Environmental Health Systems and Delivery of Services in the United States and Its Territories

Reem Tariq, MSEH
National Environmental Health Association

Diana Jaramillo, MPH
Center for Health, Work, & Environment, Colorado School of Public Health

David T. Dyjack, DrPH, CIH
National Environmental Health Association

Abstract **There is no single, uniform nationwide method for organizing and delivering governmental environmental health (EH) services to residents of the U.S. and its territories. A comprehensive effort to describe existing EH service delivery models has not been conducted. To address this gap in knowledge, the authors investigated EH organization and delivery methods among states and territories in fall 2017. The aim was to provide a synthesized understanding of EH system delivery to assist in efforts to target and deliver workforce capacity building and professional development support. We contacted EH directors of every state and territory through an informational survey to 1) describe how services are delivered, 2) quantify service delivery jurisdictions, and 3) determine the administrative home of core EH programs. We achieved a 98% survey rate response. Service delivery administrative models were heterogeneous and fell into three categories: centralized, decentralized, and mixed/shared organization. The number of jurisdictions within states and territories ranged from 1–351 jurisdictions. The administrative agency home of EH varied widely. With this research, we hope to better understand the structure of each regional agency and the efficacy of each agency's performance as it relates to its structure and distribution.**

Introduction

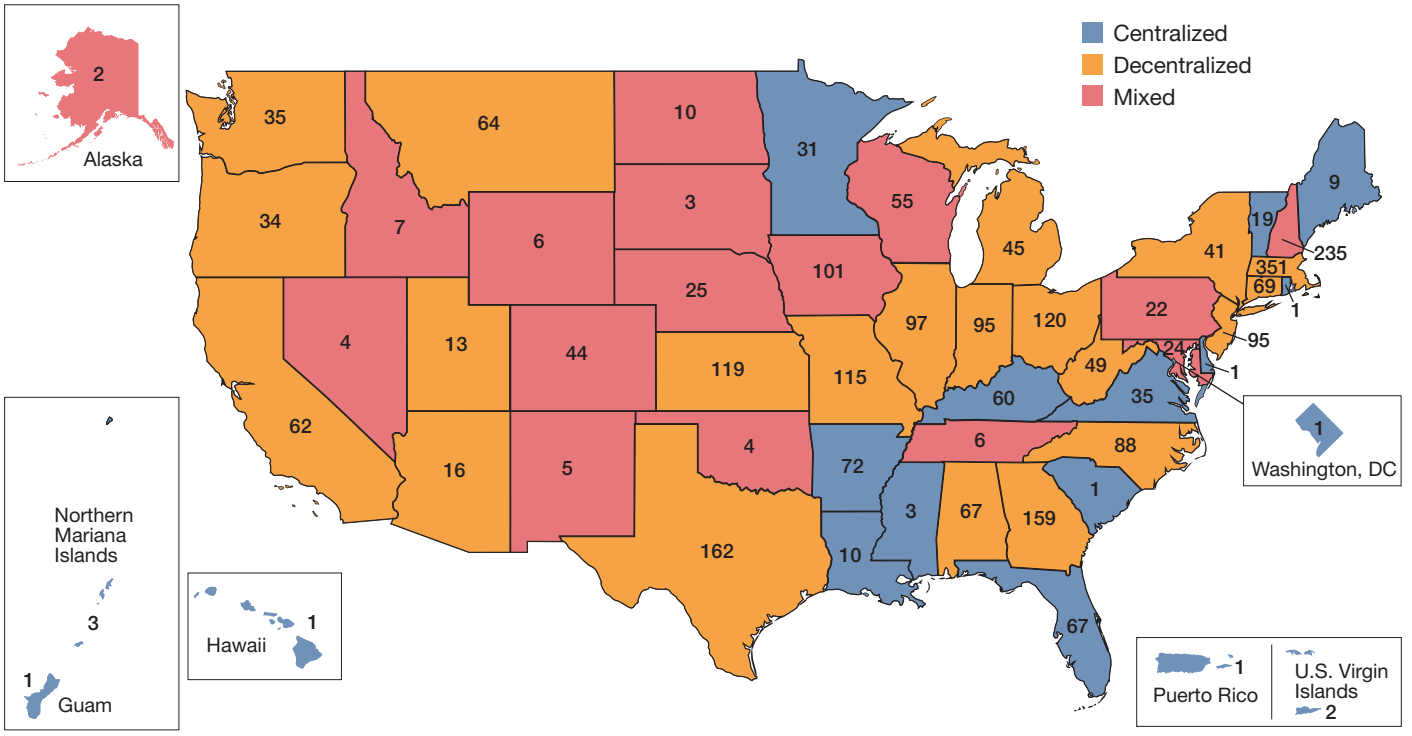
One of the greatest challenges facing U.S. policy makers today is that of the impending reformation of systems and entities that protect the nation's health (Mays, Scutchfield, Bhandari, & Smith, 2010). To be effective, such a reform needs to reassess the delivery of the foundational public health services to ensure that quality services are being made available to the population (Halverson et al., 1996; Sarisky & Gerding, 2011). Such an assessment requires an understanding of how public health systems are organized and delivered to the population.

