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Enumeration of the Governmental Public Health Workforce, 2014

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Abstract

Background—Regular assessment of the size and composition of the U.S. public health workforce has been a challenge for decades. Previous enumeration efforts estimated 450,000 public health workers in governmental and voluntary agencies in 2000, and 326,602 governmental public health workers in 2012, although differences in enumeration methodology and the definitions of *public health worker* between the two make comparisons problematic.

Purpose—To estimate the size of the governmental public health workforce in 14 occupational classifications recommended for categorizing public health workers.

Methods—Six data sources were used to develop enumeration estimates: five for state and local public health workers and one for the federal public health workforce. Statistical adjustments were made to address missing data, overcounting, and duplicate counting of workers across surveys. Data were collected for 2010–2013; analyses were conducted in 2014.

Results—The multiple data sources yielded an estimate of 290,988 (range=231,464–341,053) public health workers in governmental agencies, 50%, 30%, and 20% of whom provide services in local, state, and federal public health settings, respectively. Administrative or clerical personnel (19%) represent the largest group of workers, followed by public health nurses (16%); environmental health workers (8%); public health managers (6%); and laboratory workers (5%).

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Appendix

Supplementary data

Supplementary data associated with this article can be found at http://dx.doi.org/10.1016/j.amepre.2014.07.018.

Conclusions—Using multiple data sources for public health workforce enumeration potentially improves accuracy of estimates but also adds methodologic complexity. Improvement of data sources and development of a standardized study methodology is needed for continuous monitoring of public health workforce size and composition.

Introduction

Regular assessment of the size and composition of the U.S. public health workforce has been a challenge for public health officials and public health services and systems researchers for decades.[1–4] The breadth of the field, its multidisciplinary nature, diverse settings for employment, and lack of applied standards for case definitions, worker classifications, or data collection methods are factors that make quantifying and characterizing this workforce difficult.[5]Further, lack of a standardized national public health workforce monitoring system for collecting data in a systematic, consistent way has hampered researchers' ability to develop reliable estimates.[2,6] The lack of enumeration estimates jeopardizes the ability of public health leaders to understand workforce capacity, project trends, and develop policies regarding the future workforce.

Despite these challenges, the importance of describing the size and composition of the public health workforce has been long recognized, with the earliest enumeration efforts in the U.S. dating to the first decade of the 20th century.[7] One of the most recent national enumerations was facilitated by the Health Resources and Services Administration in 2000.[8] That effort estimated a national public health workforce of 450,000 workers in governmental and voluntary agencies and represented a decline in the estimated ratio of workers to population from 220/100,000 in 1980 to 158/100,000 in 2000.[7,8] Despite these findings, the differences in study methods and definitions of *public health worker* in these two studies make them difficult to compare.[9]

Moreover, the lack of original data survey collection during the enumeration study reported in 2000, and the fact that available information was not uniform and did not conform to any single format, created unresolved issues. Some outstanding challenges included classification of occupations within public health job titles, development of a system to identify part-time or contract public health workers or those who are students or educators of public health, and identification of job activities and work settings beyond those within official state and local health agencies that should be classified as public health.[8]

Enumerating the U.S. public health workforce is a necessary prerequisite for improving our ability to identify gaps, forecast future workforce trends and needs, guide public health workforce development and related policy, and ultimately strengthen the U.S. health workforce infrastructure.[5] To advance national efforts to enumerate the public health workforce effort, CDC supported the work of the University of Michigan Center of Excellence in Public Health Workforce Studies (UM CEPHS), which estimated in 2012 the number of local, state, and federal public health workers at 326,602, or a worker-to-population ratio of approximately 105/100,000.[10]

The current study used the enumeration methods established by UM CEPHS[10] and data from the 2013 National Association of County and City Health Officials (NACCHO) and 2012 Association of State and Territorial Health Officials (ASTHO) profile surveys to assess the size of the local and state public health workforce, as well as discipline-specific survey data from the Council of State and Territorial Epidemiologists (CSTE) Epidemiology Capacity Assessment, UM CEPHS Public Health Nurse (PHN) Workforce Survey, and the Association of Public Health Laboratories (APHL)/UM CEPHS National Laboratory Capacity Assessment. Federal data of USDHHS, U.S. Department of Agriculture (USDA), and U.S. Environmental Protection Agency (EPA) workers from the U.S. Office of Personnel Management (OPM) were used for federal workforce enumeration estimates.

