First-Destination Outcomes for 2015–2018 Public Health Graduates: Focus on Employment

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See also Shah, p. 336, and Galea and Vaughan, p. 350.

Objectives. To improve understanding of the future public health workforce by analyzing first-destination employment outcomes of public health graduates.

Methods. We assessed graduate outcomes for those graduating in 2015–2018 using descriptive statistics and the Pearson χ^2 test.

Results. In our analysis of data on 53 463 graduates, we found that 73% were employed; 15% enrolled in further education; 5% entered a fellowship, internship, residency, volunteer, or service program; and 6% were not employed. Employed graduates went to work in health care (27%), corporations (24%), academia (19%), government (17%), nonprofit (12%), and other sectors (1%). In 2018, 9% of bachelor's, 4% of master's, and 2% of doctoral graduates were not employed but seeking employment.

Conclusions. Today's public health graduates are successful in finding employment in various sectors. This new workforce may expand public health's reach and lead to healthier communities overall.

Public Health Implications. With predicted shortages in the governmental public health workforce and expanding hiring because of COVID-19, policymakers need to work to ensure the supply of public health graduates meets the demands of the workforce. (*Am J Public Health*. 2021;111:475–484. https://doi.org/10.2105/AJPH.2020.306038)

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Public health academics has grown rapidly in the past 2 decades at both the undergraduate and graduate levels.[1,2] However, we lack information on postgraduate first-destination employment and educational outcomes of public health graduates. A scoping review found 33 studies or reports since 1993 that included employment or educational outcome data for public health students after graduation.[3] Ten were studies of schools outside the United States, 18 were studies conducted by schools of their own alumni, 14 were studies of subdisciplines of public health (e.g., health communication, global health), 8 focused on either undergraduates or doctoral students, and 16 combined multiple cohorts of graduates (often more than a decade's worth of graduates) into 1 analysis, making the assessment of short- and long-term impacts of degrees on graduates' careers impossible. We have identified only 4 broad, recent, US-based studies, 2 of which are in the gray literature, including the results from the pilot project for this study.[4–7]

An assessment of first-destination outcomes of public health graduates is needed to ensure that there are enough trained public health professionals to fill rapidly changing workforce demands. On the workforce side, researchers have posited that vacancies from retiring governmental public health workers might be filled by the ample supply of recent public health graduates.[8] On the education side, an analysis of first-destination outcomes will help match curricula with workforce needs and identify emerging employment sectors. Trends in public health enrollment have changed, particularly with the increase in graduates at all degree levels. It is important for both academia and practice to know that graduates have a wide choice of employment options, stretching beyond government and into academia and the health care, nonprofit, and for-profit sectors.[6]

In 2016, the Council on Education for Public Health, recognized by the US Department of Education to accredit schools and programs of public health, made changes to their criteria that opened the door to curricula that "center learning around application and translation, giving students the opportunity to apply their . . . knowledge to real-life scenarios and job demands."[9(p3)] Further, schools and programs of public health should "educate the educators, practitioners, and researchers as well as . . . prepare public health leaders and managers."[10(p108)] The public health professional degrees, such as the master of public health degree, are expressly intended to prepare students for public health careers. Determining whether graduates enter the public health workforce and which sectors they join are key parts of evaluating these programs.

In 2014, the Association of Schools and Programs of Public Health (ASPPH) developed data-reporting standards, aligned with the Council on Education for Public Health, to capture the first-destination outcomes of public health graduates within a year after graduation.[11] The data set also includes information on graduates' continued education, fellowships, and other outcomes. We analyzed this new first-destination outcome data set, focusing on employment, to improve our understanding of the future public health workforce.

METHODS

We assessed first-destination employment and educational outcome data reported by members of ASPPH, a membership organization for domestic and international Council on Education for Public Health–accredited schools and programs of public health.[12] We collected first-destination outcome data for 64 592 public health graduates across bachelor's, master's, and doctoral degree programs for the graduating years 2015–2018 (Table 1 and Table A [available as a supplement to the online version of this article at http://www.ajph.org]). This included 9513 graduates from 55 institutions in 2015, 13 588 graduates from 75 institutions in 2016, 20 394 graduates from 112 institutions in 2017, and 21 097 graduates from 111 institutions in 2018. Across the pooled data, 31% of graduates were from bachelor's, 63% from master's, and 7% from doctoral degree programs.

