

Trends and Characteristics of the State and Local Public Health Workforce, 2010–2013

Angela J. Beck, PhD, MPH, and Matthew L. Boulton, MD, MPH

A highly trained, competent public health workforce is an essential component of effective public health service delivery.^{1–3} However, aside from periodic attempts to enumerate the public health workforce,^{4–10} modest investments have been made on a national level to systematically monitor the size, composition, demographics, training, and educational background of our nation's public health workforce.^{11–15} Job loss in state and local public health departments has been of considerable concern given the recent economic recession, with budget cuts linked to reduced services and workforce capacity^{16,17}; workforce implications associated with Patient Protection and Affordable Care Act (ACA) mandates have also been of interest.^{18,19}

The Association of State and Territorial Health Officials (ASTHO) and the National Association of County and City Health Officials (NACCHO) regularly collect comprehensive enumeration data on the state and local public health workforce, respectively, through their profile surveys.^{20,21} Workforce enumeration estimates are generated from these reports, although no published study has concurrently analyzed NACCHO and ASTHO data to characterize workforce trends over time. We assessed characteristics of the state and local public health workforce by occupational category from 2010 to 2013. We also examined health department characteristics, including geographic region, governance structure, and population size of the state or local jurisdiction, to determine whether workforce size and composition varied across these domains during the study period.

METHODS

We used ASTHO (2010, 2012) and NACCHO (2010, 2013) profile survey data for analysis of full-time-equivalent (FTE) workers. We based occupational categories on those used in the most recent enumeration efforts supported by the Centers for Disease Control

Objectives. We assessed state and local public health workforce characteristics by occupational category from 2010 to 2013. We also examined health department characteristics to determine whether workforce size and composition varied across these domains.

Methods. We analyzed Association of State and Territorial Health Officials (2010, 2012) and National Association of County and City Health Officials (2010, 2013) profile study data, including 47 state health departments and 2005 and 1953 local health departments (LHDs) in 2010 and 2013, respectively. We determined number of workers and percentage of change by occupation, population size, geographic region, and governance structure.

Results. The LHD workforce remained stable between 2010 and 2013. In states, the workforce decreased by 4%, with notable decreases in public information (–33%) and public health informatics (–29%); state health departments in small (–9%), New England (–13%), and centralized (–7%) states reported the largest decrease in number of workers.

Conclusions. Study findings provide evidence of a shifting public health workforce profile, primarily at the state level. Future research should seek to explain changing workforce patterns and determine whether they are planned or forced responses to changing budgets and service priorities. (*Am J Public Health.* 2015;105:S303–S310. doi:10.2105/AJPH.2014.302353)

and Prevention and the Health Resources and Services Administration.^{6,7,12} The 14 occupational categories, which may be composed of multiple classifications and job titles, are administrative or clerical personnel, behavioral health professional (or social worker in the ASTHO data), emergency preparedness staff, environmental health worker, epidemiologist, health educator, laboratory worker, nutritionist, public health dental worker, public health manager, public health nurse, public health physician, public health informatics specialist, and public information specialist. An “other” category included all workers whose occupations were not specified in the survey questionnaires. In addition, licensed practical or vocational nurse, community health worker, nursing aide and home health aide, and animal control worker were included in the other category for the 2013 NACCHO survey. Primary care office directors were included in the other category for both ASTHO surveys; physician assistants were included as other in the 2012 survey.

All 14 occupational categories were included in the 2010 and 2012 ASTHO data sets; however, definitions for emergency preparedness staff and public health dental worker were broadened to include additional types of workers for the 2012 survey, preventing comparison of these 2 categories of workers over time. The 2010 NACCHO data set included all occupational categories except laboratory worker and public health dental worker, both of which are available in the 2013 NACCHO data set. Finally, the 2010 NACCHO survey renamed “public health informatics specialist” as “information systems specialist” in 2013, although the category was intended to capture the same type of worker.

Measures

We constructed 3 variables for the analysis of both ASTHO and NACCHO data sets. We defined governance structure using ASTHO's governance classification system: 1 indicates centralized or largely centralized, for local

health units under state jurisdiction; 2 indicates shared or mixed, for local health units under state or local jurisdiction; and 3 indicates decentralized or largely decentralized, for local health units under local jurisdiction.²⁰

Using ASTHO's geographic region categories, which are based on US Department of Health and Human Services regions, we coded state and local units as follows: 1 indicates New England (regions 1 and 2); 2 indicates South (regions 4 and 6); 3 indicates Mid-Atlantic and Great Lakes (regions 3 and 5); 4 indicates Mountain and Midwest (regions 7 and 8); and 5 indicates West (regions 9 and 10).²⁰ We used 3 categories, small, medium, and large, to characterize population size for both state and local health departments. For ASTHO data, small states had a population of as many as 2.75 million people; medium states, a population of 2 750 001 to 6.25 million; and large states, a population of more than 6.25 million.²⁰ For NACCHO data, small jurisdictions had a population catchment of fewer than 50 000 people; medium jurisdictions, 50 000 to 499 999 people; and large jurisdictions, 500 000 or more people.²¹

Study Sample

We cleaned ASTHO and NACCHO data to ensure consistency between the total number of FTE workers reported and the number reported by occupational category. ASTHO profile data from 47 states were analyzed. We excluded 3 states because they did not provide workforce data in 2010 or 2012. We used data substitution for 7 states (i.e., 6 states did not report occupational categories in 2012, so we applied 2010 worker category proportions to 2012 worker totals, and 1 state provided worker data in 2010 but not 2012, so we carried worker totals forward to 2012).

