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FEMALES AND MINORITY RACIAL/ETHNIC GROUPS REMAIN UNDERREPRESENTED IN EMERGENCY MEDICAL SERVICES: A TEN-YEAR ASSESSMENT, 2008–2017

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ABSTRACT

Background: Workforce diversity can reduce communication barriers and inequalities in healthcare delivery, especially in settings where time pressure and incomplete information may exacerbate the effects of implicit biases. Emergency medical services (EMS) professionals represent a critical entry point into the healthcare system for diverse populations, yet little is known regarding changes in the demographic composition of this workforce. Our primary objective was to describe the gender and racial/ethnic composition of emergency medical technicians (EMTs) and paramedics who earned initial National EMS Certification from 2008 to 2017. Secondarily, we compared demographic characteristics of the 2017 EMT and paramedic cohorts to the U.S. population. **Methods:** As a proxy for recent graduates likely to enter the workforce, we conducted a serial cross-sectional analysis of all EMTs

and paramedics earning initial National EMS Certification from January 1, 2008 to December 31, 2017. Cuzick's non-parametric test of trend was used to assess for changes in the gender and racial/ethnic composition of the EMS cohorts over time. For 2017, we calculated differences the gender and racial/ethnic composition of the EMT and paramedic cohorts to the U.S. population, stratifying by Census region. **Results:** The study population included 588,337 EMTs and 105,356 paramedics. The proportion of females earning initial EMT certification rose from 28% in 2008 to 35% in 2017. Throughout the study period, less than one-fourth of newly certified paramedics were female (range: 20–23%). The proportion of EMS professionals identifying as black remained near 5% among EMTs and 3% among paramedics. The proportion of newly-certified Hispanic EMS professionals rose from 10% to 13% among EMTs and from 6% to 10% among paramedics. Compared to the U.S. population, females and racial/ethnic minorities were underrepresented among EMTs and paramedics earning initial certification and these representation differences varied across geographic regions. **Conclusions:** The underrepresentation of females and minority racial/ethnic groups observed during this 10-year investigation of EMTs and paramedics earning initial certification suggests that EMS workforce diversity is unlikely to undergo substantial change in the near future. The representation gaps were larger and more stable among paramedics compared to EMTs and suggest an area where concerted efforts are needed to encourage students of diverse backgrounds to pursue EMS. **Keywords:** emergency medical services; diversity; health equity; emergency medical technician; paramedic

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R.P. Crowe was responsible for the study conceptualization and design, literature review, data analysis, and manuscript development. W. Krebs was responsible for the literature review and manuscript development. R.E. Cash was responsible for the data analysis and manuscript development. M.K. Rivard was responsible for the manuscript development. E.W. Lincoln was responsible for the literature review and manuscript development. A.R. Panchal was responsible for the manuscript development. All authors have made significant contributions to this study and have approved the final version of this manuscript.

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BACKGROUND

An increasingly diverse U.S. population, in combination with well-documented health disparities among racial and ethnic minority groups, has led to greater focus on the demographic composition of the healthcare workforce as a mechanism to advance health equity across the nation (1). Benefits of a diverse healthcare provider workforce include reduced language, cultural, and other communication barriers that lead to reduced inequalities in the delivery of care (2, 3). Among physicians, higher levels of racial concordance between provider and patient have been linked to

improved patient involvement in care, greater satisfaction, and better health-related outcomes (4). Furthermore, physician-patient gender concordance has been associated with increased trust and provision of preventative screenings and services to patients (5, 6). The converse is also true as implicit biases, which involve cultural stereotypes that may not be consciously endorsed, can lead providers to unintentionally make decisions that perpetuate healthcare disparities (7). Another challenge facing healthcare providers is that uncertainty and time pressure during care delivery may exacerbate the effects of unconscious biases on clinical decision-making (8–11). Providing care in the prehospital setting frequently presents situations where information is limited and time pressure is high, which suggests that having a diverse workforce of emergency medical services (EMS) professionals could have important effects for improving health equity.

