

The Structure and Organization of Local and State Public Health Agencies in the U.S.

A Systematic Review

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Context: This systematic review provides a synthesis of the growing field of public health systems research related to the structure and organization of state and local governmental public health agencies. It includes an overview of research examining the influence of organizational characteristics on public health performance and health status and a summary of the strengths and gaps of the literature to date.

Evidence acquisition: Data were retrieved through an iterative process, beginning with key word searches in three publication databases (PubMed, JSTOR, Web of Science). Gray literature was searched through the use of Google Scholar™. Targeted searches on websites and key authors were also performed. Documents underwent an initial and secondary screening; they were retained if they contained information about local or state public health structure, organization, governance, and financing.

Evidence synthesis: 77 articles met the study criteria. Public health services are delivered by a mix of local, state, and tribal governmental and nongovernmental agencies and delivered through centralized (28%); decentralized (37%); or combined authority (35%). The majority of studies focused on organizational characteristics that are associated with public health performance based on the 10 Essential Public Health Services framework. Population size of jurisdiction served (>50,000); structure of authority (decentralized and mixed); per capita spending at the local level; some partnerships (academic, health services); and leadership of agency directors have been found to be related to public health performance. Fewer studies examined the relationship between organizational characteristics and health outcomes. Improvements in health outcomes are associated with an increase in local health department expenditures, FTEs per capita, and location of health department within local networks.

Conclusions: Public health systems in the U.S. face a number of critical challenges, including limited organizational capacity and financial resources. Evidence on the relationship of public health organization, performance, and health outcomes is limited. Public health systems are difficult to characterize and categorize consistently for cross-jurisdictional studies. Progress has been made toward creating standard terminology. Multi-site studies that include a mix of system types (e.g., centralized, decentralized) and local or state characteristics (e.g., urban, rural) are needed to refine existing categorizations that can be used in examining studies of public health agency performance. (Am J Prev Med 2012;42(5S1):S29–S41) © 2012 American Journal of Preventive Medicine

Context

The public health system in the U.S. is made up of a complex network of people and organizations in the public and private sectors who work with varying degrees of collaboration at national, state, and

local levels to promote and protect the public's health.¹ The public health system includes all governmental and nongovernmental entities that contribute to three core functions: assessment of information on the health of the community; comprehensive policy development; and ensuring that public health services are provided to the community.^{2–4} Responsibility for ensuring conditions that allow people in the U.S. to be as healthy as possible is shared among federal, state, and local governments.⁵

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0749-3797/\$36.00

doi: 10.1016/j.amepre.2012.01.021

Rationale

Governmental public health agencies play a lead role in ensuring the delivery of public health services.^{1,6,7} A

growing number of studies have highlighted the relationship between the structure and organization of public health services and variability in public health practice at the local and state levels. However, public health services and systems research is still relatively new as a field of study. Evidence explaining the pathways that lead to variation in the structure and organization of public health systems and the impact of these differences on performance and health outcomes is limited.

The purpose of the current systematic review is to synthesize what is known about the organization and structure of local and state public health agencies. The review includes literature on organizational characteristics associated with the capacity of governmental public health agencies to deliver public health services, population health outcomes associated with particular organizational structures, and additional research needed to build a stronger evidence base on how to organize public health services.

Evidence Acquisition

Protocol

A systematic search was conducted according to the PRISMA Statement.⁸ The review of literature was performed between September 1 and November 10, 2010. The first phase of the review entailed the development of a research protocol. The protocol entailed the formulation of primary research questions, a search strategy, inclusion criteria, and a strategy for documenting and synthesizing evidence. Three primary research questions were developed that focus on the structure and organization of governmental public health services to guide the search: (1) What descriptive research exists in the U.S., including governance, financing, and geographic coverage? (2) What is known about the relationship between organization and structure of governmental public health agencies and capacity or performance? (3) What is the relationship between the organization and structure of governmental public health agencies and population health outcomes? The search strategy entailed the identification of key words and databases to use in the search.

Eligibility Criteria

Studies and reports were eligible for inclusion if they (1) focused on local or state governmental public health agencies in the U.S.; (2) described the organization and structure of local and state governmental public health agencies; or (3) discussed the capacity or health outcomes associated with the structure and organization of governmental public health agencies. Types of articles reviewed for the study included original studies (cross-sectional and longitudinal); literature reviews; commentaries; and descriptive reports. A fourth eligibility requirement was that the research was conducted and made available for dissemination between January 1990 and September 2010. Research published in books and conference abstracts was not included because of the short timeline available to perform the review (September–November 2010).