Methods

Secondary data analyses of six different sources collecting public health workforce data within their respective jurisdictional areas were conducted during 2010–2013 (Table 1).[11–17] Descriptions of these data sources and their strengths and limitations for public health workforce enumeration have been published previously.[6,10] To allow for comparison across the different data sources and to support categorization of the public health workers at state and local public health agencies, estimates of the size of the local, state, and federal public health workforce were calculated for 14 occupational classifications recommended as part of the case definition for *public health workers* in previous reports.[4,6,8] Public health workers in other occupational categories and uncategorized workers were grouped in a separate category (i.e., other/uncate- gorized). Definitions for these occupational classifications are included in the supplementary materials (Appendix, available online).

Public health workforce enumeration point estimates were calculated using data sources with adjustments made to address worker overcounting and undercounting (Table 1). The NACCHO, ASTHO, APHL, and UM CEPHS PHN data sources all had missing data, leading to worker undercounting. The NACCHO profile survey counts are based on weighted estimates constructed by NACCHO to minimize data loss. Therefore, adjustments were made only to the ASTHO, APHL, and PHN data sets. The estimate range for local health department (LHD) workers was adopted from NACCHO's published estimate of ±15%[15]; ranges for state and federal data were calculated by analyzing raw data estimates before adjustments were made for missing or duplicate data.

Missing data were addressed by substituting workforce data from other surveys conducted during a similar time frame, which we believe provides a more accurate approximation than using statistical corrections for missing data. The number of state public health workers by occupational category was approximated for 47 states using ASTHO data.

Five states provided total number of full-time equivalent (FTEs) employees but did not report the number of workers in each occupational category. To adjust for these missing data, the proportion of workers reported by occupational category in the 2010 ASTHO profile survey for each state was applied to the total number of workers reported in the 2012 survey. One state provided no 2012 workforce data; their 2010 data were carried over to 2012 to provide the best possible approximation. No ASTHO workforce data exist for three

states; therefore, generating estimates was not possible. According to 2000 workforce enumeration estimates, the proportion of public health workers in these three states combined was only <4% of the entire state-level public health workforce, approximated at over 135,000.[8]

Despite the possibility of slightly different case definitions for laboratory workers between the data sources, 2010 ASTHO data from six states were used to supplement the state-level laboratory workforce numbers from the APHL data source for those states that had not participated. Adjustment of APHL estimates for administrative or clerical personnel, information technology workers, and laboratory workers in local, agricultural, or environmental laboratories was not possible; thus, those estimates remained unchanged. NACCHO laboratory worker estimates were used for the local enumeration estimate because of the low response rate to the APHL survey from local laboratories (61%).[11]

Finally, for UM CEPHS PHN data, estimates were developed for the five state health departments that did not participate in the survey. Three of five states reported the number of PHNs in their state health agency in the 2010 ASTHO profile survey; those estimates were incorporated into the PHN data set. For the remaining two states, approximations of the number of PHNs were developed by applying the overall proportion of PHNs in the state health agency workforce nationally to the number of FTEs reported by the two state health departments.[13] Adjustments to the LHD figures were unnecessary because they represent a national sample.

To account for duplicate counting and overcounting, data were analyzed on the basis of the worker's job setting. For example, state-employed public health workers located in LHDs are counted in the local category because they provide services at the local level. The local and state categories include data from NACCHO and ASTHO, respectively, for all occupational categories except PHNs, the estimate of which is derived from 2012 UM CEPHS PHN Workforce Survey results; state public health epidemiologists, for which 2010 CSTE data are used; and state public health laboratory workers, for which 2011 APHL data are used. All estimated counts for federal workers are derived from OPM data (Table 1).

To address potential duplicate counting of public health workers, results of the NACCHO and ASTHO profile surveys were examined further because of the possibility that state health department employees who work in local units are double-counted (i.e., counted in both surveys). The 23 states with centralized, mixed, or shared governance structures, as defined by ASTHO,[13] are more likely to have state-employed workers in LHD units, which increases the likelihood that these workers were counted in both profile surveys.