In the U.S., EMS professionals respond to more than 28 million emergency calls annually and often serve as a safety net for those with limited access to healthcare (12). Providing care to acutely ill and injured patients in the uncontrolled prehospital environment inherently exposes providers to high cognitive demands, incomplete information, and time pressure (13). These demands may increase susceptibility to stereotypes and biases that impact clinical decisions and lead to disparities in care (14). The EMS Workforce for the 21st Century report published in 2008 stated that the EMT/paramedic workforce was not representative of the population served in terms of gender and race/ethnicity and called for efforts to increase diversity among this population of healthcare professionals (15). Nevertheless, only demographic characteristics of EMS professionals who held national EMS Certification in 2007 were assessed and the report did not describe the potential effects of the pipeline of recently-graduated EMS professionals.

Little is known regarding how the gender and racial/ethnic diversity of those entering the EMS workforce has changed. Examining and understanding trends in representation of gender and racial/ethnic groups in EMS over time is a first step toward identifying the need for and developing initiatives to improve diversity among this critical healthcare workforce. Thus, the primary objective of this study was to describe the gender and racial/ethnic composition of EMS professionals who earned initial National EMS Certification between 2008 and 2017. The secondary objective was to quantify differences in representation of females and people of racial and ethnic minority

groups among newly nationally-certified EMS professionals compared to the 2017 U.S. population estimates.

METHODS

Study Design, Population, and Data Source

We sought to identify a population of EMS professionals that would be representative of those recently graduating from education programs as an early indicator of anticipated changes in the demographic composition of the workforce. Currently, there is no database of every EMS professional earning initial licensure to practice in the United States. Estimates from the U.S. Census Bureau's Current Population Survey are limited in their utility as EMTs and paramedics are grouped together, volunteers are omitted, and there is no way to discern firefighters who are cross-trained as EMS professionals (16). For this study, we selected the National EMS Certification database, administered by the National Registry of Emergency Medical Technicians (NREMT). National EMS Certification is currently part of the prerequisites for obtaining EMS licensure at one or more certification levels in 46 states and the District of Columbia (17). The NREMT administers more than 100,000 National EMS Certification examinations annually and there are nationally-certified EMS professionals in every state, covering urban and rural settings (17).

Upon graduation from an EMT or paramedic education program, candidates must complete the National EMS Certification process within 24 months of initial course completion. To earn National EMS Certification, candidates must successfully complete a cognitive computer adaptive test and a psychomotor examination. We selected the population of EMTs and paramedics earning initial National EMS Certification for the first time to serve as a proxy for recent graduates likely to enter the EMS workforce. Demographic characteristic among recent graduates likely serve as an early indication of change to come in the composition of the EMS workforce. Candidates attempting the National EMS Certification examination as part of the requirements to regain or renew certification were excluded.

We queried the National EMS Certification database for every EMS professional who earned initial National EMS Certification at the emergency medical technician (EMT) or paramedic levels between January 1, 2008 and December 31, 2017. This project was deemed exempt by the

institutional review board at the American Institutes for Research.

Measures

Demographic information was obtained from the National EMS Certification database. At the time of completing an application to test for National EMS Certification, candidates are asked to fill out a profile that includes demographic characteristics via the NREMT website. At the time of this study, the “Demographic Information” section of the profile, asked candidates to select their “sex” from a drop-down list consisting of “male” or “female.” Candidates could also choose to refrain from answering this item. While the word “sex” refers to a person’s biological sex assigned at birth, gender refers to how individuals perceive and express themselves (18). A person’s gender may differ from their sex; however, no definition was provided with the profile item and respondents may have selected their gender rather than their sex or vice versa. In terms of concordance between healthcare provider and patient, a provider’s gender likely has the most impact on communication since this is what the patient can observe, and we used responses to the profile item as a proxy for gender in our analyses.

Race/ethnicity data were collected using methods similar to those utilized by the 2010 Census. Candidates were first asked to indicate whether or not they identify as Hispanic or Latino and a second item asked candidates to select the race or races that they identify as. The following response options were presented and candidates were able to select multiple options: American Indian or Alaskan Native; Asian; Black; Native Hawaiian or Other Pacific Islander; White. Sex, race, and ethnicity fields are not mandatory. For purposes of analysis, those who selected non-Hispanic and white only were grouped as white. Those who identified as non-Hispanic and selected black only were grouped as black. The Hispanic group consisted of those who identified as Hispanic or Latino and selected a single race. Those who selected any other racial group and those who identified as bi-racial or multi-racial were grouped into a category titled “other” as small sample sizes would likely preclude meaningful inference among further subgroups.

