gpmays@uams.edu](mailto:gpmays@uams.edu).



**Figure 1.** Conceptual model of public health systems

This article focuses primarily on the governmental-system perspective because of the leading roles that governmental public health agencies play in assuring the delivery of public health services. However, the article also draws on constructs from the delivery-system perspective by recognizing that governmental agencies frequently carry out their public health responsibilities through relationships with other organizations.

The characteristics of public health systems can be examined through the lens of Donabedian's familiar structure–process–outcome framework originally developed for studying medical care delivery systems.<sup>17</sup> This article focuses on the first element of that framework and examines the major structural characteristics through which public health services are delivered, including system boundaries and size, organizational and interorganizational structures, financing and economic characteristics, and workforce characteristics. Although not exhaustive, these four structural dimensions represent some of the most tangible and tractable characteristics of public health systems that are amenable to change through policy and administrative actions. Of particular interest is how these structures interact with other elements of the public health system to influence important processes and outcomes such as those highlighted in Figure 1. A companion article in this issue focuses specifically on the second element of Donabedian's framework by reviewing the literature on public health system performance, which encompasses the processes through which public health services are delivered.<sup>18</sup>

## Dimension One: System Boundaries and Size

In theory, the boundaries of a public health delivery system should be established so as to encompass all of the organizations and interactions that influence the production and consumption of public health services for a given population, much like the methods for defining boundaries for health-care markets and service areas.<sup>19–23</sup> In practice, most existing studies of public health systems have used boundary definitions based on the geopolitical jurisdictions of local or state governmental public health agencies.<sup>3–6</sup> This definition reflects the governmental public health agency's legally defined powers and duties for protecting the

health of the population residing within its jurisdiction. Use of this definition has several consequences for producing evidence about public health systems. First, this definition produces very heterogeneous units of observation, particularly at the local level where public health agencies may be creatures of cities, townships, counties, special districts, or state governments—all with differing combinations of legal powers and responsibilities. This heterogeneity makes it difficult to identify central tendencies among systems and to generalize findings across systems. Additionally, this definition may fail to capture the public health services and activities contributed by organizations other than the designated public health agency, particularly when these entities are located outside the physical boundaries of the agency's jurisdiction. These consequences highlight the need for methods of classifying public health systems into homogenous subgroups for study, as has been done in a recently developed empirical typology of local public health systems ([www.academyhealth.org/2008/PublicHealth.pdf](http://www.academyhealth.org/2008/PublicHealth.pdf)). Moreover, these consequences highlight the need for methods of measuring nongovernmental and multi-organizational contributions to public health services, as well as for methods of analyzing cross-jurisdictional influences and interactions in public health service delivery.<sup>11,24,25</sup>

The boundaries of a public health system determine the size of the system, which may confer both advantages and disadvantages in delivering public health services. System size can be measured along multiple

dimensions, but most existing studies characterize size by the number of people who reside within the jurisdictional boundaries of a public health agency. Agencies that serve large populations may be able to realize economies of scale in performing activities such as disease surveillance and health education by spreading the fixed costs of public health infrastructure over large numbers of residents. Similarly, large agencies may realize economies of scope by using a large pool of staff and resources to support an array of related public health programs and services. Large public health systems may also benefit from a broader range of organizations operating within their jurisdictions that can be enlisted to contribute to public health services.<sup>9,11</sup> For certain public health services, volume–outcome relationships may exist such that larger systems become more effective at performing services because they are used more frequently.<sup>26</sup> Outbreak investigation and infectious disease control practices may exhibit this relationship, particularly for uncommon diseases. At the same time, there may be offsetting disadvantages associated with size. As population size increases, public health systems may face growing challenges in communicating, coordinating, and tailoring services to the multiple subgroups they serve—a form of congestion in service delivery.<sup>27</sup>

Several observational studies suggest that larger public health systems perform better than their counterparts in carrying out activities considered to be essential public health services.<sup>3,4,6</sup> In fact, population size emerges as one of the strongest predictors of system performance in analyses that examine a range of institutional, economic, and community characteristics. One of these studies, however, suggests that the advantages of size appear to diminish once local systems reach a threshold of about 500,000 residents.<sup>28</sup> Collectively, these findings indicate that small public health systems may face important challenges in performing a full range of public health services, suggesting that consolidation or regionalization strategies may be beneficial for small areas. Still, considerable uncertainty remains regarding the mechanisms through which system boundaries and size influence public health service delivery, including which services may provide economies of scale and scope, which services may demonstrate volume–outcome relationships, and which services are vulnerable to congestion in large-scale delivery.