Although the 2012 ASTHO profile survey estimated the number of state workers who work in local units at 21,868, or 21.9% of the total number of FTEs reported by the states, the exact number of workers enumerated in both profile surveys is unknown. To account for this possible duplicate counting, a proportional reduction of 21.9% was made to each occupational category of the 2012 ASTHO data, because the number of state workers in local units was not available by occupation.

Descriptive analyses were conducted in 2014 on the number of FTEs by occupational category using SPSS, version 19, and Microsoft Excel 2011. The authors had access to organizational- level information only. This project was reviewed by CDC for human subjects protection and deemed to be nonresearch.

Results

NACCHO estimated a total of 146,000 FTEs in LHDs working in the 14 recommended occupational classifications and the other/uncategorized category in their 2013 report, whereas adjustments made to ASTHO data resulted in approximately 78,195 workers in state health departments. The 2010 CSTE study enumerated 2,476 epidemiologists in state health agencies and 1,278 in LHDs. Adjusted APHL data estimated 546 laboratory workers in local and 5,699 in state public health, environmental, and agricultural laboratories, as well as 894 administrative support and 207 information technology/informatics staff in state and local laboratories. The UM CEPHS PHN Workforce Survey estimated 29,191 PHNs working in LHDs, but adjustments made to missing data resulted in an estimated 12,286 PHNs in state-level health departments. Finally, 2013 OPM data for selected federal health agencies indicate 57,056 workers in job classifications related to public health occupations (Table 2).

Combining data from six different data sources yielded an estimate of 290,988 (range=231,464–341,053) workers in governmental agencies who can be categorized in one of the recommended occupational classifications. Approximately 51% (147,491, range=125,367–169,615) of workers provide services in local public health settings; 30% (86,411, range=61,070–105,335) provide services in a state health department setting; and 20% (57,056, range=45,027–66,103) are employed in a federal agency. Administrative or clerical personnel (19%); PHNs (16%); and environmental health workers (8%) are the top three most common occupational classifications of the governmental public health workforce (Table 3).

Persons placed in the other/uncategorized public health professional category accounted for approximately 30% of all governmental public health workers (Table 3). Approximately half (55%; 16,500/30,200) of local public health workers in the other/uncategorized category were identified in categories excluded from the recommended occupational classifications. These include community health worker (6,700); nursing aide and home health aide (5,400); licensed practical or vocational nurse (3,200); and animal control worker (1,200). In addition, approximately 2% (686/35,960) of other state public health workers were identified as nurse practitioners (552); physician assistants (56); and primary care directors (78).

Discussion

This study is the first enumeration estimate of the governmental public health workforce to be published since 2000. This 2014 enumeration represents the best estimate of the size and composition of the public health workforce at the local, state, and national level and constitutes the first step toward creating a comprehensive, accessible, and current data

source on the public health workforce. The availability of a current estimate of the public health workforce provides the data and evidence from which policymakers can make decisions about the workforce and researchers can undertake additional studies to understand workforce needs and gaps. They also can use these data to raise policy concerns regarding preparation, continuing education, recruitment, and retention.

Given the lack of a unified, consistent, and ongoing approach to collecting public health workforce data and the lack of a single data source with enough specificity to provide adequate information regarding the size and composition of the entire workforce, this study offers a methodology using multiple data sources that can be replicated for constructing a national enumeration estimate of the governmental public health workforce. The availability of these diverse sources for public health workforce enumeration potentially improves the accuracy of our findings; nevertheless, it also adds methodologic complexity to generating an estimate of workforce size.

The NACCHO and ASTHO profile surveys are highly comparable with regard to time frame for data collection and occupational classification definitions. Both profile surveys collect data related to all the recommended occupational classifications used in this study and have been described as an ideal foundation on which to base enumeration estimates for state and local public health workers.[5,6] Supplementing ASTHO and NACCHO data with occupation-specific data from CSTE, APHL, and UM CEPHS PHN workforce surveys was challenging because of the variable methodologies used to collect the data and the difficulty in determining the comparability of occupational classifications across these data sources.