ASPPH collects data on first-destination outcome statuses—employed; employed in a fellowship, internship, or residency; pursuing continued education; not employed but seeking employment; not employed and not seeking employment; and unknown. The statuses were mutually exclusive; respondents were asked to select the response that best described their situation. ASPPH members also report detailed employment information, continuing education information, and public health degree debt.

Individual ASPPH member schools and programs collected data from their graduates and reported to ASPPH. ASPPH offered a core survey instrument to members that was developed in tandem with the data-reporting standards. ASPPH members could also use their own data collection instruments, which may have been in-house surveys or surveys based on other nationally accepted first-destination reporting systems, such as the National Association of Colleges and Employers survey.[13] Members also may have collected information from faculty, social media (e.g., LinkedIn), or elsewhere on the Internet, with the precaution to verify the data collected with these alternative approaches. Consequently, the data can generally be categorized as self-reported graduate outcomes.

Because members have up to 1 year to obtain a first-destination outcome on their graduates, data reported to ASPPH were reported on graduates from the academic years 2014–2015, 2015–2016, 2016–2017, and 2017–2018 (the class of 2014–2015, for example, was defined as graduates from July 1, 2014–June 30, 2015, with the time frame for obtaining an outcome ending in June 2016). We cleaned the data set and standardized it to affirm data-reporting definitions and ensure that survey display logic and skip patterns were adhered to, as well as to identify any incompatibilities in questions individual members asked that may have deviated from the core survey instrument or ASPPH data-reporting standards and definitions.

The data variables included graduate outcome (we refer to this as "first-destination outcome" throughout this article, and this includes employed, pursuing continued education, not employed but seeking employment, etc.), employment type (i.e., full time, part time), employment sector (government, nonprofit, hospital, corporation, etc.), employment sector detail (federal government, local government, etc.), salary, and degree debt. Detailed descriptions of variables and value labels are available in Table D (available as a supplement to the online version of this article at http://www.ajph.org). We calculated descriptive statistics on first-destination outcomes, employment by sector, and employment by sector detail. We also assessed continued education outcomes. We made bivariate comparisons using the Pearson χ^2 test. In further analysis, we focused on the percentage of graduates not employed but seeking employment by area of study, although a number of areas had

TABLE 1— Number and Percentage of Public Health Graduate Respondents by Characteristic and Year Graduated: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Characteristic	2015 (n = 9513), No. (%)	2016 (n = 13 588), No. (%)	2017 (n = 20 394), No. (%)	2018 (n = 21 097), No. (%)	Pooled (n = 64 592), No. (%)
Degree					
Bachelor's	2 184 (23)	3 981 (29)	6 394 (31)	7 150 (34)	19 709 (31)
Master's	6 475 (68)	8 720 (64)	12 673 (62)	12 645 (60)	40 513 (63)
Doctoral	854 (9)	887 (7)	1 327 (7)	1 302 (6)	4 370 (7)
Area of study					
Allied health	431 (5)	891 (7)	1 192 (6)	1 505 (7)	4 019 (6)
Biomedical sciences	120 (1)	150 (1)	292 (1)	465 (2)	1 027 (2)
Biostatistics	443 (5)	576 (4)	862 (4)	923 (4)	2 804 (4)
Environmental sciences	585 (6)	674 (5)	1 091 (5)	929 (4)	3 279 (5)
Epidemiology	1 334 (14)	1 805 (13)	2 516 (12)	2 526 (12)	8 181 (13)
General public health	1 361 (14)	2 984 (22)	5 185 (25)	5 441 (26)	14 971 (23)
Global health	388 (4)	600 (4)	818 (4)	653 (3)	2 459 (4)
Health disparities	12 (0)	24 (0)	67 (0)	31 (0)	134 (0)
Health education/behavioral sciences	1 446 (15)	2 147 (16)	2 719 (13)	2 860 (14)	9 172 (14)
Health informatics	0 (0)	3 (0)	58 (0)	38 (0)	99 (0)
Health policy and management	1 668 (18)	1 820 (13)	2 850 (14)	2 852 (14)	9 190 (14)
Maternal and child health	296 (3)	361 (3)	519 (3)	426 (2)	1 602 (2)
Nutrition	335 (4)	349 (3)	396 (2)	415 (2)	1 495 (2)
Public health practice	295 (3)	358 (3)	562 (3)	502 (2)	1 717 (3)
Other	799 (8)	846 (6)	1 267 (6)	1 531 (7)	4 443 (7)
Reporting institutions					
Unique count of reporting institutions	55	75	112	111	118