### **Dimension Two: Organizational and Interorganizational Structures**

Public health systems function through the work of multiple organizational participants. State and local governmental public health agencies occupy pivotal positions within these systems because of their legally

defined powers and responsibilities for protecting and promoting health. Nongovernmental organizations also contribute substantially to public health activity in some systems, both independently and in collaboration with governmental agencies. Table 1 summarizes several elements of organizational and interorganizational structure that appear influential to the work of public health systems.

### **Governmental Agency Organization**

State and local public health agencies vary widely in their powers and duties and in the ways in which they are organized to accomplish their missions. Some agencies operate as freestanding, independent departments, whereas others are embedded within larger “super agency” structures that have responsibilities for an array of health and social services programs. The perceived strengths and limitations of these alternative structures have been examined periodically in the professional literature,<sup>29–31</sup> but there are no empirical estimates of the comparative effectiveness or efficiency of these structures from well-designed research studies.

At the local level, agencies may operate under the authority of single or multiple local governments, or directly under the centralized control of the state government. In theory, multigovernmental agencies (e.g., joint city–county agencies and multicounty agencies) may promote intergovernmental coordination, but at the same time they may encounter conflicting governmental authority, cumbersome administrative rules, and complex reporting relationships that pose barriers to effective public health action. The few studies that examine this issue suggest that there may be benefits to at least some types of multigovernmental agencies.<sup>6,28</sup>

Local public health agencies operate as centralized administrative units of the state health agency in seven U.S. states. One theory of political economy suggests that decentralized governmental authority and decision-making may yield superior public services because local governments, as opposed to state administrative units, are often more informed of and responsive to local community needs.<sup>32–34</sup> Alternative theories suggest that centralized provision of services may be more effective and efficient in coordinating activities and correcting inequities in resources across communities.<sup>35</sup> The empirical evidence on this issue is limited, but two cross-sectional studies found that decentralized agencies offered a broader scope of public health services compared to their centralized counterparts.<sup>4,28</sup> Nevertheless, for small public health agencies, any benefits of decentralization could be outweighed by the advantages of size and economies of scale achievable through centralization.

**Table 1.** Selected organizational characteristics relevant to public health systems

Characteristic	Proportion of agencies (%)
<b>STATE PUBLIC HEALTH AGENCY CHARACTERISTICS (n=50)<sup>a</sup></b>	
<b>Structure within state government</b>	
Freestanding independent agency	58
Component of super agency	42
<b>Governance structure includes a board of health</b>	48
<b>Powers and legal authority of state health agency (selected)</b>	
Vital statistics	98
Health facility regulation	90
Environmental regulation	74
Designated Medicaid agency	32
<b>State authority over local public health agency operations</b>	
Centralized state authority	16
Decentralized local control	62
Shared state–local control	22
<b>Use of regional administrative structures within state</b>	44
<b>LOCAL PUBLIC HEALTH AGENCY CHARACTERISTICS (n=2864)<sup>b</sup></b>	
<b>Type of local government jurisdiction served</b>	
County	59
City/township	16
Combined city and county	14
Multicounty or regional district	10
<b>Size of jurisdiction served</b>	
<25,000 residents	41
25,000–99,999 residents	36
≥100,000 residents	23
<b>Governance structure includes a board of health</b>	74
<b>Powers and legal authority of local health agency (selected)</b>	
Adult immunization	88
Tobacco control	67
Family planning	55
Prenatal care	37
<b>OTHER ORGANIZATIONS CONTRIBUTING TO PUBLIC HEALTH SERVICES</b>	
<b>Type of organization</b>	<b>Scope of contribution<sup>c</sup></b>
Hospital	41
Physician organization	24
Health insurer	10
Community health center/clinic	29
Employer/private business	17
Community-based organization	32
Faith-based organization	19
University	22
Primary/secondary school	28

<sup>a</sup>Source: authors' analysis of data from the Association of State and Territorial Health Officials, 2005 (Reference 37)

<sup>b</sup>Source: authors' analysis of data from the National Association of County and City Health Officials, 2005 (Reference 55)

<sup>c</sup>Numbers indicate the proportion of core public health services in which each organization participates (of 20 total). Source: authors' analysis of data from the National Survey of Local Public Health Systems, 2006 (Reference 4)