Despite this gap, leveraging existing data sources provides substantial benefits in validating the accuracy of workforce data as demonstrated by our findings. If conducted on a recurring basis, this methodology approximates a national workforce surveillance system to track and enumerate the governmental public health workforce.

The federal public health workforce proved to be the most challenging segment to enumerate because of the difficulty in applying the OPM occupational series to public health. Although OPM provides extensive data regarding the federal civilian workforce–including demographic information, employment trends, and retirement statistics–the majority of occupational series do not reflect public health workers' job functions as accurately as position titles, and at the time of our analyses, at least three recommended occupational classifications were not included in the OPM occupational series.

In that regard, OPM data both undercount segments of the workforce (e.g., epidemiologists) and likely substantially overcount multiple occupational classifications because workers are being counted on the basis of the agency employing them rather than their job functions (e.g., registered nurses working in a federal government setting would be included in a public health worker count) or educational background (e.g., a physician who trained as an epidemiologist but serves in a management position).

A methodology used in characterizing federal workers at CDC enabled quantifying all recommended occupational classifications by grouping occupational series into standard occupational classifications and later matching position titles to the corresponding standard

occupational classification.[5] This method, however, has not been validated for other federal agencies.

The enumeration estimate shows a continued decrease in the number of public health workers compared with previous estimates,[8] although this finding should be interpreted with caution: The inclusion criteria for *public health worker* is unique to this study, particularly for the federal workforce, but it can be broadened considerably to include additional federal agencies. In our study, all governmental public health workers were grouped into one of the recommended occupational classifications, for which we observe that >40% were classified as either administrative or clerical personnel, public health managers, or environmental health workers.

Workers classified in the other public health professional category, however, accounted for 30% of the workforce. This finding is consistent with those from the NACCHO profile surveys[15] and CDC character- ization,[5] although lower than that of ASTHO profile survey.[13] This serves to underscore the importance of adopting a refined definition for *public health worker*.

The finding that approximately half of the public health workforce resides in LHDs is a trend that has been fairly consistent throughout the past 15 years[8] and is not surprising, given the extensive and necessary public health services that are provided at the local level. However, reduced funding for public health agencies and reported job loss among health departments supports the finding of a shrinking governmental public health workforce, which should be noted by decision makers because it might result in the public health system no longer having an adequate number of qualified staff in public health jobs.[18,19]

Although the authors attempted to correct for missing data and differences in occupational classifications across surveys, a limitation to this estimate is nonresponsiveness across all surveys. In certain cases, adjustments to compensate for missing data were impossible, and state public health workers, in particular, are likely undercounted in this estimate.

In addition, validating the number of workers reported in both ASTHO and NACCHO profile surveys is difficult. The adjustments made for duplicate counts should be refined in future studies; the use of equal proportional adjustments, instead of adjustments specific to each occupational category, is a potential limitation. It is also important to note that NACCHO publishes weighted, rounded estimates for their workforce data, whereas other data sources provide unweighted response totals.

Studies of the public health workforce remain fragmented, are sometimes uncoordinated, and use multiple survey methodologies, depending on the agency or public health specialty group involved. The field of public health should consider adopting an overarching definition for workers in the national public health workforce and a consensus-driven taxonomy of occupations and disciplines included in that workforce.

The taxonomy featured in this supplement defines workforce occupational categories and details other variables that contribute to characterizing the workforce.[20] Reliable, quantifiable data that accurately depict the number and characteristics of those providing the

essential public health services and the impact of variations in workforce characteristics on community health are necessary for developing constructive, relevant workforce policy.[6]

To our knowledge, no other segment of the government workforce has been able to successfully characterize its constituents, this being a deficiency not limited to the public health enterprise. Nevertheless, efforts are being made by CDC, UM CEPHS, ASTHO, and NACCHO to create a common database, using these existing data sources, that can be used as a registry for the public health workforce to improve comparability of local, state, and federal data sources and create a uniform system for monitoring the public health workforce by using a surveillance approach. Improvement of data sources and development of a standardized methodology for continuously monitoring the size and composition of the public health workforce can help ensure that a competent and capable cadre of workers is available to promote and protect our nation's health.