Analysis

For each year in the study period, we calculated descriptive statistics for gender (male/

female) and race/ethnicity (white; black; Hispanic; or other) for each certification level cohort (EMT/paramedic) annually. Available case analysis was used to handle missing data. Cuzick’s non-parametric test for trend was used to assess for increases or decreases in the proportion of female providers and providers of a minority racial/ethnic group (black, Hispanic, or other) between 2008 and 2017 (19). An alpha level of 0.05 was used to determine statistical significance. For 2017, we descriptively compared demographic characteristics of the EMT and paramedic cohorts to the U.S. one-year population estimates from the 2017 American Community Survey (20). We calculated the percent difference from the U.S. population for the EMT and paramedic cohorts, stratified by U.S. Census Region using the following formula: $|N1 - N2| / [(N1 + N2) / 2]$ where N1 refers to the proportion in one group of interest (the U.S. population or the EMS population) and N2 refers to the proportion in the second group involved in the comparison. For example, in the comparison of newly-certified EMTs who identified as black to the U.S. population, N1 would refer to the proportion of the U.S. population that identified as black and N2 would refer to the proportion of newly-certified EMTs who identified as black. It should be noted that the use of absolute value in the numerator of this formula means that the order in which each population is assigned will not influence the results (i.e., the US proportion could be assigned to N1 and the EMS proportion to N2 and vice versa). Due to the large size of the 2017 U.S. population estimates, the 2017 EMT cohort, and the 2017 paramedic cohort, we did not perform statistical comparative testing, which would likely result in statistically significant differences for all comparisons, while practical relevance for the observed differences may not exist. All analyses were carried out using Stata/IC Version 15 (StataCorp, LLC; College Station, TX).

RESULTS

A total of 588,337 EMTs and 105,356 paramedics earned initial National EMS Certification from 2008 to 2017. The annual number of EMTs that earned initial certification ranged from 54,423 in 2008 to 64,846 in 2017 (Table 1). The annual number of paramedics earning initial certification ranged from 9,611 in 2008 to 10,854 in 2017 (Table 1). The proportion of females earning initial EMT certification rose from 28% to 35% between 2008 and 2017. In 8 out of 9 of the year-to-year comparisons the proportion

TABLE 1. EMT and paramedic cohorts who earned initial National EMS Certification annually from 2008 to 2017, stratified by gender and race/ethnicity

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
EMT (N)	54,423	59,967	61,891	56,115	52,912	56,950	57,922	59,025	64,286	64,846
Gender										
Female (%)	28	27	28	30	30	31	33	34	35	35
Male (%)	72	73	72	70	70	69	67	66	65	65
Missing (N)	4,567	4,199	4,571	4,541	4,551	6,996	7,766	7,726	9,490	10,387
Race/ethnicity										
White (%)	78	77	77	77	76	76	75	75	74	73
Black (%)	5	5	5	4	5	4	4	4	5	5
Hispanic (%)	10	10	10	12	12	12	12	12	13	13
Other (%)	7	8	8	7	8	8	8	9	9	8
Missing (N)	3,786	3,093	3,141	3,656	3,746	5,638	6,681	7,097	10,184	19,512
Paramedic (N)	9,611	10,125	10,634	10,744	11,066	10,981	10,667	10,375	10,299	10,854
Gender										
Female (%)	21	21	21	20	21	21	21	22	22	23
Male (%)	79	79	79	80	79	79	79	78	78	77
Missing (N)	613	505	477	296	240	278	330	531	626	799
Race/ethnicity										
White (%)	87	85	86	85	85	84	83	83	82	81
Black (%)	2	3	3	3	2	3	3	3	3	3
Hispanic (%)	6	7	7	7	7	8	9	10	10	10
Other (%)	4	5	4	4	5	5	5	5	5	5
Missing (N)	401	364	293	251	251	294	328	353	483	682

EMT = emergency medical technician; EMS = emergency medical services.