Of 2565 local health departments (LHDs), 2107 responded to the 2010 NACCHO profile survey; 102 were excluded because they did not provide workforce data. In 2013, 47 of the 2000 responding LHDs did not provide workforce data and were excluded, leaving 2005 LHDs in 2010 and 1953 LHDs in 2013 for analysis. Occupational category data were not available for 103 LHDs in 2010 and 174 LHDs in 2013 that reported worker totals; we treated these workers as other or uncategorized. Washington, DC was included in the LHD analysis.

Data Analysis

We used 2 different methods to analyze state and local data to accommodate the varying response rates over time in the 2 surveys. For state-level data, we used a trend analysis that directly compared data from 2010 with that from 2012 for the same 47 state public health agencies using the percentage of change in workers. For local-level data, we analyzed percentage point differences in worker characteristics by occupational category for all responding LHDs in 2010–2013 because the number of LHD respondents differed between 2010 and 2013. This analysis method preserved 100s of LHDs in the study that would have been eliminated if the sample had been limited to LHDs completing the NACCHO survey in both 2010 and 2013 (Table 1). We used SPSS version 19 (IBM, Armonk, NY) and Excel (Microsoft, Redmond, WA) for descriptive analyses conducted in 2014.

RESULTS

Study results detail changes in the public health workforce by occupation, state population size, geographic region, and governance structure. Workforce trends for state and local health departments are presented separately.

State-Level Results

The size of the state public health workforce in the responding 47 states declined from 104 522 to 100 064 workers (−4%).

Workforce changes by occupation. The occupational categories with the highest proportion of workers in all states collectively in both 2010 and 2012 were administrative or clerical personnel (approximately 20%), public health nurse (approximately 10%), and environmental health worker (6%).

Occupations experiencing the greatest decreases in FTE workers were public information specialist (−33%), public health informatics specialist (−29%), and behavioral health professional (−20%). The public health manager, nutritionist, and environmental health worker occupational categories had 11%, 7%, and 3% increases, respectively, in number of state public health workers from 2010 to 2012 (Table 1).

Workforce changes by state population size. By state population, small states experienced a 9% decrease in FTE state public health workers

between 2010 and 2012, and medium and large states saw decreases of 5% and 3%, respectively. Small states saw large increases in nutritionists (92%), administrative and clerical personnel (64%), and public health nurses (46%) and decreases in public information specialists (−78%) and public health informatics specialists (−56%). Medium states saw increases in the number of public health managers (29%), public health nurses (13%), and environmental health workers (13%) in the workforce; the largest decrease in medium states was seen in the number of health educators (−50%). Public health physicians (21%) were the only occupational group to increase in large states; behavioral health professionals (−48%), public health informatics specialists (−38%), and public health nurses (−37%) were among the occupations with greatest decrease (Tables 2 and 3).

Workforce changes by region. The geographic region with the largest decrease in FTE state public health workers was New England (−13%), followed by West (−8%) and South (−4%). The size of the state public health workforce remained stable (approximately 1% decrease in number of workers) in the Mid-Atlantic and Great Lakes and Mountain and Midwest regions. New England states saw large decreases in the number of health educators (−83%), epidemiologists (−45%), and public health nurses (−41%) and a large increase in behavioral health professionals (89%). States in the South region experienced the largest decreases in behavioral health professionals (−33%) and public health nurses (−16%) and the largest increases in public health managers (46%), public health informatics specialists (30%), and laboratory workers (23%).

Mid-Atlantic and Great Lakes states had the largest decreases in public information specialists (−71%) and public health informatics specialists (−24%) and the largest increase in public health nurses (24%). States in the Mountain and Midwest region had the largest decreases in health educators (−34%) and public information specialists (−25%) and the largest increases in public health managers (46%) and public health nurses (29%). States in the West region saw large decreases in public health informatics specialists (−94%), public health nurses (−68%), and public health

TABLE 1—Number and Percentage of Full-Time-Equivalent Workers by Occupational Category: ASTHO and NACCHO Profile Surveys, United States, 2010–2013