This enumeration estimate provides a useful data to inform future efforts to strengthen the national public health workforce. The methods used in our study can be applied as a systematic approach for enumerating the governmental public health workforce. As noted by Gebbie et al.,[21] national public health workforce enumeration will continue to challenge researchers, policymakers, and practitioners until a methodology for routine enumeration is instituted, data definitions are developed and consistently used, federal labor classification systems are modified to better facilitate public health workforce enumeration, and groups and agencies that use workforce data engage in more regular and active collaboration to address the multiple methodologic and logistic concerns confronting enumeration efforts. This study offers a sound approach for assessing the size and composition of the governmental public health workforce that can be replicated over time until a national system to monitor the public health workforce is established.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Summary of data sources used for 2014 enumeration estimates

Data source	Government level	Data collection year	Context	Data source inclusion	Data source missing data and exclusions	Data adjustments or categorizations
APHL National Laboratory Workforce Capacity Assessment[11,12]	State and local (laboratory workers)	2011	Organizational- and individual-level survey administered to public health, environmental, and agricultural laboratories	80 (76%) public health, environmental, and agricultural laboratories	25 laboratories	Workforce data were collected in the occupational categories of administrative or clerical personnel, information technology workers, and laboratory workers
ASTHO profile survey	State	2012	Organizational-level data on state and territorial health department's responsibilities, structure, planning, quality-improvement activities, and full-time employee workforce	47 states	3 states did not respond to survey; additional 5 states did not report workers in occupational categories, and 1 state did not provide workforce data	Data from the 2010 ASTHO profile survey were used to address missing data[13]; ASTHO data were used for all occupational categories except epidemiologists (CSTE data used), laboratory workers (APHL), and PHNs (UM CEPHS PHN); a proportional reduction of 21.9% was used across all occupational categories to address duplicate counting of state workers in local units
CSTE National Epidemiology Capacity Assessment[14]	State and local (epidemiologists)	2010	Organizational-level data characterizing the state-level epidemiology workforce	All 50 states and District of Columbia workforce data for LHD epidemiologists	–	Only state health department data were used; NACCHO profile survey data were used to estimate LHD epidemiologists
NACCHO profile survey[15]	Local	2013	Organizational-level data on LHDs' responsibilities, structure, planning, quality-improvement activities, and full-time employee workforce	2000 (79%) LHDs, including District of Columbia	532 LHDs	Community health workers, nursing aides, home health aides, licensed practical or vocational nurses, and animal control workers were included in the other/uncategorized category
OPM[16]	Federal	2013	Organizational-level data on USDHHS workers and USDA and EPA workers	All workers in seven occupational categories in the study case definition	The U.S Public Health Service, other noncivilian federal public health workers, and federal contractors. Also, it does not capture the roles of emergency preparedness staff, epidemiologists, or public health informatics specialists	Workers in occupational classifications that might not be specific to public health (e.g., administrative or clerical personnel) were omitted from the USDA and EPA estimates to reduce the possibility of including non–public health workers in the enumeration
UM CEPHS Public Health Nurse Workforce Survey[17]	State and local (public health nurses)	2012	Organizational- and individual-level data on all registered PHNs	PHNs employed or contracted by local (81%; 265/327) and state (45%; 45/50) health departments, including those in governmentoperated hospitals	62 LHDs, and 5 state health departments	Weights were used to create a national estimate for PHNs employed or contracted by LHDs; state data were not weighted

APHL, Association of Public Health Laboratories; ASTHO, Association of State and Territorial Health Officials; CSTE, Council of State and Territorial Epidemiologists; EPA, U.S. Environmental Protection Agency; LHD, local health department; NACCHO, National Association of County and City Health Officials; OPM, U.S. Office of Personnel Management; PHN, public health nurse; UM CEPHS PHN, University of Michigan Center of Excellence in Public Health Workforce Studies Public Health Nurse Workforce Survey.

Table 2.