## Governance Structures

State and local governing bodies may exert considerable influence on governmental public health agencies and their roles within public health systems. About half of the states appoint a board of health to oversee and establish policy for the state public health agency, and at the local level nearly three fourths of public health agencies operate under a local board of health.<sup>36</sup> Governing board composition and power varies widely across states and communities. Several cross-sectional studies have found that local public health systems governed by local boards of health perform a broader range of services compared with systems that do not have these boards.<sup>4,28</sup> Similarly, a recent longitudinal study suggests that local public health spending is higher among agencies governed by these boards ([www.academyhealth.org/2007/abs/tracts/PopulationPublicHealth.pdf](http://www.academyhealth.org/2007/abs/tracts/PopulationPublicHealth.pdf)). Nevertheless, considerable uncertainty remains about how governing structures influence public health system performance, and about what specific board powers and responsibilities are most influential.

## Statutory Powers and Authority

Governmental public health agencies vary considerably in their statutorily defined powers and responsibilities. For many public health services, responsibility rests with the local public health agency in some communities, with the state agency in other communities, and with a separate governmental agency or private organization in still other communities.<sup>37</sup> Differences in how public health powers and responsibilities are distributed across state and local governments may have important effects on the delivery of public health services. Legal analyses of state and local public health statutes have found evidence of important inconsistencies and ambiguities in how public health powers are defined and distributed.<sup>38</sup> In response, model state public health laws have been developed recently that offer states explicit guidance for updating and standardizing their statutes.<sup>39</sup> Little is currently known about the effects of such legal reforms on public health delivery and outcomes.

## Interorganizational Relationships

A growing body of evidence confirms that numerous organizations beyond governmental public health agencies make important contributions to public health activities in many communities.<sup>9,10,40–42</sup> These contributors include community-based and faith-based organizations, healthcare providers and insurers, social service agencies, public safety agencies, and private businesses. Consequently, the range of organizations contributing to public health services and the scope and nature of their contributions are likely to be important determinants of a public health system's

success in addressing population health needs. Several cross-sectional studies support this hypothesis by documenting significant, positive associations among the various types of organizations participating in public health activities and the overall availability of such activities within communities.<sup>11,25,43,44</sup>

Considerable attention has focused on multi-organizational partnerships and coalitions as vehicles for expanding the reach of governmental public health agencies and improving the availability and quality of public health services.<sup>45,46</sup> Existing studies have identified factors that influence successful public health partnerships, including mission congruence and alignment of financial incentives.<sup>41-45,47</sup> Several studies suggest that partnerships with private businesses and employers have expanded in recent years, particularly around issues such as employee health promotion and emergency preparedness.<sup>48,49</sup> Although the frequency of interorganizational relationships in public health is now well documented, the nature and intensity of these relationships are not well understood, nor are the ways in which these relationships influence public health service delivery and outcomes.

### Dimension Three: Financing and Economics

Public health activities in the U.S. are supported through a patchwork of funding sources and financing arrangements that vary widely across states and communities, giving rise to large disparities in governmental expenditures for public health services.<sup>50-52</sup> Although relatively little is known about the financial and economic characteristics of public health systems, related studies on medical care suggest that spending levels, financing instruments, resource allocation decisions, and efficiency considerations may be important drivers of system performance and outcomes (Table 2).

#### Public Health Expenditures

Governmental public health spending in the U.S. totaled an estimated \$35 billion or \$120 per capita in 2005, accounting for less than 2% of all U.S. health spending.<sup>53</sup> Wide disparities in state and local public health spending exist, and gaps in public health service delivery may exist in communities where spending is limited.<sup>54,55</sup> Observational studies have found significant associations between per-capita public health agency spending and the performance of essential public health services.<sup>4,28,56,57</sup> Nevertheless, disparities in spending may result at least in part from factors that have little impact on population health. For example, in some communities, nongovernmental organizations play important roles in performing selected public health activities, potentially reducing the need for governmental agency spending. In other cases, public health agencies may have high levels of spending but