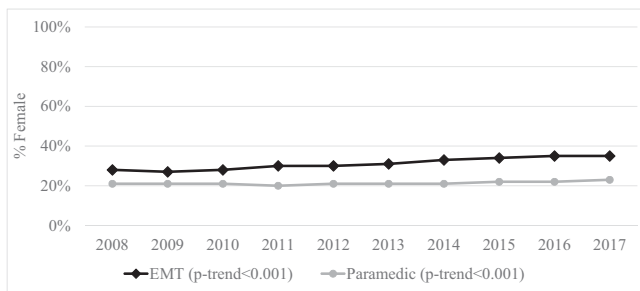


FIGURE 1. Gender distribution of EMTs and paramedics who earned initial National Emergency Medical Services (EMS) Certification annually from 2008 to 2017.

of female EMTs increased (Figure 1). The test for a monotonic increase in the proportion of females earning EMT certification was statistically significant (p -trend < 0.001). Meanwhile, the proportion of females earning initial paramedic certification was 21% in 2008 and rose to 23% in 2017. There was an increase in 3 of the 9 year-to-year comparisons and each increase was equal to one percentage point or less (Figure 1). While the test for trend was statistically significant (p -trend < 0.001), the absolute increase was less than 2 percentage points over the 10-year period.

The proportion of newly nationally-certified EMTs belonging to a minority racial/ethnic group

rose from 22% to 27% between 2008 and 2017. Paramedics from minority racial/ethnic groups comprised 13% of the population in 2008 and 19% in 2017. The proportion of EMS providers identifying as black remained near 5% of the EMT cohort and 3% of the paramedic cohort throughout the 10-year study period. Meanwhile, the proportion of newly-certified Hispanic EMTs rose from 10% to 13% and the proportion of newly-certified Hispanic paramedics rose from 6% to 10% (Figure 2).

Next, we assessed changes in the racial/ethnic composition of EMTs and paramedics earning initial certification by gender (Table 2). A slightly higher proportion of males identified as Hispanic in each study year, yet the rate of growth was higher for Hispanic females. The proportion of female EMTs who identified as Hispanic grew by 5 percentage points, representing a 71% increase between 2008 and 2017 (Table 2). Similarly, the proportion of female paramedics who identified as Hispanic doubled from 4% to 8% (Table 2). For both EMTs and paramedics, the proportion of males and females who identified as black was similar throughout the study period.

To assess how the racial/ethnic diversity of the EMS workforce compares to the diversity of the population served, we compared the cohort of

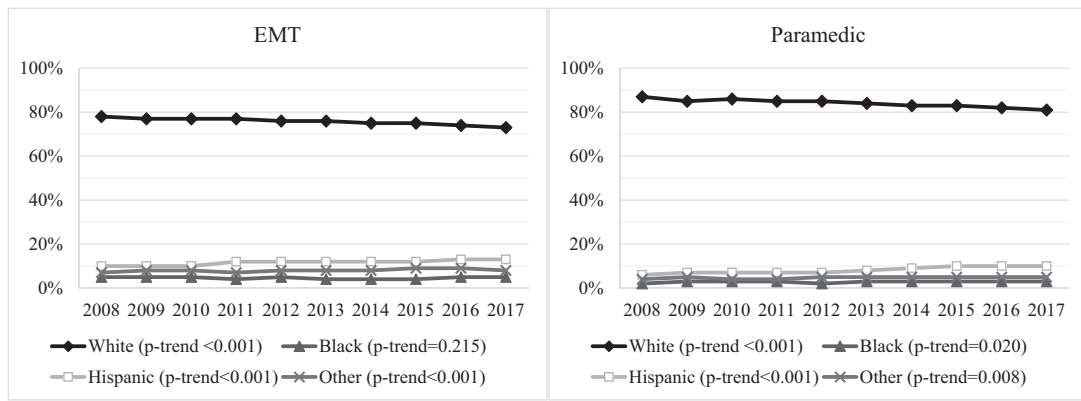


FIGURE 2. Racial/ethnic composition of emergency medical technician (EMT) and paramedic cohorts who earned initial National Emergency Medical Services (EMS) Certification annually from 2008 to 2017.

TABLE 2. Race/ethnicity of EMT and paramedic cohorts who earned National EMS Certification annually from 2008 to 2017, stratified by gender

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
EMT										
Female										
White (%)	81	79	80	79	78	77	77	77	75	74
Black (%)	5	5	5	4	5	4	4	4	5	5
Hispanic (%)	7	8	8	9	9	10	10	10	11	12
Other (%)	7	8	8	7	8	9	9	9	9	9
Male										
White (%)	78	77	77	77	75	76	75	74	73	73
Black (%)	4	5	4	4	4	4	4	4	5	5
Hispanic (%)	11	11	11	12	13	13	13	13	14	14
Other (%)	7	7	7	7	8	8	8	8	8	8
Paramedic										
Female										
White (%)	89	87	88	88	87	87	86	85	85	85
Black (%)	3	3	3	2	3	3	3	3	2	2
Hispanic (%)	4	5	5	5	6	6	7	8	8	8
Other (%)	4	5	4	4	4	5	5	4	5	5
Male										
White (%)	86	85	86	85	85	83	83	82	81	80
Black (%)	2	3	3	2	2	3	2	3	3	3
Hispanic (%)	7	8	7	8	8	9	10	10	11	12
Other (%)	5	5	5	5	5	5	5	5	5	6

EMT = emergency medical technician; EMS = emergency medical services.