Occupational Category	State Public Health Workers			Local Public Health Workers		
	2010, No. (%)	2012, No. (%)	% Change ^a	2010, No. (%)	2013, No. (%)	% Point Difference ^b
Administrative or clerical personnel	18 301 (18)	18 631 (19)	1.8	31 405 (22)	24 619 (20)	-2
Behavioral health professional	2 957 (3)	2 353 (2)	-20.4	4 752 (3)	2 624 (2)	-1
Emergency preparedness staff ^c	42 (< 1)	1 037 (1)	NA	2 173 (2)	1 895 (2)	0
Environmental health worker	5 767 (6)	5 909 (6)	2.5	11 088 (8)	9 439 (8)	0
Epidemiologist	2 549 (2)	2 329 (2)	-8.6	1 563 (1)	1 348 (1)	0
Health educator	2 412 (2)	2 012 (2)	-16.6	3 807 (3)	3 460 (3)	0
Laboratory worker ^d	3 961 (4)	3 818 (4)	-3.6	NA	1 430 (1)	NA
Nutritionist	1 532 (1)	1 633 (2)	6.6	3 706 (3)	3 314 (3)	0
Public health dental worker ^e	225 (< 1)	456 (< 1)	NA ^e	NA	1 769 (1)	NA
Public health informatics specialist	1 315 (1)	933 (1)	-29.0	759 (1)	1 473 (1)	0
Public health manager	3 793 (4)	4 218 (4)	11.2	8 037 (6)	7 134 (6)	0
Public health nurse	11 021 (11)	9 482 (9)	-14.0	22 629 (16)	19 824 (16)	0
Public health physician	1 132 (1)	1 012 (1)	-10.6	1 478 (1)	1 394 (1)	0
Public information specialist	331 (< 1)	223 (< 1)	-32.6	372 (< 1)	349 (< 1)	0
Other public health professional or uncategorized worker	49 183 (47)	46 017 (46)	-6.4	49 053 (35)	45 616 (36)	1
Total	104 521 (100)	100 063 (100)	-4.3	140 822 (100)	125 688 (100)	NA

Note. ASTHO = Association of State and Territorial Health Officials; FTE = full-time equivalent, NACCHO = National Association of County and City Health Officials; NA = not applicable. Forty-seven states are included in the ASTHO data analysis; 2005 and 1953 local health department respondents are included in the 2010 and 2013 NACCHO data analysis, respectively. Percentages may not total 100 as a result of rounding.

^aPercentage of change reflects the change in the size of the state health workforce by occupational category from 2010 to 2012.

^bPercentage point difference reflects the proportional difference in the number of FTE workers by occupational category from 2010 to 2013. Direct comparison was not possible because fewer or different respondents completed the workforce section of the survey in 2010 and 2013.

^cA definitional change in the occupational category accounts for the increase from 2010 to 2012 in ASTHO data. The 2010 ASTHO Profile Survey limited this category to emergency preparedness directors; this was broadened to all emergency preparedness staff in 2012.

^dLaboratory workers were not identified in the 2010 NACCHO Profile and are included in the other or uncategorized worker category.

^eA definitional change in the occupational category accounts for the increase from 2010 to 2012 in ASTHO data. The 2010 ASTHO Profile Survey limited this category to public health dentists; this was broadened to include dental hygienists in 2012. Public health dental workers were not identified in the 2010 NACCHO Profile and are included in the other or uncategorized worker category.

managers (-52%); worker increases occurred only in public information specialists (3%) and other or uncategorized workers (41%; Tables 2 and 3).

Workforce changes by public health governance structure. By governance structure, centralized states experienced an overall decrease of 7% in FTE state public health workers, with the largest proportional decreases in public health informatics specialists (-14%) and other or uncategorized workers (-39%). Occupations with the largest increase in workers included epidemiologist (64%) and nutritionist (35%).

Mixed or shared states reported a 3% decrease in the number of state public health workers, with health educator (-17%) and public information specialist (-17%) showing the largest proportional decreases in workers and public health informatics specialist (56%) and public health manager (24%) showing the

largest increases. Decentralized states saw a decrease (-4%) in the overall number of state public health workers, with the largest proportional decreases in public health nurse (-63%), behavioral health professional (-45%), and public information specialist (-43%) occupations and an increase in the public health informatics specialist occupation (51%; Tables 2 and 3).

Local-Level Results

LHDs responding to the NACCHO survey in 2010 (n=2005) reported 140 822 workers, while a total of 125 688 workers were reported by the 1953 responding LHDs in 2013.

Workforce changes by occupation. In 2010, 22% were administrative or clerical personnel. Public health nurses (16%) and environmental health workers (8%) made up the next largest occupational categories of the LHD workforce.

In 2013, the workforce profile remained stable, with the proportion of workers remaining unchanged for most occupational categories (Table 1).

Workforce changes by local jurisdiction size. The analysis by jurisdictional size showed that workers in LHDs with small jurisdictions made up 13% of the LHD workforce in both 2010 and 2013, whereas LHDs in medium jurisdictions saw a proportional increase in the size of their FTE workforce from 38% to 40%. The proportion of workers in large jurisdictions was stable; 49% of all LHD workers were in large jurisdictions in 2010, compared with 48% in 2013. Small-jurisdiction LHDs saw no percentage point differences for any occupational category from 2010 to 2013.