**Table 2.** Selected financial and economic characteristics relevant to public health systems

Financial and economic characteristics	
<b>Public health expenditures</b>	
Governmental expenditures: federal, state, local	
Nongovernmental expenditures	
Expenditures by type of service	
<b>Sources of revenue</b>	
Federal appropriations	
State appropriations	
Local appropriations	
Public health insurance payments (e.g., Medicare, Medicaid, SCHIP)	
Private health insurance payments	
Other fees and charges for services	
Private sources (e.g., grants, contracts, gifts)	
<b>Public financing instruments</b>	
General revenue (e.g., income, sales, and property tax)	
Special-purpose taxes and fees	
Debt financing	
<b>Funding vehicles</b>	
Categoric grants	
Block grants	
Contracts and cooperative agreements	
Intergovernmental transfers	
Unrestricted sources	
<b>Resource allocation mechanisms</b>	
Need-based formula	
Cost-based formula	
Performance-based formula	
<b>Efficiency and cost effectiveness</b>	
Per-capita cost by type of service	
Cost per quality-adjusted life year gained	

use these funds to provide services outside the traditional realm of public health, such as medical care and social services.<sup>8,58,59</sup> A better understanding of how public health funds are used and their impact on service delivery and outcomes is needed to allow policymakers to make more-informed decisions about the nation's investments in public health.

#### Financing Mechanisms

The wide disparities in state and local public health spending may stem in part from differences in how and where these funds are generated. Many communities depend heavily on local tax bases to support public health, suggesting that economically disadvantaged communities may face considerable challenges in supporting a full array of public health services.<sup>55,61,60</sup> Some states and localities have established dedicated funding streams such as special tax levies (e.g., tobacco and fuel taxes), whereas others rely principally on appropriations from general revenues to fund public health needs. Governments also vary widely in the size and stability of the tax bases used to support general revenue spending in public health, with some governments being heavily dependent on relatively volatile bases such as income and payroll taxes. The few existing studies suggest that these public financing charac-

teristics are potentially powerful determinants of public health spending levels.<sup>61,62</sup>

## Resource Allocation

Systems that receive similar levels of funding may perform very differently in delivering public health services based on how resources are allocated to specific activities and responsibilities. Most federal and state governmental spending in public health is administered through categorical funding programs that target resources to specific public health activities such as immunization, cancer prevention, and tuberculosis control, thereby limiting the ability of grantees to allocate resources according to local needs or priorities. Additionally, most governmental public health programs disperse funds through formula-based allocations, competitive application processes, or a combination of these two strategies, resulting in funding levels that vary widely on a per-capita or per-case basis.<sup>63</sup> These levels often do not track closely with objective measures of disease burden, service delivery cost, or demand for services.<sup>64,65</sup> Several state health agencies have begun to establish funding arrangements with local organizations that tie funding levels to measurable elements of performance and outcomes,<sup>66–68</sup> similar to the pay-for-performance methods now being tested in medical care.<sup>69</sup>

Relatively little evidence exists concerning the impact of alternative funding mechanisms and funding formulas on public health system performance and outcomes. Longitudinal studies of categorical funding programs involving tobacco prevention and sexually transmitted disease prevention have documented reductions in disease incidence and risk in response to funding increases.<sup>70–73</sup> Unfortunately, no existing studies have examined the comparative effectiveness of alternative funding mechanisms. Consequently, although there are widespread perceptions that categorical funding streams and rigid funding formulas have not performed well in matching resources to needs within public health systems, very little evidence exists to confirm these perceptions and suggest better approaches.

## Efficiency

The ability of public health systems to operate successfully within their funding environments is likely to hinge on how efficiently resources are used to produce the desired services and outcomes. Ideally, efficiency measures for public health systems would indicate the costs required to produce a defined unit of service or a specific health outcome of interest. The current evidence base on efficiency and cost-effectiveness issues in public health practice focuses primarily on specific health promotion and disease prevention interventions rather than on delivery systems as a whole.<sup>74</sup> As this

**Table 3.** Selected workforce characteristics relevant to public health systems

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### Workforce characteristics

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#### Supply and occupational composition

- Total FTE workers in public health occupations
- Public health nurses
- Epidemiologists
- Health educators
- Nutritionists
- Environmental health specialists
- Laboratory scientists
- Physicians
- Other occupational categories

#### Geographic and organizational distribution

- Workers per 100,000 population at local, state, and census-region levels
- Workers practicing in rural vs urban communities
- Workers employed by federal, state, and local governments
- Workers employed in private sector
- Full-time, part-time, and voluntary worker status