Information Sources

The literature review began with a search of three library databases: MEDLINE (via PubMed), Web of Science, and JSTOR. MEDLINE and Web of Science were the primary databases, but JSTOR was used during the initial search to determine if there were additional records found in an arts and sciences database. Once overlap between the databases was confirmed, the search continued through MEDLINE and Web of Science. Given the large number of articles that were found through initial database searches in the *Journal of Public Health Management and Practice*, a manual search was conducted to identify potentially relevant articles published during the inclusion time frame. Key words (noted below) were used in this targeted review.

Gray literature was identified using Google Scholar™ and a search of select websites. Google Scholar was used to identify reports, reviews, and other articles that were not published in journals. Websites searched were primarily those of agencies that funded national studies of local and state public health systems; they included the Association of State and Territorial Health Officials (ASTHO); National Association of County and City Health Officials (NACCHO); and National Association of Local Boards of Health (NALBOH).

Search and Study Selection

Initial key word searches included *public health organization*, *public health structure*, *public health department*, *public health governance*, *public health finance*, and *public health regionalization*. The results of each of these searches yielded thousands of “hits.” The advanced search function in these databases was used to help narrow the search results. Searches were narrowed to studies conducted in the U.S. and available in English.

Initial study selection was performed by screening the abstracts of all documents that were identified using the key words above. Studies were included if there was evidence that the research could address at least one of the main study questions (i.e., description of organization/structure, relationship between organization/structure and capacity or performance, relationship between organization/structure and health outcomes). Papers that did not meet these criteria or were published outside of the inclusion time frame were excluded.

Data Collection

A chart was developed to facilitate data abstraction and review. The chart included several fields, including author name(s); title of article; study type; relevant or important findings; and recommendation for inclusion in the review (yes/no). Information was entered onto the chart after each article was reviewed. Once the key findings from all papers screened in for review were recorded, the data chart was reviewed several times in an effort to organize the data and identify salient themes.

Studies were organized as follows: (1) descriptive studies of local and state public health organization (e.g., agency characteristics, governance, funding, local–state relationship); (2) studies examining the relationship between organization/structure and performance of governmental public health agencies; (3) studies examining the relationship between organization/structure of governmental public health agencies and health outcomes. Descriptive studies were further organized by key topic areas, including agency characteristics, governance, funding, and local–state relationship. The data abstraction sheet was

reviewed to identify emerging themes for each study question. Papers that addressed the key study questions were retained for inclusion.

Evidence Synthesis

Study Selection and Results

Sixty-three articles and papers were identified (Appendix) that provide descriptive or outcome data on the structure and organization of governmental public health agencies (Figure 1). An additional 14 papers were included that provided contextual information or commentary about public health infrastructure in the U.S. (Appendix). The initial key word search used in MEDLINE and Web of Science resulted in the identification of more than 647,000 records. Additional search limits designed to include a focus on the U.S. and local and state governmental public health systems resulted in 2560 records.

After review of study titles and abstracts, 2492 records were excluded because they were not relevant to the study. Examples of excluded studies are those whose main focus is on public health interventions (e.g., HIV, obesity) or primary health care (e.g., organization of or interventions in hospitals or health centers, hospital accreditation). Eighty-six records were identified through the “related literature” feature in PubMed and review of bibliographies of included studies.

These strategies resulted in 154 articles to review in full. After full review, 77 articles were excluded because they did not meet the study criteria. These were related to the eligible topics but were excluded because (1) they provide commentary on local or state public health organization but no empirical data; (2) they are qualitative or descriptive studies about a particular initiative and did not contribute to an overall understanding of local or state public health organization; or (3) the data identified in an unpublished source overlapped or were very similar to data presented in a published article by the same author. Approximately 50% of all articles screened in for

full review were included in the systematic review. The papers represent a mix of types and research designs (Table 1).

A synthesis of data on the governmental public health systems is presented in the next section. First, a summary is presented of descriptive data collected to describe state and local governmental public health agencies in the U.S. Second, a synthesis of research is provided, examining the relationship between the organization and structure of governmental public health agencies and capacity or performance of essential public health services. Third, the data on the relationship between organization and structure of governmental public health and health outcomes are summarized.