Medium jurisdictions saw percentage point differences of -3% for administrative or clerical personnel, -2% for public health nurse,

TABLE 2—Number and Percentage of Full-Time-Equivalent Workers by Size of State Population, Region, and Governance Structure: ASTHO and NACCHO Profile Surveys, United States, 2010–2013

Category	State Health Agencies				LHDs, 2010		LHDs, 2013		% Point Difference ^b
	No.	2010, No. Workers (%)	2012, No. Workers (%)	% Change ^a	No.	No. Workers (%)	No.	No. Workers (%)	
Population size^c									
Small	14	13 174 (13)	12 047 (12)	-9	1 171	18 404 (13)	1120	15 882 (13)	0
Medium	17	34 760 (33)	32 890 (33)	-5	708	53 343 (38)	706	50 090 (40)	2
Large	16	56 588 (54)	55 127 (55)	-3	126	69 075 (49)	127	59 716 (48)	-1
Total	47	104 522 (100)	100 064 (100)	...	2 005	140 822 (100)	1953	125 688 (100)	...
Geographic region^d									
New England	7	10 812 (10)	9 531 (10)	-13	344	17 177 (12)	320	15 629 (12)	0
South	13	54 489 (52)	52 503 (52)	-4	565	48 924 (35)	534	39 420 (31)	-4
Mid-Atlantic and Great Lakes	11	20 067 (19)	19 848 (20)	-1	546	31 398 (22)	520	31 806 (25)	3
Mountain and Midwest	9	7 735 (7)	7 691 (8)	-1	414	10 229 (7)	448	13 536 (11)	4
West	7	11 420 (11)	10 490 (10)	-8	136	33 094 (24)	131	25 297 (20)	-4
Total	47	104 522 (100)	100 064 (100)	...	2 005	140 822 (100)	1953	125 688 (100)	...
Governance structure									
Centralized or largely centralized	13	27 708 (27)	25 703 (26)	-7	223	15 270 (11)	221	12 534 (10)	-1
Shared, largely shared, or mixed	10	34 299 (33)	33 313 (33)	-3	346	33 698 (24)	370	32 165 (26)	2
Decentralized or largely decentralized	24	42 515 (41)	41 048 (41)	-3	1 436	91 854 (65)	1362	80 989 (64)	-1
Total	47	104 522 (100)	100 064 (100)	...	2 005	140 822 (100)	1953	125 688 (100)	...

Note. ASTHO = Association of State and Territorial Health Officials; FTE = full-time equivalent; LHD = local health department; NACCHO = National Association of County and City Health Officials.

^aPercentage of change reflects the change in the size of the state health workforce by occupational category from 2010 to 2012.

^bPercentage point difference reflects the proportional difference in the number of FTE workers by occupational category from 2010 to 2013. Direct comparison was not possible because fewer or different respondents completed the workforce section of the survey in 2010 and 2013.

^cFor ASTHO data, small indicates a population of ≤ 2 750 000, medium indicates 2 750 001–6 250 000, and large indicates > 6 250 000. For NACCHO data, small indicates a population of < 50 000, medium indicates 50 000–499 000, and large indicates ≥ 500 000.

^dNew England included the following states: ME, NH, VT, NY, MA, RI, CT, and NJ; the South included: KY, NC, SC, TN, GA, AL, FL, MS, LA, AR, OK, TX, and NM; the Mid-Atlantic and Great Lakes regions included: DE, MD, DC, VA, WV, PA, OH, IN, IL, MI, WI, and MN; the Mountain and Midwest regions included: IA, MO, ND, SD, NE, KS, MT, WY, CO, and UT; the West included AK, WA, OR, ID, NV, CA, AZ, and HI.

and -1% each for behavioral health professional, environmental health worker, nutritionist, and public health manager categories. LHDs in large jurisdictions saw percentage point differences of -3% for administrative or clerical personnel, -2% for behavioral health professionals, 1% for health educators and public health informatics specialists, and 2% for public health nurses (Tables 2 and 4).

Workforce changes by region. By geographic region, LHD workers in the South made up 35% of the workforce in 2010, compared with 31% in 2013, a percentage point difference of -4%. Mid-Atlantic and Great Lakes workers made up 22% of the LHD workforce in 2010, increasing to 25% in 2013. Workers in LHDs in the West region composed 24% of the workforce in 2010, falling to 20% in 2013. The proportion of LHD workers in the New England region remained stable at 12% in both

years. Finally, Mountain and Midwest workers made up 7% of the LHD workforce in 2010 and 11% of the workforce in 2013.

The New England region saw percentage point differences in administrative or clerical personnel occupations (-4%) and behavioral health professional, emergency preparedness staff, environmental health worker, and public health nurse occupations (-1% each). A percentage point difference of 2% was seen for public health informatics specialists. In the South region, percentage point differences were reported from 2010 to 2013 for public health nurse (-4%), administrative or clerical personnel (-3%), behavioral health professional (-2%), and environmental health worker (-1%). Mid-Atlantic and Great Lakes states saw percentage point differences for administrative or clerical personnel (-3%), behavioral health professional (-2%), public

health nurse (-2%), and emergency preparedness staff (-1%). We found a percentage point difference of 1% for public health informatics specialists.