In the U.S., there is no single uniform nationwide method for organizing and delivering governmental public health services to residents (Mays et al., 2006). The different organizational patterns tend to represent the varying functional and administrative relationship between state and local health departments (LHD) (Meit et al., 2012). The most frequently observed organizational patterns of public health agencies are centralized, decentralized, and mixed/shared (referred to here simply as mixed). Centralized systems are defined as public health systems where the state/territory agency retains much of the power and authority to issue public health orders, make budgetary decisions, and recruit personnel (Association of State and Territorial Health Officials [ASTHO], 2012). In decentralized systems, the converse is true in that local governments retain much of the authoritative power, often referred to as "home rule." In the context of environmental health (EH) services, mixed models are those in which EH units are organized and led centrally, yet at the same time some programs and services in some areas are managed and delivered through local governance (ASTHO, 2011).

Many studies have examined the governance, administration, and delivery of public health services, but no study, to the best of our knowledge, has exclusively surveyed the governance and administration of EH services across the U.S. and its territories (ASHTO, 2012; Mays, Halverson, Baker, Stevens, & Vann, 2004; Meit et al., 2012). EH services are a critical component of the foundational public health services that work toward protecting and promoting a healthful environment for all (Banerjee, Gerding, & Sarisky, 2018).

FIGURE **1**

Governance Structure of Environmental Health Services for the United States and Its Territories



Note. Numerals represent the number of environmental health jurisdictions within that state/territory.

The Centers for Disease Control and Prevention (2003) issued a document titled *A National Strategy to Revitalize Environmental Health Services* that argued for a renewal of EH services predicated on the following: 1) several diseases that are influenced by environmental factors are increasingly affecting the lives of people in the U.S. at a significant cost, 2) emerging threats to environmental public health require innovative interventions and solutions, 3) the role of EH professionals is extremely relevant in emergency and disaster preparedness, and 4) EH service issues are becoming more complex. These reasons continue to be relevant. Such a revitalization calls for a need to understand the structure and organization of EH services. Likewise, investigating environmental public health systems across the nation from a systems approach is critical to ascertain the effectiveness and efficiency of EH programs (Mays et al., 2004). To carry out such a comprehensive investigation, however, it is necessary to understand how EH services are administered and delivered nationwide.

Researchers who have studied the delivery of EH services have observed that EH is dominated by profoundly local challenges and frequently shaped by local politics. Furthermore, EH services are somewhat unique in that they generate revenue through permitting, licensing, and other fees (Dyjack, Case, Marlow, Soret, & Montgomery, 2007). Furthermore, the distinction in delivery patterns is also reflective of the state's governance structure and the administrative relationship between state and local levels (Meit et al., 2012). EH services are often grouped with other public health services depending on multiple factors such as administrative structure, governance, workforce, and size and area of the jurisdiction (Banerjee et al., 2018). Local EH practitioners constitute one of the largest professional fractions of the U.S. professional governmental public health workforce, second only to nursing (Murphy & Neistadt, 2009). Given this information, it is useful to compare the difference in delivery patterns between public health services and EH services.