Descriptive Studies of the Structure and Organization of Governmental Public Health Agencies

Two primary sources of information about the current structure and organization of governmental public health agencies in the U.S. are the NACCHO National Profile of Local Health Department series^{9,10} and the ASTHO Profile of State Public Health surveys.^{5,10,11} Not only do the data from these national surveys provide a descriptive overview of local and state public health agencies but they were often found to be used in studies examining the relationship between structure or organization and capacity, performance, and/or health outcomes.

The governmental public health system in the U.S. is made up of 51 state (including the District of Columbia), 2794 local, and 565 federally recognized American Indian and Alaska Native tribal public health agencies.¹⁰ The majority of state public health departments (55%) are structured as free-standing or independent agencies within state government, and 45% are located within an “umbrella” or “super agency,” such as DHHS.⁵ Umbrella agencies are often responsible for a variety of health and public health services, including Medicaid, public assistance, long-term care, and state mental health/substance abuse services.⁵

Comparison of state-level survey data between 1991⁴ and 2001^{12,13} indicated a change in the organization of state agencies, with a decreasing number of freestanding public health entities and a trend toward integration of state health agencies into larger agency structures. In 2003, nearly half (44%) of all states were considering, planning, or implementing state health agency restructuring initiatives as a result of fiscal pressures.¹⁴ Bietsch et al.^{13,15} have expressed concerns that the movement toward integration of state public health services into umbrella health and human service agencies may hinder or blunt public health performance. No research was found to confirm or dispute these concerns.

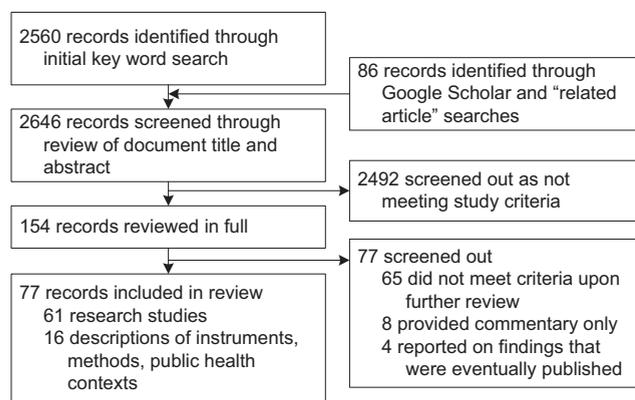


Figure 1. Flow of information through phases of the review

Public health services are delivered at the regional or local level through a variety of organizational structures. These organizational structures likely influence the delivery of essential public health services, but research describing how and why is relatively limited. Data from ASTHO's State Profile Survey, conducted in 2007 and 2008,⁵ indicate that 13 states (28%) and the District of Columbia have a centralized public health service delivery system, meaning that all local public health services are provided by a state public health agency. In these states, local services are typically offered or coordinated through regional state offices of public health. In 19 states (37%), local health services are decentralized, provided by independent local or regional public health departments. Eighteen states (35%) function with some combination of the above arrangements and are often considered hybrid or mixed systems. Finally, 8% of states reported having no local public health agencies at all.

Approximately 43% of all regional/local public health departments in the U.S. serve a population of <25,000, and 64% serve a population of <50,000.¹⁰ The 64% of health departments serving populations of ≤50,000 provide public health services to approximately 12% of the U.S. population. In contrast, 5% of all local health departments serve a population of ≥500,000 and provide services to approximately 46% of the entire U.S. population. About 45% of states report <50 local health departments operating within their borders; 40% report 50–99 local public health agencies; and 14% report >100.⁵ The majority of local public health services are provided through county health departments (60%), followed by city/county health departments (11%); township health departments (11%); multi-county/district/regional health departments (9%); and city health departments (7%).¹⁰

The NACCHO profile surveys have repeatedly demonstrated that the majority of local health departments have a relatively small reach with respect to population size. The number and location of public health jurisdictions

has changed very little during the past 30 years despite several efforts to reduce the number of public health jurisdictions across the country.^{4,7,16} Numerous commentaries on local public health systems have highlighted the challenges that health departments serving smaller populations face in providing the full spectrum of public health services and activities to promote and protect the public's health.^{7,13,17–23}

Governance and authority characteristics. Governance of state and local public health authorities varies across the U.S. State public health agencies play a critical role in supporting public health service delivery.^{5,24,25} They are often primary health authorities within states, responsible for policy making, priority setting, data collection and analysis, financing, and oversight of local public health activities.^{5,13,14,26} Approximately 60% of all state public health departments are governed by a board or council of health. These boards and councils most often promulgate rules (65.4%); advise elected officials on public health policies and concerns (50%); develop state public health policies (38.5%); and develop legislative public health agendas (23.1%).^{5,13} State boards of health and health councils are typically gubernatorial appointees and consist of a mix of public health professionals (80.8%); citizens (69.2%); consumers (53.8%); business professionals (42.3%); and educators (19.2%).¹³