States in the Mountain and Midwest region saw percentage point differences for administrative or clerical personnel (-2%), emergency preparedness staff, environmental health worker, and public health manager (-1% each). A percentage point difference of 1% was reported for public health informatics specialists and public health nurses. The largest variance in proportional distribution of workers from 2010 to 2013 was in the West region, where percentage point differences were reported for administrative or clerical personnel and behavioral health professional (-1% each) and for public health nurses (5%), environmental health workers (2%), and health educators, public health informatics specialists,

TABLE 3—Percentage of Difference in Number of Workers by Occupational Category, Governance Structure, Geographic Region, and Population Size: ASTHO Profile Survey, United States, 2010–2012

Occupational Category	Population ^a			Region ^b					Governance Structure ^c		
	Small	Medium	Large	New England	South	Mid-Atlantic and Great Lakes	Mountain and Midwest	West	Centralized	Mixed-Shared	Decentralized
Administrative or clerical personnel	64.0	-6.2	-0.5	-12.5	21.3	-13.4	-3.2	-6.4	25.9	-4.0	-9.5
Behavioral health professional	29.0	-3.3	-48.2	89.0	-32.8	-8.6	5.6	-10.3	6.8	5.6	-45.1
Environmental health worker	22.4	12.9	-7.7	-8.0	19.6	-10.5	1.0	-19.8	16.6	7.7	-10.5
Epidemiologist	28.6	7.3	-21.4	-45.2	11.9	10.3	9.9	-30.8	63.5	1.7	-23.8
Health educator	8.5	-50.0	-7.3	-83.4	7.8	-2.4	-33.5	-21.3	14.3	-17.4	-24.1
Laboratory worker	25.7	2.7	-12.5	-27.7	22.7	-4.9	-3.9	-14.6	19.2	17.5	-16.6
Nutritionist	91.9	2.0	-1.4	1.1	19.0	-17.3	15.3	-24.4	35.4	-6.8	-12.6
Public health informatics specialist	-56.3	13.5	-38.1	-87.2	29.8	-23.9	0.5	-93.7	-14.3	56.3	50.7
Public health manager	28.0	28.7	-8.5	17.1	46.4	0.5	46.2	-51.8	57.7	23.6	-19.8
Public health nurse	46.1	13.0	-36.6	-41.4	-16.1	23.6	28.8	-67.7	12.1	7.6	-63.0
Public health physician	6.6	-9.6	20.7	56.8	-12.1	-16.9	-2.5	-11.7	2.7	0.1	-37.2
Public information specialist	-78.4	-11.3	-12.3	-24.3	-6.3	-70.7	-25.4	2.8	-1.8	-17.2	-43.0
Other public health professional or uncategorized worker	-42.8	-17.6	9.2	-1.9	-14.0	3.6	-8.3	41.4	-39.1	-10.9	19.5
Total	-8.6	-5.4	-2.6	-11.8	-3.6	-1.1	-0.6	-8.1	-7.2	-2.9	-3.5

Note. ASTHO = Association of State and Territorial Health Officials. Emergency preparedness staff and public health dental worker are not included because of definitional changes in the category, which made trend comparison impossible.

^aSmall indicates a population of $\leq 2\,750\,000$ ($n = 14$ states); medium indicates 2 750 001–6 250 000 ($n = 17$); large indicates $> 6\,250\,000$ ($n = 16$).

^bNew England ($n = 7$) included: ME, NH, VT, NY, MA, RI, CT, and NJ; the South ($n = 13$) included: KY, NC, SC, TN, GA, AL, FL, MS, LA, AR, OK, TX, and NM; the Mid-Atlantic and Great Lakes ($n = 11$) regions included: DE, MD, DC, VA, WV, PA, OH, IN, IL, MI, WI, and MN; the Mountain and Midwest ($n = 9$) regions included: IA, MO, ND, SD, NE, KS, MT, WY, CO, and UT; the West ($n = 7$) included: AK, WA, OR, ID, NV, CA, AZ, and HI.

^cCentralized, $n = 13$; mixed-shared, $n = 10$; decentralized, $n = 24$.

and public health physicians (1% each; Tables 2 and 4).

Workforce changes by public health governance structure. Analyses based on governance structure showed that workers in LHD jurisdictions in centralized states made up 11% of the workforce in 2010 and 10% in 2013, and shared or mixed-jurisdiction workers made up 24% and 26% of the workforce in 2010 and 2013, respectively. Workers in LHDs in decentralized states composed 65% of the workforce in 2010 and 64% in 2013. LHDs in centralized states reported percentage point differences from 2010 to 2013 in administrative or clerical personnel (–4%) and in behavioral health specialists, environmental health workers, epidemiologists, and public health nurses (–1% each).