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relatively few first-destination outcomes. We cleaned the data and analyzed them in Stata 16.1.[14]

RESULTS

Across all years and 64 592 alumni, general public health was the most common area of study (23% of graduates), followed by health policy and management (14%), health education or behavioral sciences (14%), and epidemiology (13%).

Among a cohort of 55 institutions reporting for each graduating year from 2015 to 2018, reporting of bachelor's degree program graduates increased 62% (from 2184 to 3541), master's degree program graduates increased 21% (from 6475 to 7820), and doctoral degree program graduates increased 6% (from 854 to 903). This was largely driven by an increase in reporting of graduates from the general public health area of study. For bachelor's degree programs, 31% were general public health in 2015, compared with 47% in 2018 ($P \leq .001$). For master's degree programs, 10% were general public health in 2015 and 16% in 2018 ($P \leq .001$). For doctoral degree programs, 3.0% were general public health in 2015, and 4.6% in 2017 ($P = .07$).

Of the reported 64 592 public health graduates, 53 463 (83%) had known first-destination outcomes. This was 71% for bachelor's, 88% for master's, and 92% for doctoral degree programs. We observed differential success in determining first-destination outcomes by institution. For students graduating in 2018, the interquartile range (IQR) for capturing postgraduate outcomes was 80% to 97% for bachelor's (n = 43 institutions), 85% to 97% for master's (n = 110 institutions), and 94% to 100% for doctoral (n = 70 institutions) degree programs. First-destination outcomes are shown in Table 2.

Across all years, 73% of all graduates with reported first-destination outcomes were employed; 15% were enrolled in further education; 5% had a fellowship, internship, residency,

TABLE 2— Number and Percentage of Public Health Graduates by Degree Level and Known First-Destination Graduate Outcome: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Degree	Employed, No. (%)	Fellowship, Internship, Residency, No. (%)	Volunteer or Service Program, No. (%)	Enrolled in Further Study, No. (%)	Not Employed and Not Seeking, No. (%)	Not Employed and Seeking, No. (%)	Total Reported Outcomes, No.	Outcome Unknown, No.
Bachelor's								
2015	880 (65)	27 (2)	8 (1)	350 (26)	8 (1)	79 (6)	1 352	832
2016	1 991 (66)	34 (1)	24 (1)	726 (24)	29 (1)	198 (7)	3 002	979
2017	2 710 (63)	63 (1)	59 (1)	1 163 (27)	30 (1)	305 (7)	4 330	2 064
2018	2 961 (57)	78 (1)	80 (2)	1 623 (31)	26 (0)	452 (9)	5 220	1 930
Master's								
2015	4 294 (77)	324 (6)	14 (0)	690 (12)	26 (0)	231 (4)	5 579	896
2016	6 237 (79)	484 (6)	20 (0)	818 (10)	55 (1)	313 (4)	7 927	793
2017	8 531 (79)	435 (4)	29 (0)	1 314 (12)	80 (1)	474 (4)	10 863	1 810
2018	8 513 (76)	628 (6)	34 (0)	1 393 (12)	126 (1)	457 (4)	11 151	1 494
Doctoral								
2015	617 (78)	118 (15)	1 (0)	35 (4)	6 (1)	9 (1)	786	69
2016	645 (77)	153 (18)	2 (0)	16 (2)	6 (1)	15 (2)	837	51
2017	975 (80)	198 (16)	3 (0)	21 (2)	6 (0)	21 (2)	1 224	104
2018	919 (77)	226 (19)	0 (0)	15 (1)	8 (1)	24 (2)	1 192	107
Total	39 273 (73)	2 768 (5)	274 (1)	8 164 (15)	406 (1)	2 578 (5)	53 463	11 129