Public health services and EH services are provided through an effective partnership and collaboration of several governmental agencies and private organizations (Mays et al., 2006). Despite their distinct missions, resources, and operations, these organizations work together to create a complex public health system that is orchestrated through the collaborative actions of many independent institutions (Mays et al., 2006). Within the EH sector, it is important to identify which government agencies and private organizations play a defining role in the delivery of services that collectively influence availability and effectiveness of EH programs across the nation.

This study was conducted to gain a preliminary understanding of the organization and delivery methods of EH services for each individual state and territory to provide a synthesized understanding of EH systems in the U.S. We hope that by describing and comparing the range of health agencies in the U.S., this study will provide the groundwork for answering questions about how U.S. public health agencies can better provide environmental public health services for their communities and residents.

Methods

The study aimed to investigate the organization and delivery methods of EH services among each individual state and territory to provide a synthesized understanding of EH systems in the U.S. The study was performed by collecting qualitative and quantitative data from EH directors of every state and territory in the form of an information survey that inquired about the methods of delivery, distribution of jurisdictions, and administrative agency home of each state and territory.

Data were collected by the National Environmental Health Association (NEHA) in September–December 2017. A short survey/questionnaire was designed to gather input that focused on the 1) categorization of the administration of EH services, 2) number of EH jurisdictions within a state or territory, and 3) major administrative home for the core EH services within a state or territory. With regards to the first query, the respondents were given three options to categorize the EH services within their state, which were decentralized, centralized, and mixed. The survey grouped mixed and shared models together, and the directors and affiliates were not asked to make a distinction between the two models. The remaining questions were open-ended.

This self-administered questionnaire was sent via an e-mail to 56 individuals representing all states and territories, which included 38 NEHA affiliates, 17 EH directors, and 1 EH representative from American Samoa. Electronic messages and phone reminders were provided to EH directors and affiliate presidents until feedback was received from a majority of states and territories. We then aggregated and analyzed the collective feedback from the respondents.

Results

Of the contacted individuals, 98% (n = 55) responded to the questionnaire. Responses were not received from one U.S. territory (American Samoa). All health service delivery methods are described here with comments on individual and overall patterns.

TABLE **1**

States That Have Adopted Different Models of Governance for Public Health and Environmental Health Services

State	Organization of Environmental Health Services[a]	Organization of Public Health Services[b]
Alabama	Decentralized	Centralized
Colorado	Mixed	Decentralized
Florida	Centralized	Mixed
Georgia	Decentralized	Mixed
Idaho	Mixed	Decentralized
Iowa	Mixed	Decentralized
Kentucky	Centralized	Mixed
Minnesota	Centralized	Decentralized
Nebraska	Mixed	Decentralized
Nevada	Mixed	Decentralized
New Hampshire	Mixed	Centralized
New Mexico	Mixed	Centralized
North Dakota	Mixed	Decentralized
South Dakota	Mixed	Centralized
Wyoming	Mixed	Decentralized

[a]Results from the National Environmental Health Association survey.
[b]Results from the Association of State and Territorial Health Officials report (2012).

Governance Structure and Typology

States and territories differ in organizational structure by centralized, decentralized and mixed organizational methods. Figure 1 presents which states and territories have a governance structure of centralized, decentralized, and mixed with regard to the delivery of EH services within the state/territory. We found that 12 states and 5 territories have centralized governance structure, 21 states have a decentralized governance structure, and 17 states operate under a mixed model of governance.

Furthermore, the characterization of the governance and administration of EH services were compared with that of public health services. Under the guidance of the Association of State and Territorial Health Officials (ASTHO) and the National Association of County and City Health Officers (NACCHO), the National Opinion Research Center (NORC) at the University of Chicago conducted a comprehensive study that characterized the governance and administration of public health services in the U.S. (ASTHO, 2011). The results of our study were compared with the data from the ASTHO (2012) study. Upon comparing the characterization of EH and public health services, we found that 15 out of 50 states were characterized differently in terms of the model of governance. Table 1 lists the states that have adopted different models of governance for public health and EH services.