One percentage point increase each was reported for emergency preparedness staff, health educators, nutritionists, and public health informatics specialists. LHDs in

shared or mixed states reported percentage point differences in administrative and clerical personnel (–2%), public health nurses (–2%) and behavioral health specialists (–1%). LHDs in decentralized states reported percentage point differences in administrative or clerical personnel (–2%) and behavioral health specialists (–1%) and 1 percentage point increase in public health nurses (Tables 2 and 4).

DISCUSSION

The size of the state and local public health department workforce was relatively stable from 2010 to 2013 despite budget cuts at state and local health departments, consistent with NACCHO findings.¹⁶ Some variation in workforce composition by occupational category was evident, particularly at the state level, at which job losses were greater among behavioral health professionals, public health informatics specialists, public information specialists,

health educators, and public health nurses. Concurrent job growth at the local level did not take place in these same occupational categories, with the exception of the category of public health informatics specialist, which saw an increase in number of LHD jobs from 2010 to 2013.

The finding that workforce numbers have recently stabilized is positive news; however, workforce size is substantially smaller since the economic downturn^{16,17} and it seems unlikely that the governmental public health workforce will return to its previous size in the foreseeable future. This may partially reflect the evolving role of state and local health departments in the context of ACA. As health departments integrate into accountable care organizations, their functions, services, and workforce will change with a diminishing need for clinicians.^{18,19} For example, the decrease in public health nurse positions at the state and local levels is perhaps not surprising given the common speculation that nurses are likely among those most affected by the reduction in health departments’

TABLE 4—Percentage Point Differences in Number of Workers by Occupational Category, Governance Structure, Geographic Region, and Jurisdiction Population Size in Local Health Departments: NACCHO Profile Survey, United States, 2010–2013

Occupational Category	Population Size ^a			Region ^{b,c}					Governance Structure ^d		
	Small	Medium	Large	New England	South	Mid-Atlantic and Great Lakes	Mountain and Midwest	West	Centralized	Mixed-Shared	Decentralized
Administrative or clerical personnel	0	-3	-3	-4	-3	-3	-2	-1	-4	-2	-2
Behavioral health professional	0	-1	-2	-1	-2	-2	0	-1	-1	-1	-1
Emergency preparedness staff	0	0	0	-1	0	-1	-1	0	1	0	0
Environmental health worker	0	-1	0	-1	-1	0	-1	2	-1	0	0
Epidemiologist	0	0	0	0	0	0	0	0	-1	0	0
Health educator	0	0	1	0	0	0	0	1	1	0	0
Nutritionist	0	-1	0	0	0	0	0	0	1	0	0
Public health informatics specialist	0	<1	1	2	0	1	1	1	1	0	0
Public health manager	0	-1	0	0	0	0	-1	0	0	0	0
Public health nurse	0	-2	2	-1	-4	-2	1	5	-1	-2	1
Public health physician	0	0	0	0	0	0	0	1	0	0	0
Public information specialist	0	0	0	0	0	0	0	0	0	0	0

Note. LHD = local health department; NACCHO = National Association of County and City Health Officials. Emergency preparedness staff and public health dental worker are not included because they were not categories in the 2010 NACCHO survey. Uncategorized or other workers not included in this table.

^aSmall indicates a population of < 50 000 (n = 1171 LHDs in 2010; n = 1120 LHDs in 2013); medium indicates 50 000–499 999 (n = 708 LHDs in 2010; n = 706 LHDs in 2013); large indicates ≥ 500 000 (n = 126 LHDs in 2010; n = 127 LHDs in 2013).

^bNew England, n = 344 LHDs in 2010, n = 320 LHDs in 2013; South, n = 565 LHDs in 2010, n = 534 LHDs in 2013; Mid-Atlantic and Great Lakes, n = 546 LHDs in 2010, n = 520 LHDs in 2013; Mountain and Midwest, n = 414 LHDs in 2010, n = 448 LHDs in 2013; and West, n = 136 LHDs in 2010, n = 131 LHDs in 2013.

^cNew England included: ME, NH, VT, NY, MA, RI, CT, and NJ; the South included: KY, NC, SC, TN, GA, AL, FL, MS, LA, AR, OK, TX, and NM; the Mid-Atlantic and Great Lakes regions included: DE, MD, DC, VA, WV, PA, OH, IN, IL, MI, WI, and MN; the Mountain and Midwest included: IA, MO, ND, SD, NE, KS, MT, WY, CO, and UT; the West included: AK, WA, OR, ID, NV, CA, AZ, and HI.

^dCentralized, n = 223 LHDs in 2010, n = 221 LHDs in 2013; mixed-shared, n = 346 LHDs in 2010, n = 370 LHDs in 2013; decentralized, n = 1436 LHDs in 2010, n = 1362 LHDs in 2013.

clinical service provision under ACA. The proportional decrease in this segment of the workforce varied by population size of the jurisdiction, geographic region, and governance structure, indicating that implementation of ACA mandates and their effect on health department clinical service provision may not be uniform or consistent on a national level. We do not know whether nurses who retained their position in state or local public health maintained all of their duties, including clinical services, or had their job tasks modified over this period of time. This finding is not limited to clinicians; the shifting role of health departments may explain workforce reductions in occupations dealing with counseling services, behavioral health, and health education, all of which can broadly intersect with clinical service delivery.