Table 1. Study characteristics

Study design/article type	% (n)	Description
Cross-sectional	47 (36)	62% of cross-sectional studies focused on local public health infrastructure; 38%, on state infrastructure. Most examined infrastructure in relation to performance and/or financing.
Longitudinal	10 (8)	All longitudinal studies utilized NACCHO's Local Public Health Profile Survey in multiple years to examine changes in infrastructure, performance, and/or financing.
Descriptive/case studies	13 (10)	Descriptive studies of local or state public health systems, including partnerships and organization
Policy/commentary	13 (10)	Articles called attention to the need for improvements and investment in local and state public health systems.
Reviews of literature	9 (7)	Reviews focused on public health infrastructure and services, partnerships, and financing.
Methodologic	8 (6)	Tools or studies reporting on strategies for measuring public health performance and measuring public health financing
Total	100 (77)	

NAACHO, National Association of County and City Health Officials

In addition to boards of health and health councils, state public health agencies are strongly influenced by their elected officials. In more than 80% of the states, legislatures approve the state public health agency budget, pass public health laws and regulations, determine fees for health services, and establish taxes in support of public health.⁵ The governor in most states (68%) has authority to hire or appoint the State Health Official, who is responsible for the day-to-day activities of the agency, policy setting, and keeping the legislature informed of public health matters, among many other activities.¹³

The majority (80%) of local public health agencies in the U.S. are also governed by boards of health. However, states with centralized organizational structures are less likely to have local boards of health compared with their decentralized or mixed-structure counterparts (22.2% vs 87.1%, $p < 0.001$).¹² Local boards of health are typically described as playing a policy-making (54%) or advisory-only (46%) role, with less-populous states more likely to have policy-making boards.¹² Like state boards of health, local boards of health include a diverse cross-section of the populations they serve (e.g., public health professionals, citizens, consumers, business people). In nearly three quarters (71%) of states, local board of health members are appointees of local government and in 7% of states they are elected officials. A small number of states also have a combination of elected and appointed board of health members.^{4,12} States with local boards of health are more likely to fulfill public health responsibilities at the local level than states without them.¹²

Financing public health services. In a recent assessment of public health funding in the U.S., Beitsch et al.¹⁵ found that the spending on state and local public health agencies averaged \$149 per person, representing <2.5% of all U.S. healthcare spending in 2004 and 2005. State and local public health agencies are funded through a mix of federal, state, local, and private dollars.^{5,10,26–29} Sources and combinations of these funding sources vary by state, and often within states. In 2008, the average state public health agency reported receiving roughly 50% of its funding from federal grants, contracts, and cooperative agreements; 24% from state general funds; and 26% from other sources, such as Medicare or Medicaid reimbursements, fees, and fines for public health services and other sources.⁵ The proportion of funds from each source varies, with some state health agencies receiving up to 83% of funding from federal sources, whereas other states have up to 56% of funding from their general funds or other state sources.

Funding for local public health services comes from local and state contributions, federal pass-through funds, Medicaid/Medicare reimbursements, and other grants

and fee sources.^{30,31} In 2007, the greatest proportion of funds for local public health came from local contributions (25%), followed by state contributions (20%); federal pass-through funding (17%); Medicaid and Medicare reimbursements (15%); and fees (11%).¹⁰ The proportion of local public health funding coming from local contributions is relatively similar across all jurisdictional population sizes. However, local health departments serving smaller populations (<50,000) are more likely to have a greater portion of their budgets come from Medicaid/Medicare reimbursements. Local health departments that are units of local government are also more likely to obtain a higher percentage of their funding from local government (29%) than local health departments that are units of state departments of public health (12%).¹⁰

A small number of studies^{27,32–34} have examined how financial resources within local and state public health agencies are used. In these studies, the vast majority of financial resources were dedicated to the provision of individual services to patients and clients rather than population-based health services or programs. For example, Atchison and colleagues³² found a range of personal health services spending as a percentage of state public health budgets, ranging from 53% in Washington to 77% in New York, and 73% in Maryland (local–state budgets combined). In Florida, Brooks et al.³³ found that 68.7% of public health funding goes toward individual public health services. These findings run against the grain of current efforts to focus public health service delivery on population-health outcomes. A better understanding is needed of what factors drive decisions about how public health funds are used if strategic shifts in the focus of public health funding and service delivery are to be achieved.³⁵