Environmental Health Jurisdictions

Figure 1 presents how many EH jurisdictions are reported in each state and territory. In sum, the number of jurisdictions within all state agencies ranged from 1–351. We found Massachusetts to have the largest number of EH jurisdictions. Besides Massachusetts, the following states were identified as having >100 EH jurisdictions: Georgia, Iowa, Kansas, Missouri, Ohio, New Hampshire, and Texas. On the other hand, the states and territories with the few-

TABLE **2**

Major Administrative Agencies of Core Environmental Health Services in Each State and Territory

State/Territory	Major Administrative Agency of Core Environmental Health Services
Alabama	Alabama Department of Public Health, Bureau of Environmental Services
Alaska	Alaska Department of Environmental Health, Division of Air Quality, Division of Environmental Health, Division of Water
Arizona	Arizona Department of Health Services Arizona Department of Environmental Quality
Arkansas	Arkansas Department of Health
California	California Department of Public Health California Environmental Protection Agency
Colorado	Colorado Department of Public Health and Environment Local public health agencies
Connecticut	Connecticut State Department of Public Health
Delaware	Delaware Department of Health and Social Services, Division of Public Health, Health Systems Protection
District of Columbia	DC Department of Health DC Department of Energy and Environment
Florida	Florida Department of Health
Georgia	Georgia Department of Public Health
Guam	Guam Department of Public Health and Social Services
Hawaii	Hawaii State Department of Health
Idaho	Idaho Department of Health and Welfare Idaho Department of Environmental Quality Idaho's seven health districts
Illinois	Illinois Department of Public Health
Indiana	Indiana State Department of Health Indiana Department of Environmental Management
Iowa	Iowa Department of Public Health Iowa Department of Natural Resources Iowa Department of Inspections and Appeals
Kansas	Kansas Department of Health and Environment
Kentucky	Kentucky Department for Public Health Kentucky Department for Environmental Protection
Louisiana	Louisiana Department of Health
Maine	Maine Department of Health and Human Services
Maryland	Maryland Department of Health Maryland Department of the Environment
Massachusetts	Massachusetts Department of Public Health
Michigan	Michigan Department of Health and Human Services
Minnesota	Minnesota Department of Health
Mississippi	Mississippi Department of Health
Missouri	Missouri Department of Health and Senior Services

continued on page 26

est EH jurisdictions were Delaware, District of Columbia, Guam, Hawaii, Rhode Island, and South Carolina. Each of these states/territories has only one EH jurisdiction that administers EH services. We categorized the number of EH jurisdictions in Pennsylvania as uncertain based on the EH director's response.

The survey also asked for the major administrative agency home of core EH services in each state (Table 2). In some cases, respondents identified more than one major administrative home of core EH services. Examples of more than one administrative home include Kentucky, Maryland, Montana, and Nebraska. Most often the administrative hubs of EH services were identified as the state's department of health/public health/health and human services, followed by the department of environmental quality or department of agriculture.

Discussion

This study was conducted to better understand how EH services are constructed and delivered throughout the U.S. and its territories based on their governance typology, administrative dominance, and quantitative extent of EH jurisdictions and independent programs. The outcome is an enriched strategy in support of workforce capacity building, improved situational awareness in times of disease outbreak, and enhanced approaches to national information dissemination.

Governance Structure and Typology

This survey found that 12 states and 5 territories have a centralized governance structure, 21 states have a decentralized governance structure, and 17 states operate under a mixed model of governance. The authors did not, however, attempt to describe intracategory variation in the centralized, decentralized, and mixed models. The e-mail with the survey link did encourage respondents to ask questions in case of typological confusion. Otherwise, it was up to the respondent to interpret these terms to classify the governance structure and typology within their respective states. It is evident that there is little common understanding of the classifications, which can lead to ambiguity (ASTHO, 2011, 2012; Meit et al., 2012). There is ample evidence of this ambiguity in the 2012 ASTHO study, which performed a literature review to compare the typological classification of states regarding the governance of public health services. Of the seven peer-

reviewed articles that were reviewed in that study, only eight states had the same typological classification (ASTHO, 2012). Additional research is required to develop an effective survey instrument that minimizes ambiguity to aid in the appropriate classification of governance typology with regard to EH systems and delivery.