volunteer, or service program appointment; 5% were not employed but were seeking employment, and 1% were not employed and were not seeking employment (by choice). Comparing the 2015 and 2018, respectively, graduating years, the percentages of employed graduates by degree level were 65% and 57% for bachelor's ($P \leq .001$), 77% and 76% for master's ($P = .37$), and 79% and 77% for doctoral ($P = .38$). Twenty-six percent of bachelor's degree program graduates were reported as enrolled in further education for graduating year 2015, compared with 31% in 2018 ($P \leq .001$), 12% of master's in 2015 and 2018 ($P = .82$), and 4% versus 1% of doctoral graduates in, respectively, 2015 and 2018 ($P \leq .001$). Not employed but seeking employment was highest for bachelor's degree program graduates at 6% in 2015 and 9% in 2018 ($P \leq .001$), followed by 4% for master's degree program graduates in 2015 and 2018 ($P = .90$), and 1% versus 2% for doctoral degree program graduates in, respectively, 2015 and 2018 ($P = .14$).

Among those with reported full-time employment, we captured employment sector for 26 422 graduates. Employment sector was not reported for fellowships or internships. Overall, 27% of graduates were employed in health care organizations, 24% for-profit organizations, 19% academic institutions, 17% government agencies, 12% nonprofit organizations, and 1% other sectors or self-employed. The distribution of employment sectors varied by degree level (Table 3). Doctoral degree graduates' top employment sectors were academic institutions (42%), for-profit organizations (21%), and government agencies (16%). Master's degree graduates found employment in health care organizations (29%), for-profit organizations (21%), government agencies (19%), and academic institutions (18%). Bachelor's degree graduates were different from both doctoral and master's degree graduates, with for-profit

TABLE 3— Number and Percentage of Full-Time Employed Public Health Graduates by Degree Level and Known Employment Sector: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Employment Sector	Bachelor's Degree, No. (%)	Master's Degree, No. (%)	Doctoral Degree, No. (%)	Total, No. (%)
Academic institution	507 (10)	3479 (18)	947 (42)	4933 (19)
Academic	493 (10)	3248 (17)	894 (40)	4635 (18)
Other	14 (0)	231 (1)	53 (2)	298 (1)
For-profit organization	1905 (38)	3978 (21)	467 (21)	6350 (24)
Consulting	240 (5)	1359 (7)	95 (4)	1694 (6)
Health information technology	70 (1)	287 (1)	31 (1)	388 (1)
Insurance	82 (2)	324 (2)	14 (1)	420 (2)
Other	1513 (30)	2008 (10)	327 (15)	3848 (15)
Government agency	518 (10)	3748 (19)	357 (16)	4623 (17)
Federal	141 (3)	834 (4)	175 (8)	1150 (4)
Local	175 (4)	985 (5)	37 (2)	1197 (5)
Other	75 (2)	800 (4)	76 (3)	951 (4)
State	124 (2)	1106 (6)	67 (3)	1297 (5)
Tribal	3 (0)	23 (0)	2 (0)	28 (0)
Health care organization	1351 (27)	5488 (29)	266 (12)	7105 (27)
Hospital	452 (9)	3039 (16)	126 (6)	3617 (14)
Other	899 (18)	2449 (13)	140 (6)	3488 (13)
Nonprofit organization	596 (12)	2401 (12)	182 (8)	3179 (12)
Other	569 (11)	2271 (12)	173 (8)	3013 (11)
Trade association	27 (1)	130 (1)	9 (0)	166 (1)
Other employment sector	64 (1)	61 (0)	10 (0)	135 (1)
Self-employed	23 (0)	68 (0)	6 (0)	97 (0)
Total known sector	4964	19 223	2235	26 422
Unknown sector	369	874	65	1308