Several studies^{29,36–38} highlighted the vast disparities in per capita spending for local public health services by population size and geographic location. In a longitudinal analysis of NACCHO Local Public Health Survey data from 1993, 1997, and 2005, Mays and Smith²⁸ found that the median spending on local public health services increased <1% between 1993 and 2005 (\$26.26–\$29.57). Local jurisdictions in the lowest 20% of public health spending averaged less than \$8 per capita in 2005 compared to \$102 per capita among jurisdictions in the top 20%. Jurisdictions in the top 20% of spending were more likely to provide a broader array of prevention, population-based, and medical treatment services ($p < 0.05$) and receive a higher share of revenue from clinical service reimbursements (e.g., Medicare, Medicaid) ($p < 0.05$) and smaller shares from local government sources ($p < 0.05$). They are also likely to operate as decentralized units of government ($p < 0.05$).

In a multivariate analysis of public health spending patterns, Mays and Smith found that local public health agencies governed by a board of health spent at least 14% more on local public health services than those without such boards ($p < 0.001$).²⁸ Decentralized local public health agencies spent an average of 25% more than those operating under a centralized state authority. The observed differences in agency structural characteristics and service mix was able to explain only one third of the variation in public health spending.²⁸ More detailed data on sources of public health funding and expenditures are needed to build an evidence base around the appropriate level and mix of funds to support robust public health systems.^{28,37,39}

Descriptive typologies of public health agencies. Variation in the size, governance, organizational control, populations served, and sources and levels of financing among local public health departments in the U.S. challenges public health systems researchers in their efforts to develop an evidence base for public health infrastructure. In an attempt to find commonality across public health jurisdictions, Mays et al.⁴⁰ identified seven distinct public health configuration types among jurisdictions serving populations of $\geq 100,000$. The typologies emerged from analysis of a longitudinal database created from the NACCHO profile surveys of 1998 and 2006.

Adapting attributes that have been applied to multi-organizational health delivery systems,⁴¹ the authors suggest that public health delivery systems may be described by three main attributes: differentiation, integration, and centrality. Differentiation describes the breadth of programs and services that are delivered through the public health system. Integration is defined as the degree to which public health services are provided through organizational partners. Finally, centrality refers to the concentration or distribution of authority over public health responsibilities. Seven typologies were identified, anchored by the concept of differentiation (highly, moderately, and limited) and further described by the degree of integration and concentration of service delivery. The authors suggest that highly differentiated public health systems may be preferred to other models as they tended to provide more comprehensive services within jurisdictions. However, comparative research is needed to build evidence in this area.⁴⁰

Associations Among Public Health Structure, Organization, and Performance

The release of the IOM’s 1988 *Future of Public Health* report had an important influence on research, policy, and advocacy around public health systems at all levels of government.⁴² The report called for the development of a

clear definition and mission of public health, which led to the development of the 10 Essential Public Health Services (EPHS) framework in 1994 (Table 2). Turnock⁴³ and Miller⁴⁴ catalyzed research on public health performance using the 10 EPHS framework. Today there are several nationally recognized instruments^{3,9,45} that have been tested and increasingly used as methods for measuring the performance of local and state health agencies. The development of performance standards and associated tools to measure them are critical for systematically assessing the strengths and gaps in public health systems and monitoring progress toward improvement efforts.

Twenty research articles and one review article^{20,25,29,35,36,38,43,46-60,61} were identified that provided insights into the relationship between governmental public health structure and organization and capacity to provide the 10 EPHS. Similar to what Erwin⁶¹ found in his review of research on local public health performance, the majority of studies utilized either the National Performance Standards surveys or investigator-developed surveys of performance, both of which are based on the 10 EPHS framework. Although measures of performance were generally based on the same framework, the indicators for each essential service and/or the number of indicators used to measure performance varied across studies.

Table 2. 10 Essential Public Health Services Framework

Essential services provide a working definition of public health and a guiding framework for the responsibilities of local public health systems.
1. Monitor health status to identify and solve community health problems.
2. Diagnose and investigate health problems and health hazards in the community.
3. Inform, educate, and empower people about health issues.
4. Mobilize community partnerships and action to identify and solve health problems.
5. Develop policies and plans that support individual and community health efforts.
6. Enforce laws and regulations that protect health and ensure safety.
7. Link people to needed personal health services and ensure the provision of health care when otherwise unavailable.
8. Ensure competent public and personal healthcare workforce.
9. Evaluate effectiveness, accessibility, and quality of personal and population-based health services.
10. Research for new insights and innovative solutions to health problems.