EMTs and paramedics who earned initial National EMS Certification in 2017 to the American Community Survey estimates for the U.S. population for the same year by Census region (Table 3). In all regions, newly-certified EMTs and paramedics who identified as black and those who identified as Hispanic were underrepresented compared to the U.S. population. In the West region, there were 67% fewer EMTs who identified as black compared to the U.S. population (2% vs. 4%, respectively). In the Northeast, there were 93% fewer EMTs who

identified as black compared to the U.S. population (4% vs. 11%). The same trend was present for the paramedic cohort with black persons being underrepresented by 67% in the West (2% vs. 4%) and by 138% in the Northeast (4% vs. 11%). Newly-certified EMTs and paramedics who identified as Hispanic were most underrepresented in the Northeast by 86% and 100%, respectively. The gaps in representation for EMTs and paramedics identifying as Hispanic were smallest in the South and West regions (Table 3).

TABLE 3. Race/ethnicity composition of EMT and paramedic cohorts who earned initial National EMS Certification compared to the U.S. population composition in 2017, stratified by census region

Race/Ethnicity	Census Region			
	West	Midwest	South	Northeast
White				
2017 U.S. Population (35), %	50	76	57	65
2017 EMT Cohort, % (% difference from U.S. population)*	64 (25)	87 (13)	71 (22)	82 (23)
2017 Paramedic Cohort, % (% difference from U.S. population)*	71 (35)	91 (18)	80 (34)	90 (32)
Black				
2017 U.S. Population (35), %	4	10	19	11
2017 EMT Cohort, % (% difference from U.S. population)*	2 (67)	4 (86)	9 (71)	4 (93)
2017 Paramedic Cohort, % (% difference from U.S. population)*	2 (67)	3 (108)	4 (130)	2 (138)
Hispanic				
2017 U.S. Population (35), %	30	8	18	15
2017 EMT Cohort, % (% difference from U.S. population)*	21 (35)	4 (67)	14 (25)	6 (86)
2017 Paramedic Cohort, % (% difference from U.S. population)*	19 (45)	3 (91)	11 (48)	5 (100)
Other				
2017 U.S. Population (35), %	16	6	6	9
2017 EMT Cohort, % (% difference from U.S. population)*	13 (21)	5 (18)	6 (0)	8 (12)
2017 Paramedic Cohort, % (% difference from U.S. population)*	8 (67)	3 (67)	5 (18)	3 (100)

EMT = emergency medical technician; EMS = emergency medical services.

*% difference calculated as: $|N1 - N2| / [(N1 + N2) / 2]$ where N1 refers to the proportion among the first group in the comparison and N2 refers to the proportion among the second group in the comparison.

DISCUSSION

Using the largest available database of recently-graduated EMS professionals in the United States, we found that females and people from minority racial/ethnic groups were underrepresented among newly-certified EMTs and paramedics throughout the 10-year study period. While some changes were observed over the last 10 years, the diversity of EMS professionals earning initial certification does not reflect the diversity of the population served. Furthermore, since newly-certified EMS professionals can be viewed as a proxy for recent graduates entering the workforce, the magnitude of changes observed among these newly-certified EMS professionals suggests that the overall diversity of the EMS workforce is unlikely to undergo substantial change in the near future.