It should be noted that some of the responses indicated that several states were considering altering the governance structure of EH services. For instance, Connecticut currently operates under a decentralized model; however, the State Commissioner of Public Health has initiated an attempt to regionalize EH services to adopt a mixed model. In some instances, the leadership described in detail how the governance within a state or territory was categorized as mixed. One such example is Colorado, where food safety services based on state food regulations are administered at the local level in most counties; however, water program services are administered entirely by the state. While child care and onsite wastewater have state-issued regulations, the services are administered locally in Colorado.

While the issue of effectiveness is an important one, the scope of this study did not include the exploration of how the effectiveness of EH programs vary across the various governance structures. The authors recommend conducting a follow-up study to learn more about the benefits of each structure through qualitative insights gathered from focus groups with representatives of their respective constituencies. The goal of the focus groups would be to broach questions that would provide more clarity on which structures are more effective than others for protecting and promoting the health of the nation.

Quantitative Extent of Jurisdictions

The number of EH jurisdictions in the states and territories ranged from 1–351. EH services provided at the local level can vary greatly depending on their administrative coverage such as cities, counties, municipalities, and districts. Operating under a decentralized governance model, Massachusetts was found to have the largest number of EH jurisdictions. Massachusetts has 351 cities and towns that administer EH services within their municipal or regional jurisdictions. The Massachusetts Department of Public Health and Department of Environmental Protec-

TABLE **2** *continued from page 25*

Major Administrative Agencies of Core Environmental Health Services in Each State and Territory

State/Territory	Major Administrative Agency of Core Environmental Health Services
Montana	Montana Department of Public Health and Human Services Montana Department of Environmental Quality
Nebraska	Nebraska Department of Health and Human Services Nebraska Department of Agriculture Nebraska Department of Environmental Quality Three local public health agencies
Nevada	Southern Nevada Health District (Board of Health)
New Hampshire	New Hampshire Department of Environmental Services
New Jersey	New Jersey Department of Health
New Mexico	New Mexico Department of Environmental Health, Consumer Health Protection Division
New York	New York Department of Health
North Carolina	North Carolina Department of Health and Human Services Local public health agencies
North Dakota	North Dakota State Health Department
Northern Mariana Islands	Northern Mariana Islands Commonwealth Healthcare Corporation, Bureau of Environmental Health, Bureau of Environmental & Coastal Quality Commonwealth Utility Corporation Division of Agriculture
Ohio	Ohio Department of Health
Oklahoma	Oklahoma State Department of Health Oklahoma Department of Environmental Quality
Oregon	Oregon Health Authority
Pennsylvania	Pennsylvania Department of Health Pennsylvania Department of Environmental Protection Pennsylvania Department of Agriculture
Puerto Rico	Puerto Rico Department of Health
Rhode Island	Rhode Island Department of Health
South Carolina	South Carolina Department of Health and Environmental Control
South Dakota	South Dakota Department of Environment and Natural Resources South Dakota Department of Health
Tennessee	Tennessee Department of Health Tennessee Department of Agriculture Tennessee Department of Environment and Conservation
Texas	Texas Department of State Health Services
U.S. Virgin Islands	Virgin Islands Department of Health
Utah	Utah Department of Environmental Health
Vermont	Vermont Department of Environmental Conservation Vermont Department of Health Vermont Agency of Agriculture
Virginia	Virginia Department of Health Virginia Department of Agriculture and Consumer Services
Washington	Washington State Department of Health
West Virginia	West Virginia Department of Health and Human Resources
Wisconsin	Wisconsin Department of Agriculture, Trade, and Consumer Protection
Wyoming	Wyoming Department of Agriculture

tion, however, also administer environmental services for the state and write regulations that are administered at the local level.

It is important to note that there is variation in terms of what constitutes an EH jurisdiction. For instance, New Hampshire reportedly has 234 cities and towns, with each having a local health officer who provides some type of environmental service. Hence, the number of EH jurisdictions suggested was 235, which includes cities, towns, and the state health department. This interpretation is different from Vermont—the respondent assessed the number of EH jurisdictions based on the number of offices within the Vermont Department of Health (12 offices), Vermont Department of Environmental Conservation (5 offices), and Vermont Agency of Agriculture (2 offices). Hence, a total of 19 EH jurisdictions were reported from Vermont. This finding implies that a more structured understanding of what constitutes an EH jurisdiction needs to be established across the states and territories.