Predictors of performance. Despite the variation in measurement across studies conducted to date, the strongest predictor of performance in multiple studies^{36,47,50,52,53,57,58,62–64} is the size of the jurisdiction served by a public health agency. Jurisdictional size associated with improved performance did vary across studies, with some finding that significant improvements were found in jurisdictions of $\geq 50,000$ ^{56,62,64} and others among health departments serving populations of $\geq 100,000$.⁵³ Most studies,^{36,47,50,52,57,58,63} however, did not report specific population thresholds, but rather reported that larger jurisdictions performed better than smaller ones. In their examination of the correlates of local public health performance, Mays and colleagues³⁶ also found that population size was a positive predictor of performance for populations up to 500,000, at which time performance began to decrease. At least one study⁴⁹ found no relation between population size and performance.

Staffing patterns and characteristics were also found to be associated in several studies with overall performance. Local health departments with larger numbers of staff in comparison to the means of their respective study samples and higher staff per population served performed better on most essential public health services.^{47,49–52} Although leadership is often considered to be an important contributor to public health performance, findings across studies were inconsistent with respect to the educational background of local health directors. For example, Scutchfield et al.,⁵⁵ in a regression analysis that included capacity and population variables, found that a public health director with a master's or bachelor's degree and training in public health was one of the strongest predictors of performance for at least six of the ten EPHS. Having a woman as the health director⁴⁹ and having a director with a nursing degree¹⁷ have also been positively associated with performance on at least five of the ten EPHS. In one state, the presence of a diverse (not all trained in public health) and experienced staff was also positively associated with performance.⁴⁸

Relatively few studies have examined the relationship between organizational control and public health system performance. Richards et al.⁵³ and Suen et al.⁶⁴ found that local health departments whose organizational control was centralized had higher mean percentage performance of practices when compared to health departments with decentralized or mixed structures ($p < 0.05$). Others^{36,65} found higher performance to be associated with mixed or hybrid organizational structures. Some studies also found no relationship or inconclusive evidence on the association between organizational control and performance.

A small number of studies examined the relationship between boards of health and performance of EPHS. Studies by Scutchfield et al.,⁵⁵ Mays et al.,³⁶ and Bhandari et al.¹⁷ found that the jurisdictions governed by a local board of health with policy-making authority is positively associated with performance of some EPHS. However, Bhandari et al.¹⁷ found that this relationship may not hold true for smaller jurisdictions with populations of $\leq 100,000$.

Several studies have also examined the performance of public health agencies in relation to funding resources and types. In a single-state study, Honoré and colleagues⁶⁶ found that per capita taxes within jurisdictions were significant ($p < 0.05$) in six of the ten EPHS. Higher-performing jurisdictions averaged 38% greater taxes per capita than lower-performing systems (\$9.60 vs \$6.96). At the local level, Mays et al.²⁹ found local public health agency spending to be a modest predictor of performance for nine of the ten EPHS. Substantial increases in local government expenditures (approximately \$10 per capita)²⁹ and large increases in per capita spending^{25,54,64} are associated with better performance and increased service provision. Similarly, expenditures as a ratio of FTEs has also been associated with local public health performance.⁵⁵ At least two studies^{17,33} found no to little relationship between the level of state and local funding for public health services and performance at the local level.

A small body of research is also beginning to look at the relationship between public health performance of the types and numbers of partners contributing to service delivery. Scutchfield et al.⁵⁵ found partnerships with universities and businesses to be associated with improved performance. Halverson and colleagues⁴⁶ found that overall public health performance is significantly related to the extent of participation of outside agencies in the planning and provision of public health services. However, there is still need for evidence that the mobilization of partnerships to build public health systems capacity improves population health status.⁶⁷

Relationship Between Public Health Organization and Health Outcomes

Demonstrating the relationship between local health department infrastructure, performance, and health outcomes is a critical area in need of research. A small number of studies^{38,54,68} test the conceptual model put forth by Handler, Issel, and Turnock to explain the relationship between public health and community health status.⁶⁹ The model posits that an increase in inputs (finances, staffing, partnerships) leads to enhanced capacity to provide the essential public health services, which increases performance and ultimately improves community

health. Very few studies were found that fully test the model or provide evidence that the model is accurate.