Previous survey-based analyses of EMS workforce diversity have grouped providers certified at the paramedic and EMT levels together (21). Meanwhile, the present study highlighted important differences in diversity gaps between provider levels. More concerning, we found that the gender and racial/ethnic composition gaps were more pronounced and changed at a slower rate among paramedics compared to EMTs. Because paramedics provide more critical invasive interventions compared to EMTs and make complex, time-sensitive decisions regarding care, the wider gap among EMS professionals certified at the paramedic level could have a greater negative impact on communication with patients and health outcomes (22, 23). For

example, disparities in pain management have been noted in the prehospital setting with consistent findings indicating that patients of racial and ethnic minority groups are less likely to receive pain medications by EMS compared to non-Hispanic white patients (24, 25). Racial/ethnic diversity in the healthcare workforce has been correlated with improved cultural competence, reduced communication barriers and improved delivery of quality care to minority patient populations (26, 27). Increasing the presence of underrepresented groups in the EMS workforce may help expand awareness of the effects of unconscious biases, heighten cultural awareness, and reduce treatment disparities in the prehospital setting.

Compared to the 2017 U.S. population estimates, those belonging to minority racial/ethnic groups remained underrepresented among those earning initial EMT and paramedic certification; however, the proportion of EMTs and paramedics who identified as Hispanic showed the fastest rate of growth. Meanwhile, the proportion of EMTs and paramedics identifying as black was relatively unchanged over the 10 years. We also observed geographic variations in the level of underrepresentation. Compared to the U.S. population, newly-certified EMTs and paramedics who identified as black or Hispanic were most underrepresented in the Northeast region.

Efforts to increase diversity among healthcare professionals are increasing on a national scale, yet few have specifically targeted EMS. Key recommendations from the Institute of Medicine's landmark study, "Unequal Treatment: Confronting Racial and

Ethnic Disparities in Health Care” include undertaking efforts to increase the proportion of underrepresented minority groups in the healthcare workforce and integrating greater cross-cultural education in healthcare training greater programs (1, 28). Medical schools have undergone largescale efforts to increase diversity, including the holistic review process, and have seen an increase in enrollment among students from underrepresented groups in medicine (29, 30). Other student pipeline and internship programs, like those supported by the Office of Minority Health and Health Equity at the Centers for Disease Control and Prevention, are being used to enhance recruitment of underrepresented groups in healthcare and public health (31). The findings of our study suggest that the impacts of these concerted efforts in other healthcare professions have not made their way to EMS. While local efforts to improve diversity among EMS professionals exist and have been successful, coordinated national efforts are needed (32, 33). Examples of direct and indirect practices that could lead to increased recruitment of a more diverse workforce of EMS professionals include partnerships with schools and community engagement activities that involve youth activities and classes (33).

Limitations to this study include the inability to evaluate providers who graduated from EMS programs and directly obtained a state license without earning National EMS Certification. Nevertheless, it is unlikely that a systematic difference would exist in the gender or racial/ethnic composition of graduates who obtain National EMS Certification versus those who do not, particularly when variation due to geographic Census region is taken into account as in the analysis of 2017 data in this study. We were also unable to discern EMS professionals who earned National EMS Certification and did not apply for a state license to practice or never obtained a job in EMS.

The potential for information bias exists as sex and race/ethnicity data were not available for all newly-certified EMTs and paramedics as completing this field was not mandatory in the application process for National EMS Certification. Previous research among the nationally-certified EMS population suggests that missing data may be more common among minority racial/ethnic groups, which may result in an overestimate of the observed diversity gaps in this study (34). The wording of the demographic item used in the profile section of the National EMS Certification application precludes the distinction between gender and sex. Candidates were asked to select their “sex” and only the options “male” and “female” were provided with

no instructions regarding how an individual whose assigned sex at birth differs from his or her gender should respond. For the purposes of this study, responses to this item were used as a proxy for gender, though misclassification may have occurred. With regards to the groups used to describe race and ethnicity, 2 racial groups (white and black) and one ethnic group (Hispanic) were created. The remaining groups of EMS professionals who identified as other races or ethnicities or those who identified as multi-racial were too small to make reliable inferences and were not assessed in this study.

CONCLUSIONS

Diversity among EMS professionals is important for fomenting multicultural awareness, enhancing patient-provider communication, and improving equality in the delivery of care. However, substantial improvement in the diversity of the EMS workforce is unlikely to come in the near future. Females and racial/ethnic minority groups remained underrepresented among newly-certified cohorts of EMTs and paramedics compared to the U.S. population in 2017. The gaps in representation for females and providers belonging to minority racial/ethnic groups were more pronounced among paramedics compared to EMTs and geographic variation was noted. Collectively, these results suggest that improving diversity in the EMS workforce will require coordinated national recruitment efforts to encourage underrepresented groups to pursue careers in EMS.

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