#### Demographic composition/distribution

- Age and gender
- Race and ethnicity
- Languages spoken

#### Education and training

- Educational attainment
- Graduate public health training
- Other graduate and professional degrees
- Professional certifications and licensures
- Continuing education training

#### Experience and tenure

- Years of practice in occupation
- Years of practice in current position

#### Recruitment and retention

- Vacancy rates by occupation and organizational setting
- Turnover rates by occupation and organizational setting

#### Compensation

- Earnings by occupation
- Use of productivity and performance incentives
- Total labor costs

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FTE, full-time equivalent

evidence base continues to grow, it provides an indirect strategy for examining system-level efficiency, using studies that assess the extent to which cost-effective public health interventions are adopted and implemented within these systems.<sup>75,76</sup>

## Dimension Four: Workforce Characteristics

Public health practice is a labor-intensive endeavor that is heavily dependent on human capital for successful operations. The workforce characteristics relevant to public health delivery systems vary widely across states and communities (Table 3); they include staffing levels and composition, geographic and organizational distribution, training and competency, and recruitment and retention. Of critical interest is how these attributes—alone and together—influence the work performed and outcomes achieved by public health systems.

## Workforce Size, Composition, and Distribution

The size and composition of the public health workforce reflects the total amount of human capital available within a public health system to support its activities.<sup>77</sup> Existing labor statistics indicate that the governmental public health workforce has grown steadily in recent decades, until relatively recently, but has not kept pace with population growth in recent decades.<sup>78,79</sup> The causes of both the absolute and relative reductions in workforce size are not well understood and may be attributable to several factors, including macroeconomic fluctuations and resulting government budget shortfalls, growth in the medical care workforce that has heightened competition for trained health professionals, and the aging demographics of the workforce. The composition of the public health workforce in terms of professional training and occupational roles and responsibilities is also not well understood, but large proportions of the workforce lack formal academic training and professional certification in the public health field.<sup>80</sup> Available evidence indicates that public health workers are not distributed evenly across geographic regions nor across different organizational levels of the public health system.<sup>78,79</sup>

Existing evidence about the public health workforce is not adequate to support specific recommendations concerning the level and mix of staffing needed by communities to assure effective public health service delivery, nor to identify geographic areas that are underserved by public health professionals.<sup>81</sup> Studies that document the effects of public health workforce size and composition on system performance and outcomes are needed to inform workforce policies and resource allocation decisions for the field of public health.

## Training and Competencies

Training programs for public health workers include degree programs at the bachelor's, master's, and doctoral levels, along with certificate and continuing education programs. Efforts to identify and assess standard sets of competencies for public health professionals have accelerated in recent years, including those developed by the Council on Linkages Between Academia and Public Health Practice, the Council on Education for Public Health, and various professional societies.<sup>82</sup> Competency sets have proliferated in specialized areas of practice such as epidemiology, health education, emergency preparedness, and environmental health. In some cases, these competencies have been integrated into formal certification and credentialing programs for public health professionals.<sup>82,83</sup> Additionally, a variety of workforce training and continuing education programs have been developed for public health workers, including those related to management and

leadership, cultural competency, and public health preparedness.<sup>79</sup>

These workforce development initiatives are relatively new, and their impact on public health service delivery and outcomes has yet to be determined. These programs have the potential to improve workforce skills and productivity, thereby enhancing the overall quality and efficiency of services delivered within public health systems. Such programs may also increase the earning potential and job opportunities for public health workers, possibly making retention more difficult and raising labor costs for public health organizations. Examining these programs and their impact will require expanded empirical research on the public health workforce and on workforce development initiatives.<sup>84</sup>

## Promising Areas for Future Research

This review highlights numerous gaps and uncertainties in the current understanding of how public health services are organized, financed, and delivered in the U.S., and what factors influence the effectiveness and efficiency of these services. The operational complexity of public health agencies and delivery systems makes them inherently difficult to study through traditional research designs and analytic methods, and existing data and metrics for studying public health system performance are limited. The research that does exist focuses largely and appropriately on governmental public health agencies, but it leaves many unanswered questions about nongovernmental roles. Closing the research gaps, therefore, will require innovative and flexible research designs along with rigorous analytic approaches that draw on multiple disciplinary and methodologic perspectives. Several promising areas for future research are identified below that will address key gaps in knowledge that have been uncovered in this review, while also responding to national research priorities regarding public health agencies and systems.<sup>85</sup>

## System Boundaries and Organization

**Impact of consolidation/regionalization.** The size and geographic boundaries of public health systems change substantially when public health agencies undertake consolidation or regionalization initiatives, as many have done in recent years.<sup>86</sup> Detailed longitudinal studies that compare public health service delivery and outcomes both before and after these reforms can help to fill existing gaps in knowledge about the advantages and limitations of system size and boundaries.