Erwin et al.³⁸ examined the extent to which changes in local health inputs are associated with changes in seven health measures (smoking and obesity prevalence; infectious disease morbidity; infant mortality; mortality from cardiovascular disease [CVD]; and cancer). They found that an increase in expenditures per capita was associated with a decrease in infectious diseases ($p=0.037$). For each 10% increase in expenditures per capita, infectious disease morbidity declined by 1.82%. An increase in FTEs per capita was also associated with a decrease in CVD mortality ($p=0.014$). For each 10% increase in FTEs per capita, CVD mortality declined by 0.65%. These findings are consistent with cross-sectional studies reviewed earlier that demonstrate associations between local public health expenditures and system performance.

Kanarek et al.⁶⁸ and Richards et al.⁵³ also found positive associations between county health status and local public health performance. Both used cross-sectional research designs. Kanarek found that local public health performance predicted county health status for most health outcomes examined (e.g., colon cancer, lung cancer, coronary heart disease, motor vehicle accidents, homicide). However, both argue that public health interventions vary by disease type of health concern. Different capacities (e.g., enforcement of laws, data-driven decision making, use of evidence-based practices) are likely needed to effectively achieve a broad range of positive health outcomes.

Finally, Wholey and colleagues⁷⁰ conducted a network analysis study in rural communities to examine the relationship between public health system network density and organizational centrality, public health governance, community size, and health status in two domains (adolescent health and senior health). Network structure appears to be connected to health status outcomes, but no consistent directional relationship was found between the two domain studies. Contextual factors and causal processes likely influence the structure and impact of social networks. A better understanding of public health networks and their impact on performance and health outcomes is needed.^{67,70–72}

Risk of Bias in Studies and Study Limitations

There are some common risks and limitations of the studies reviewed for this study. First, approximately half of all cross-sectional and all but one longitudinal study relied on national profile surveys conducted by NACCHO, ASTHO or the CDC to assess the relationship between public health infrastructure and performance. Although these data sets have been important for advancing

the field of public health services and systems research, they have some biases.

Several authors utilizing the data sets have acknowledged that not all local or state health departments participate in the surveys; smaller health departments with more-limited capacity are less likely to participate than those with greater capacity. Exclusion of public health departments with less capacity may result in an overestimation of capacity, resources, and/or performance in studies that use these data sets. This risk is speculative, as a thorough assessment of the characteristics of health departments included in each of the profile studies was not conducted for this review.

Second, there are limits on creating a true synthesis of the findings from research studies conducted over the past 2 decades. Primary outcomes of interest, whether they be performance or health measures, were typically not defined or measured in the same way. This lack of consistency poses methodologic challenges when comparing findings across studies. For this reason, common themes across studies were presented rather than a meta-analysis of cross-study findings.

A third risk of bias in the current review is the reliance on research largely published in professional journals. Research disseminated in books and in conference proceedings was not reviewed given the limited time available. A search was conducted for research findings disseminated in the gray literature. However, the authors cannot be certain of the thoroughness of the search, as it is likely that not all unpublished studies focusing on public health infrastructure are available online.

Several other limitations are important to note. A protocol to guide decision making was established in advance of the study implementation, but only one of the authors reviewed and coded the findings. To help ensure that a thorough search for literature was conducted, results of searches were compared to those at the University of Kentucky's Public Health Services and Systems Research library to identify research studies that may have been overlooked. To reduce the risk of bias in the review and selection of data to report, key findings were reviewed and discussed with leaders in the field of public health services and systems research at the University of Kentucky.

Discussion

The IOM's 1988 report on the state of public health in the U.S. sparked a flurry of strategic planning, research, and advocacy on the critical, yet fragile, infrastructure that is in place to protect and promote the health and well-being of the public. National profile surveys supported by the CDC, ASTHO, and NACCHO have provided descriptive data about local and state governmental public health

infrastructure. A growing body of research focusing on the relationship between public health infrastructure and capacity to provide ten EPHS has helped to identify structural and organizational changes that can improve performance of local and state health agencies. As standardized instruments to measure public health capacity and performance become institutionalized, understanding of the relationship between infrastructure and capacity or performance across geographic settings and system types will likely improve.