Administrative Dominance

The survey also asked respondents to identify the major administrative agency home of the core EH services in each state. Several states identified more than one major administrative hub of the core EH services. While in most states and territories the department of health/public health served as the most dominant administrative agency for the delivery of EH services, there were some exceptions. The Vermont Department of Environmental Conservation was identified as more dominant than the Vermont Department of Health and the Vermont Agency of Agriculture. This finding reflects the differences of governance patterns within the states, which further highlights the lack of a unified system in terms of governance typology.

Conclusions

Despite some limitations, this study provides a preliminary understanding of the organization and delivery methods of EH services. In order to gather a synthesized understanding of governance of EH systems in the U.S., however, additional research is required to develop an effective survey instrument that provides operational definitions to aid in the appropriate classification of governance typology with regard to EH systems and delivery. Also, a more structured understanding of what constitutes an EH jurisdiction needs to be established across the states and territories. This study focused on the foundational groundwork for answering questions about how public health agencies can better provide EH services for their communities and residents. Further research will help us better understand the structure of each regional agency and the efficacy of each agency's performance as it relates to its structure and distribution.

Corresponding Author: David T. Dyjack, Executive Director, National Environmental Health Association, 720 South Colorado Boulevard, Suite 1000-N, Denver, CO 80246. E-mail: ddyjack@neha.org.

References

Association of State and Territorial Health Officials. (2011). *ASTHO profile of state public health* (Vol. 2). Retrieved from http://www.astho.org/uploadedFiles/_Publications/Files/Survey_Research/ASTHO_State_Profiles_Single%5B1%5D%20lo%20res.pdf

Association of State and Territorial Health Officials. (2012). *State public health agency classification: Understanding the relationship between state and local public health*. Retrieved from http://www.norc.org/PDFs/Projects/Classification%20of%20State%20Health%20Agencies/ASTHO%20NORC%20Governance%20Classification%20Report.pdf

Banerjee, S.N., Gerding, J.A., & Sarisky, J. (2018). Organizational characteristics of local health departments and environmental health services and activities. *Journal of Environmental Health*, *80*(8), 20–29.

Centers for Disease Control and Prevention. (2003). *A national strategy to revitalize environmental public health services*. Retrieved from https://www.cdc.gov/nceh/ehs/docs/nationalstrategy2003.pdf

Dyjack, D.T., Case, P., Marlow, H.J., Soret, S., & Montgomery, S. (2007). California's county and city environmental health services delivery system. *Journal of Environmental Health*, *69*(8), 35–43.

Halverson, P.K., Miller, C.A., Kaluzny, A.D., Fried, B.J., Schenck, S.E., & Richards, T.B. (1996). Performing public health functions: The perceived contribution of public health and other community agencies. *Journal of Health and Human Services Administration*, *18*(3), 288–303.

Mays, G.P., Halverson, P.K., Baker, E.L., Stevens, R., & Vann, J.J. (2004). Availability and perceived effectiveness of public health activities in the nation's most populous communities. *American Journal of Public Health*, *94*(6), 1019–1026.

Mays, G.P., McHugh, M.C., Shim, K., Perry, N., Lenaway, D., Halverson, P.K., & Moonesinghe, R. (2006). Institutional and economic determinants of public health system performance. *American Journal of Public Health*, *96*(3), 523–531.

Mays, G.P., Scutchfield, F.D., Bhandari, M.W., & Smith, S.A. (2010). Understanding the organization of public health delivery systems: An empirical typology. *The Milbank Quarterly*, *88*(1), 81–111.

Meit, M., Sellers, K., Kronstadt, J., Lawhorn, N., Brown, A., Liss-Levinson, R., . . . Jarris, P.E. (2012). Governance typology: A consensus classification of state-local health department relationships. *Journal of Public Health Management and Practice*, *18*(6), 520–528.

Murphy, T., & Neistadt, J. (2009). *Board of health recommendations for hiring qualified environmental health practitioners*. Bowling Green, OH: National Association of Local Boards of Health. Retrieved from https://www.cdc.gov/nceh/ehs/docs/nalboh_eh_workforce_guide.pdf

Sarisky, J., & Gerding, J. (2011). Environmental public health systems and services research. *Journal of Environmental Health*, *73*(10), 24–25.