Public health informatics, an area of growing importance in public health with the increasing reliance on electronic health records and other health information technologies, experienced worker increases at the local level, although this may partially reflect the

renaming of this occupational category in the 2013 NACCHO survey from public health informatics specialist to information systems specialist.

The picture is mixed at the state level, with some health departments adding workers and others losing them across geographic regions and governance types, which may indicate that some state health agencies have adopted informatics more quickly or on a larger scale than others. An alternative explanation for the observed decrease in public health informatics specialists and administrative and clerical personnel, the latter of which experienced a proportional decrease in workers for almost every population size, region, and governance type, is the possibility that state agencies may centralize services in times of budget crisis. It is possible that jobs such as these could be shared among multiple state agencies and relocated to centralized branches of state government.

The finding that greater workforce variation occurred at the state level across governance structure, geographic region, and

population size than at the local level may indicate that state health agencies are more susceptible to shifting workforce patterns. Erwin et al.²² found that some LHDs have characteristics of resiliency such as a mix of funding streams and services provided that help protect them from experiencing job losses and program cuts during economic hardships. Whether similar characteristics could have an impact on the resiliency of state health agencies and lead to stabilization of workforce size and composition is unknown. In addition, state health agencies are much more likely to experience substantial variation in funding and focus when new governors or political parties take office, whereas LHDs may be more insulated from state-level political changes given the availability of local funds and prioritization of local needs, particularly in decentralized states. It is possible that political administrative changes during the study period may partially account for some of the variation seen at the state level and not evident at the local level.

Limitations

This analysis is limited by nonresponse at both the state and the local levels. We used data substitution to include as many health departments as possible in the analysis, recognizing that some estimates may overcount or undercount the workforce. Most nonresponse occurred at the local level; NACCHO uses weighting techniques to address nonresponse in the profile survey to account for this issue. In addition, the different methods used to analyze trend data at the state and local levels prevent direct comparison of these 2 public health workforce sectors; however, these analysis methods maximize the number of health departments included in the analysis and provide a valuable assessment of the size and composition of the state and local public health workforce. Finally, the analysis is limited by the lack of a national public health workforce taxonomy. Although NACCHO and ASTHO provide definitions for each occupational category, health departments may still categorize workers differently. This limitation may be addressed in future research because a workforce taxonomy has now been proposed for use by ASTHO, NACCHO, and other public health workforce researchers to improve data collection.²³

Conclusions

This study provides some insight into workforce patterns over a 2- to 3-year period in state and local public health departments. The variation in the proportion of state and local public health workers by occupational category across geographic region, governance structure, and size of population served provides an interesting indication of shifts in workforce size and composition. However, little information is available to explain why these shifts are occurring. Although it is tempting to interpret health department job loss in an occupational category as bad and job growth in other occupations as positive, it is possible that the workforce needs of state and local public health departments have changed and the shifting workforce profile, particularly at the state level, is a planned response as a result of changes in service delivery or program responsibilities and not solely an unexpected change caused by budget cuts.

Future research should consider qualitative studies with state and local public health department leaders and human resources personnel to determine whether certain occupational categories are most susceptible to position loss and why. Conversely, identification of workforce categories that are more protected from cuts for reasons such as state or local laws and regulations or type of services offered by the health department would be informative, as would trends or new roles within the public health workforce that emerge as a result of ACA. As the responsibilities of the public health and health care systems are respectively redefined, it is reasonable to expect these workforce trends to continue for the foreseeable future. ■

About the Authors

Angela J. Beck is with the Center of Excellence in Public Health Workforce Studies, Department of Health Management and Policy, School of Public Health, University of Michigan, Ann Arbor. Matthew L. Boulton is with the School of Public Health and the Division of Infectious Disease, School of Medicine, University of Michigan, Ann Arbor.

Correspondence should be sent to Angela J. Beck, PhD, MPH, Department of Health Management and Policy, University of Michigan School of Public Health, 1420 Washington Heights, Ann Arbor, MI 48109 (e-mail: ajbeck@umich.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted September 22, 2014.

Contributors

A. J. Beck was responsible for developing the study design, completing the analysis, interpreting the data, and drafting and revising the article. M. L. Boulton was responsible for assisting with data interpretation and drafting and revising the article.

Acknowledgments

This study was funded by the Robert Wood Johnson Foundation through the National Coordinating Center for Public Health Services and Systems Research at the University of Kentucky.

We acknowledge the Association of State and Territorial Health Officials and the National Association of County and City Health Officials for releasing profile study data for this analysis.

Human Participant Protection

The University of Michigan institutional review board deemed this study as nonresearch.

References

1. Institute of Medicine. *The Future of the Public's Health in the 21st Century*. Washington, DC: National Academies Press; 2003.
2. Gebbie KM. The public health workforce: key to public health infrastructure. *Am J Public Health*. 1999;89(5):660–661.