**Comparative effectiveness of governance structures.** Governing boards appear to be strongly associated with public health system performance, but very little is known about the mechanisms through which these effects occur and about the specific board powers and

duties that are most influential. Detailed case studies of board composition, structure, and power in representative samples of state and local public health systems are needed to identify the most salient characteristics of boards, so that future comparative studies can determine how these characteristics influence public health service delivery and outcomes.

**Impact of modernizing public health laws.** Empirical studies are needed to describe the range of legal structures currently used for distributing governmental public health powers among state and local agencies and to compare the effectiveness of these structures. New studies are needed to document the effects of recent legal reforms on public health system operations and outcomes.

**Impact of organizational capacity and accreditation.** New empirical research is needed to develop refined indicators of organizational capacity within state and local public health agencies and to assess the impact of recently developed accreditation programs, performance standards, and related efforts designed to improve public health organizational capacity. Because many of these programs rely on voluntary participation and compliance, the research designs used in such studies should examine the possibility of selective uptake and the potential for differential effects on agencies of differing size and structure.

**Nongovernmental contributions and interorganizational relationships.** Alongside the research on governmental public health systems, more evidence is needed on the scope and scale of public health contributions made by private organizations and their relationships with governmental agencies. Studies that compare the many ways in which public health responsibilities are distributed across public and private organizations—and their effects on service quality, costs, and outcomes—are needed. As public health agencies test new approaches for enhancing coordination, reducing duplication, and expanding program reach through multi-organizational alliances and partnerships, research is needed to document the effects of these innovations. Research designs and measurement strategies commonly used in the field of network analysis are likely to be useful for these types of studies.<sup>19–21</sup>

## Financing and Economics

**Comparative effectiveness of alternative financing mechanisms.** New research is needed to examine the impact of existing financing mechanisms and funding formulas for public health services, and to test new approaches. To enable such research, federal and state policymakers must be willing to experiment with alternative financing regimes, much like the current efforts to test new payment methods in Medicare and Medicaid on a demonstration basis.

**Efficiency in public health delivery systems.** New empirical research is needed to develop methods for assessing efficiency in public health practice and for identifying the factors that influence resource use within public health systems.

## Workforce

**Comparative effectiveness of alternative staffing levels and models.** New studies are needed to document the extent of changes in public health workforce size and composition, and to elucidate the causes and consequences of these changes. These recent workforce changes also create opportunities for studying the effects of alternative staffing models employed within state and local public health agencies. Moreover, as new competency-based education, training, and certification programs diffuse across the workforce, well-designed studies are needed to assess the impact of these programs on individual-level worker skills and productivity as well as on system-level performance and outcomes.

## Conclusion

Research on the structure, operation, and impact of public health delivery systems promises to accelerate the production and translation of evidence that can improve policy and administrative decision-making in public health. Although the research needs identified in this review are considerable, they likely address only a fraction of the many important policy questions and administrative uncertainties that public health officials confront daily in practice. Consequently, continued efforts to improve the volume and quality of research on public health systems will be required to address the unmet demand for this evidence.

Expanding the research enterprise on public health systems will require several key developments. First, sustained commitments are needed to build robust data resources that reflect the organizational, financial, and workforce characteristics of public health delivery systems at local, state, and national levels. Data elements that historically have been collected from multiple, episodic surveys of state and local public health agencies need to be standardized and routinely collected to support expanded research on systems. Second, public health agencies, professionals, and others involved in the delivery of public health services need to be engaged more directly in the conceptualization, design, and conduct of research on public health systems. Practitioner engagement promises to enhance the relevance of research and reduce the time required for disseminating and integrating new evidence into practice. Third, researchers from a broad spectrum of social, behavioral, and scientific disciplines must be engaged in applying the methodologic advances from their fields to the study of public health systems,

thereby ensuring improvements in scholarship. If these developments are successful, expanded research on public health systems will strengthen the ability of governmental public health agencies and their private-sector partners to deliver services that protect and promote health. The result will be a continuously improving public health system that assures the conditions necessary for all Americans to enjoy healthier lives.

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