organizations (38% overall, with 30% of all undergraduates finding employment in for-profit corporations outside consulting, health information technology, and insurance) being the top employment sector, followed by health care organizations (27%), nonprofit organizations (12%), and government agencies and academic institutions, each at 10%.

Table 4 shows the proportion of alumni with known first-destination outcomes, excluding those enrolled in further education, who were not employed but were seeking employment by degree level and area of study. A higher than average proportion of graduates sought employment in certain areas of study. At the bachelor's degree level, maternal and child health (19%) and allied health, nutrition, and public health practice (each at 11%) had higher than the average of 10% not employed but seeking employment. At the master's level, health disparities (13%), nutrition (11%), global health (8%), environmental sciences (6%), and biomedical sciences (6%) were higher than the average (5%). At the doctoral level, the areas of study above the average (2%) were nutrition (4%) at the highest, followed by general public health, health education and behavioral sciences, biomedical sciences, global health, and maternal and child health (all at 3%).

Salary data were reported for 9857 full-time employed graduates. The data were reported as absolute values and are presented in ranges in Table B (available as a supplement to the online version of this article at http://www.ajph.org). The median salary among bachelor's degree graduates who were employed full time was $36 000 (IQR = $30 000–$46 000). For full-time employed master's degree graduates, the median salary was $58 000 (IQR = $45 000–$73 000), and for doctoral degree graduates, it was $80 000 (IQR = $55 000–$101 000).

Public health degree debt was captured consistently among those who reported debt, although it was not captured consistently regarding whether a graduate had debt. Consequently, we were able to examine debt levels only for the 6451 responses with reported debt loads (Table C, available as a supplement to the online version of this article at http://www.ajph.org). Among 1574 bachelor's degree program graduates with any debt, 55% had $25 000 or more debt, as did 80% of 4521 master's degree program graduates and 73% of 356 doctoral degree program graduates. Overall, 44% of graduates with reported debt had more than $50 000 in debt and 10% had more than $100 000 (comprising 3% of bachelors, 12% of master's, and 24% of doctoral graduates).

TABLE 4— Number and Percentage of Public Health Graduates Not Employed but Seeking Employment by Degree Level and Area of Study: Association of Schools and Programs of Public Health Members, Pooled for Graduating Years 2015–2018

Area of Study	Bachelor's Degree, No (%)	Master's Degree, No (%)	Doctoral Degree, No (%)
Allied health	145 (11)	25 (5)	3 (2)
Biomedical sciences	0 (0)	25 (6)	4 (3)
Biostatistics	0 (0)	45 (3)	2 (0)
Environmental sciences	12 (5)	109 (6)	8 (2)
Epidemiology	1 (9)	259 (5)	12 (1)
General public health	373 (9)	151 (3)	5 (3)
Global health	5 (6)	134 (8)	6 (3)
Health disparities	. . .	12 (13)	. . .
Health education/behavioral sciences	138 (8)	251 (5)	15 (3)
Health informatics	. . .	2 (2)	. . .
Health policy and management	28 (9)	265 (4)	6 (1)
Maternal and child health	46 (19)	43 (5)	2 (3)
Nutrition	18 (11)	66 (11)	3 (4)
Public health practice	13 (11)	40 (4)	0 (0)
Other	255 (17)	48 (3)	3 (2)
Total	1034 (10)	1475 (5)	69 (2)

Note. The table excludes respondents who reported they were enrolled in further study.