Number of public health workers, by data source (FTE)

Occupational category	2013 NACCHO	2012 ASTHO	2010 CSTE		2011 APHL		2012 UM CEPHS PHN		2013 OPM Federal
	Local[a]	State[b]	Local	State	Local	State[c]	Local[a]	State[c]	
Administrative or clerical personnel	35,000	14,559	-	-	85	809	-	-	6,085
Behavioral health professional	4,000	1,839	-	-	-	-	-	-	895
Emergency preparedness staff	2,900	810	-	-	-	-	-	-	-
Environmental health worker	13,300	4,618	-	-	-	-	-	-	5,920
Epidemiologist	1,800	1,820	1,278	2,476	-	-	-	-	-
Health educator	5,100	1,572	-	-	-	-	-	-	43
Laboratory worker	2,000	2,984	-	-	546	5,699	-	-	5,685
Nutritionist	5,000	1,276	-	-	-	-	-	-	223
Public health dental worker	2,600	356	-	-	-	-	-	-	443
Public health informatics specialist	2,100	729	-	-	16	191	-	-	-
Public health manager	10,100	3,296	-	-	-	-	-	-	4,998
Public health nurse	27,700	7,410	-	-	-	-	29,191	12,286	5,793
Public health physician	2,100	791	-	-	-	-	-	-	6,700
Public information specialist	2,100	174	-	-	-	-	-	-	-
Other public health professional or uncategorized worker	30,200	35,960	-	-	-	-	-	-	20,271
Total	**146,000**	**78,195**	**1,278**	**2,476**	**647**	**6,699**	**29,191**	**12,286**	**57,056**

Source: Table adapted from Public Health Workforce Enumeration, 2012.[10]

[a]Weighted estimates.

[b]Adjusted for missing data and overcounting.

[c]Adjusted for missing data.

APHL, Association of Public Health Laboratories; ASTHO, Association of State and Territorial Health Officials; CSTE, Council of State and Territorial Epidemiologists; FTE, full-time equivalent; NACCHO, National Association of County and City Health Officials; OPM, U.S. Office of Personnel Management; UM CEPHS PHN, University of Michigan Center of Excellence in Public Health Workforce Studies Public Health Nurse Workforce Survey.

Table 3.

Number and percentage of local, state, and federal public health workers, by occupational category

Occupational category	Worker job setting			Total	%
	Local[a]	State[b]	Federal[c]		
Administrative or clerical personnel	35,000	14,559	6,085	55,644	19
Behavioral health professional	4,000	1,839	895	6,734	2
Emergency preparedness staff	2,900	810	-	3,710	1
Environmental health worker	13,300	4,618	5,920	23,838	8
Epidemiologist	1,800	2,476	-	4,276	2
Health educator	5,100	1,572	43	6,715	2
Laboratory worker	2,000	5,699	5,685	13,384	5
Nutritionist	5,000	1,276	223	6,499	2
Public health dental worker	2,600	356	443	3,399	1
Public health informatics specialist	2,100	729	-	2,829	1
Public health manager	10,100	3,296	4,998	18,394	6
Public health nurse	29,191	12,286	5,793	47,270	16
Public health physician	2,100	791	6,700	9,591	3
Public information specialist	2,100	174	-	2,274	1
Other public health professional or uncategorized worker	30,200	35,960	20,271	86,431	30
Total	**147,491**	**86,411**	**57,056**	**290,988**	
Range	**125,367–169,615**	**61,070–105,335**	**45,027–66,103**	**231,464–341,053**	
%	**50**	**30**	**20**		**100**

Source: Table adapted from Public Health Workforce Enumeration, 2012[10]

Note: Column % is % of total workers. Percentages shown do not total 100% due to rounding.

[a]Local, NACCHO and UM CEPHS PHN.

[b]State, ASTHO, CSTE, APHL, and UM CEPHS PHN.

[c]Federal, OPM.

APHL, Association of Public Health Laboratories; ASTHO, Association of State and Territorial Health Officials; CSTE, Council of State and Territorial Epidemiologists; NACCHO, National Association of County and City Health Officials; OPM, U.S. Office of Personnel Management; UM CEPHS PHN, University of Michigan Center of Excellence in Public Health Workforce Studies Public Health Nurse Workforce Survey.