3. Lichtveld MY, Cioffi JP. Public health workforce development: progress, challenges, and opportunities. *J Public Health Manag Pract*. 2003;9(6):443–450.
4. Merrill J, Btoush R, Gupta M, Gebbie K. A history of public health workforce enumeration. *J Public Health Manag Pract*. 2003;9(6):459–470.
5. Health Resources and Services Administration. *Public Health Workforce: Enumeration 2000*. Rockville, MD: Health Resources and Services Administration; 2000.
6. University of Michigan Center of Excellence in Public Health Workforce Studies. *Public Health Workforce Enumeration, 2012*. Ann Arbor: University of Michigan; 2013. Available at: http://www.sph.umich.edu/cephw/docs/PH_Workforce_Enum_2012.pdf. Accessed May 15, 2014.
7. Beck AJ, Boulton ML, Coronado F. Enumeration of the governmental public health workforce, 2014. *Am J Prev Med*. 2014; 47(5 suppl 3):S306–S313.
8. University of Michigan Center of Excellence in Public Health Workforce Studies and Association of Public Health Laboratories. *National Laboratory Capacity Assessment, 2011: Findings and Recommendations for Strengthening the US Workforce in Public Health, Environmental and Agricultural Laboratories*. Ann Arbor: University of Michigan; 2012. Available at: sph.umich.edu/cephw/docs/Natl_Lab_Cap_Assess2011.pdf. Accessed May 15, 2014.
9. University of Michigan Center of Excellence in Public Health Workforce Studies and Association of Public Health Laboratories. *National Laboratory Capacity Assessment, 2011*. Ann Arbor: University of Michigan; 2012.
10. University of Michigan Center of Excellence in Public Health Workforce Studies. *Enumeration and Characterization of the Public Health Nurse Workforce: Findings of the 2012 Public Health Nurse Workforce Surveys*. Ann Arbor: University of Michigan; 2013.
11. Beck AJ, Boulton ML. Building an effective workforce: a systematic review of public health workforce literature. *Am J Prev Med*. 2012;42(5 suppl 1):S6–S16.
12. Hilliard TM, Boulton ML. Public health workforce research in review: a 25-year retrospective. *Am J Prev Med*. 2012;42(5 suppl 1):S17–S28.
13. Gebbie K, Merrill J, Sanders L, Gebbie EN, Chen DW. Public health workforce enumeration: beware of the "quick fix." *J Public Health Manag Pract*. 2007;13:72–79.
14. Sumaya CV. Enumeration and composition of the public health workforce: challenges and strategies. *Am J Public Health*. 2012;102(3):469–474.
15. University of Michigan Center of Excellence in Public Health Workforce Studies, University of Kentucky Center of Excellence in Public Health Workforce Research and Policy. *Strategies for Enumerating the US Governmental Public Health Workforce*. Rev. ed. Washington, DC: Public Health Foundation; 2012. Available at: http://www.phf.org/resourcestools/Documents/Enumerating_the_Public_Health_Workforce_Revised_Sept_2012.pdf. Accessed May 15, 2014.
16. National Association of County and City Health Officials. *Local Health Department Job Losses and*

Program Cuts: Findings From the 2013 Profile Study. Washington, DC: National Association of County and City Health Officials; 2014. Available at: <http://www.naccho.org/topics/infrastructure/lhdbudget/upload/Survey-Findings-Brief-8-13-13-3.pdf>. Accessed May 15, 2014.

17. Association of State and Territorial Health Officials. *Budget Cuts Continue to Affect the Health of Americans.* Arlington, VA: Association of State and Territorial Health Officials; 2013.

18. Association of State and Territorial Health Officials. *Accountable Care Organizations and Public Health.* Arlington, VA: Association of State and Territorial Health Officials; 2013. Available at: http://www.astho.org/Programs/Access/Primary-Care/_Materials/ACO-and-Public-Health-Fact-Sheet. Accessed May 15, 2014.

19. American Public Health Association. *The Affordable Care Act's Public Health Workforce Provisions: Opportunities and Challenges.* Washington, DC: American Public Health Association; 2011.

20. Association of State and Territorial Health Officials. *ASTHO Profile of State Public Health: Volume Three.* Arlington, VA: American Public Health Association; 2014.

21. National Association of County and City Health Officials. *2013 National Profile of Local Health Departments.* Washington, DC: National Association of County and City Health Officials; 2014. Available at: <http://www.naccho.org/topics/infrastructure/profile/upload/2013-National-Profile-of-Local-Health-Departments-report.pdf>. Accessed May 15, 2014.

22. Erwin PC, Shah GH, Mays GP. Local health departments and the 2008 recession: characteristics of resiliency. *Am J Prev Med.* 2014;46(6):559–568.

23. Boulton ML, Beck AJ, Coronado F, et al. Public health workforce taxonomy. *Am J Prev Med.* 2014;47(5 suppl 3):S314–S323.