DISCUSSION

First-destination outcomes for public health graduates, particularly employment outcomes, are a key metric in assessing the supply and demand equation of the public health workforce. Graduates' first-destination outcomes provide academia insight into changes in the job market, which may then inform decisions on the degrees and areas of study an institution offers. If first-destination outcome data show changes in employment trends in an area of study, schools and programs of public health may alter their courses and curricula to align with these trends. A school's or program's ability to prepare graduates with the competencies demanded by the workforce may help ensure student success, not only in finding employment that uses their education but also in finding career satisfaction. Further, as public health responds to the COVID-19 pandemic, new competencies may be needed to address such crises.

The variability in employment outcome by area of study is consistent with previous research. It is not surprising that biostatistics graduates have the lowest rates of unemployment, considering that statistics is the eighth fastest-growing occupation in the United States.[15] Global health graduates, on the other hand, have higher than average rates of job seeking, consistent with another study.[16] Higher job seeking in global health graduates may be attributable to current job openings in the field requiring more extensive experience than most recent graduates have.[17]

Employment by degree level shows that graduates with advanced public health degrees had better employment outcomes, similar to findings of a national data collection by the National Association of Colleges and Employers.[5] This study shows that first-destination employment outcomes of public health doctoral graduates are more favorable than had been reported in another study, in which data were collected before or upon graduation.[18] However, questions remain regarding whether bachelor's degree graduates are competing for the same jobs as master's degree graduates. This study does show that there are differences in employment sectors by degree level, however; an analysis of employer requirements may elucidate the answer further. In addition, there may be demand for different education formats to replace or bolster formal degrees (certifications, micromasters, etc.) that increase the number of public health workers with needed competencies.

Governmental public health remains a key necessity for communities, nations, and the world, as shown in the COVID-19 response. Filling new or vacated government public health positions is crucial.[8] However, although there has been an increase in bachelor's degree graduates, they do not seem to be filling governmental vacancies at high rates. Historically, master's and doctoral degree graduates have entered governmental public health at higher rates. A study analyzing 2404 public health graduates from 1978 and 1979 showed that 52% of graduates found employment in government,[19] and in a 1992 longitudinal study of 2429 graduates, 42% of graduates in the classes of 1956–1965 found their first-destination employment in health departments, whereas 17% of the classes of 1976–1985 began their careers in health departments.[20]

If government agencies wish to recruit public health graduates, recent literature suggests they may need to reassess hiring practices to recruit enough trained candidates.[21,22] Even if only a small minority of current governmental public health employees have degrees in public health[23]—although it could be argued that this is also an indicator of underfunding—if there is a workforce shortage, it is uncertain whether there will be enough public health graduates who will enter government agencies to fill the gap. This potential workforce mismatch should be explored further.[24]

Although it is too soon to know how the COVID-19 pandemic will affect the class of 2020, the hardest hit employment sectors (e.g., restaurant, travel, entertainment, and retail) are less likely to employ public health graduates,[25] although furloughs and layoffs in the public sector have begun.[26] Additionally, health care systems across the country have been laying off staff, although health care, science, technology, engineering, and mathematics occupations may have smaller numbers of jobs at risk for layoffs.[27] Overall, sharp declines in job postings, including for statisticians and other highly skilled professionals, in geographic areas most affected by COVID-19 are concerning.[28]

There may be new opportunities related to pandemic response, such as epidemiology and contact-tracing efforts.[29,30] Occupations that were growing quickly before the pandemic, such as data analytics, may continue to grow.[31] However, informal surveys of college recruiters (not specific to public health; n = 246) show that 7.8% to 9.0% have rescinded job offers and 31.0% delayed start dates for full-time hires.[32] Anecdotally, informal discussions with career service professionals from several public health schools indicate that

2020 graduates appear to be employed at rates similar to those of previous years. For both traditional public health roles and new COVID-19–related positions, graduates appear to be more flexible about the roles they will accept. Regardless of what we now know about the workforce, recalibration may be necessary after the current pandemic.