The findings from this review suggest that the relationship between organizational structure and performance and health outcomes is complex. One of the strongest findings across studies is the relationship between greater population size served by a governmental public health agency and increased capacity to provide 10 EPHS. The consistent link between population size and performance may support advocacy efforts to change public health infrastructures, as disparities in local and state public health service provision and performance is often attributed to the sheer number of small public health agencies.^{10,21}

The challenges of creating an effective and strong public health system are many given the array of local public health organization types—counties, cities, towns, county-city, multi-county, regional—nested within a three-level system of federal, state, and local governments. The fragmentation of structure contributes to inefficiencies in performance of core public health functions, such as population health monitoring, community health planning, and administration of public health services, such as financial management, staff supervision, and grant writing. Since as early as the mid-1940s, there have been calls in the published literature for consolidation of local public health agencies, or at the least, improved regional cooperation across jurisdictions.^{21,28,73} Although many suggest that regional cooperation will improve public health capacity and performance, research currently available to assess this organizational strategy is limited.

There is also relatively strong evidence suggesting that public health expenditures and per capita funding is positively associated with performance. However, public health financing is another area in need of focus for the sustainability and improvement of public health systems.³⁴ Obtaining accurate information about the sources of public health funding and expenditures has been noted by many researchers as a challenge and area for future work.^{33,39,74,75} Challenges of measuring expenditures for public health activity include a lack of agreement on the definition of what kinds of activities constitute public health services and data on state and local government expenditures for public health activities.^{75,76} A strategy for consistently determining how much is be-

ing spent on public health activities and what services are purchased through these expenditures is needed.

Evidence of the influence of other structural characteristics, such as type of organizational control (centralized, decentralized, mixed); leadership; jurisdiction; and partnership on performance or health outcomes was mixed. Inconsistencies in how these and other structural and organizational characteristics are measured may underlie disparate findings on their contribution to performance and health outcomes. Developing common definitions and measurement strategies will help improve cross-study comparisons of future public health services and systems studies.

Given the large number of state and local health departments in the U.S. serving small and rural populations, there is also a surprising lack of research on best practices or organizational strategies to improve public health performance in these jurisdictions. In national studies^{17,20,25,28} examining capacity and performance of local health departments, small and rural health departments were often found to provide fewer EPHS or other public health services. Small and rural health departments face a number of crucial challenges in accessing federal resources for local prevention work, including inadequate funding to distribute evenly across localities to support comprehensive services, lack of infrastructure to compete for grants, and geographic isolation, which leads to increases on costs for promotion and participation in programs.^{18,31,77} However, studies^{37,47,48,50,70} conducted within single states or across a limited number of states found variability in capacity and performance across jurisdictions when controlling for population of jurisdiction served. Given the challenges of making major changes to the public health infrastructure, more research on best practices for local and rural public health departments may be useful to inform improvements in the short term.

One of the most notable gaps in the literature is studies that examine the relationship of organizational structure and performance with health status or outcomes. The prevalent assumption is that better public health performance is associated with better health outcomes. However, demonstrating a clear link between the two is complicated by a host of organizational, contextual, economic, political, and sociocultural factors. Future research will need to focus on identifying and developing measurements for these contextual factors for use in services and systems studies. Local and state public health systems need evidence that investments and new organizational strategies or changes will improve population health.

Conclusion

The data reviewed for this study indicate that success in bringing about major infrastructure changes since the release of the IOM's 1988 report on *The Future of Public Health* has been limited.^{1,7} Improvements have been made on some fronts: there is widespread consensus on the three core functions of public health, a national framework for organizing public health services, and measures of performance that are ready for widespread implementation. The public health system still lacks a sound, consistent infrastructure and faces a number of critical challenges, including disparate and often limited financial resources, organizational inefficiencies, and varied capacity to meet core performance goals.

Public health services and systems research is needed to help inform understanding of what organizational characteristics and structures make a difference in public health performance and health outcomes. Data regarding key capabilities and organizational structures within different contexts (e.g., urban, suburban, and rural and governance structure) that are associated with performance and health outcomes will help policymakers and public health professionals set priorities, decide where to channel limited resources, and support local and state efforts to increase the equity, efficiency, and delivery of public health services in the U.S.

Publication of this article was supported by a grant from the Robert Wood Johnson Foundation.

The authors acknowledge Dr. F. Douglas Scutchfield, Dr. Richard Ingram, and Alex F. Howard from the Center for Public Health Services and Systems Research at the University of Kentucky for their support and feedback on earlier versions of this article.

During the period of this review, SMS served on the advisory board to the California Department of Public Health.

No financial disclosures were reported by the authors of this paper.

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Appendix: Full List of Studies in the Review

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