Return on investment in higher education is a much-discussed topic that may play a larger part in explaining the vocational decisions of graduates. A recent study found

> a net benefit in career outcomes associated with a public health master's degree, although . . . some other master's degrees likely offer greater lifetime earning potentials or lower lifetime debt associated with degree attainment.[7(p1)]

A future analysis of this data set may identify salary differentials among employment sectors and the possible impact of degree debt on vocational choice—perhaps showing graduates with higher debt choosing fields with higher salaries.

Overall, a study of the longitudinal career paths of public health graduates would illuminate the longer-term earnings of public health professionals. Such career path studies would also show whether public health graduates gain government experience at some point in their careers, whether they are moving to higher-paying sectors earlier to pay off debt, whether new and different employers are seeking graduates with public health skills, and the impact of the COVID-19 pandemic on graduates' careers.

Limitations

This study has several limitations of note. The data we analyzed were collected by more than 100 institutions during the first 4 years of ASPPH members reporting graduates' first-destination outcomes. The decentralized approach to first-destination outcomes reporting allows institutions to customize their collection methods, creating possible hard-to-detect issues with standardization. Therefore, we used rigorous data cleaning and member data checking to identify data issues, although data-reporting issues may remain. For instance, we found that some institutions reported unknown graduate debt levels as 0, whereas other institutions reported no debt levels at 0 and unknown debt levels as missing. Additionally, some institutions relied on graduate self-reporting of debt, and even when asked about "public health degree debt," some graduates may have reported all educational debt (including from previous degrees). Relatedly, there are several areas that have high levels of unknown or missing data. About 80% of records had associated graduate outcomes for graduating in 2017, and 83% in 2018.

Of note, 2017 was the first year that all members of ASPPH reported graduate outcomes across all public health degrees. Certain members have higher levels of unknown or missing data; this is problematic as an internal validity consideration. This is particularly the case for bachelor's degree graduates' data, which have greater levels of unknown outcomes. We have analyzed multiple years and examined outcomes by institution (some institutions may have more resources than others for complex data collection on alumni). Sensitivity analyses, excluding institutions with lower reported outcome rates, did not appear to change national estimates. Consequently, generalizability is not implicated, although greater precision would be achieved with higher levels of reporting. Another caveat with these data is that previous work experience of the graduates is not known. Additionally, we did not directly clarify the factors influencing the career decisions of public health graduates, including salary, debt, or previous internship experience. Finally, employment sector data were not collected for graduates entering into fellowship, internship, or residency programs, which might change the percentages entering certain sectors, along with the salary data, for sectors that rely more heavily on fellowships for recruitment.

Public Health Implications

Postgraduate first-destination employment and educational outcomes of public health graduates have important implications for public health policy and practice. Especially now, public health has an unprecedented opportunity to affect the health and well-being of populations via different employment sectors. Governmental public health has long experienced a workforce shortage owing to underfunding,[8] but research has shown that public health graduates experience barriers to employment in the sector.[22] This new study, showing that only 17% of graduates enter government work, underscores the need for continued policy efforts to increase funding to and encourage employment in the government sector.

Employment data indicate that public health graduates are entering employment sectors at different rates than historical data show and potentially expanding public health's impact—whether these graduates are contributing to the 10 essential services of public health in an obvious way[33] or advancing the sustainable

developmental goals and innovating with new technologies for the well-being of diverse populations. With the COVID-19 pandemic, new opportunities for employment may be on the horizon as government, businesses, and communities continue to respond and change their practices.

In addition, with the growth and changes in public health degree programs, it is important to know which areas of study are achieving the best employment outcomes, identify which sectors are recruiting these graduates, and help schools and programs of public health communicate their impact to prospective students, employers, and those who support their educational missions. With more focus on public health and more students studying public health, there will be a better-educated citizenry who "understand and appreciate public health and value its contributions to their lives."[34(p428)] With more graduates embarking on careers both in and outside the traditional public health workforce and being engaged citizens, public health graduates are ready to "[embrace] health as a value worth pursuing and protecting," which may then lead to healthier communities overall.[35(p200)] AJPH

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

We have reported all data in aggregate with no identifiers; therefore, the Association of Schools and Programs of Public Health determined that this study is not human participant research.

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