PA program characteristics and diversity in the profession

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25 providing the data that made this research
26 possible.

27

28 **ABSTRACT**

29 **Objectives:** The primary objective of this
30 study was to identify PA program
31 characteristics that may be associated with
32 higher or lower percentages of
33 underrepresented minority students in PA
34 school.

35 **Methods:** Data from the Physician Assistant
36 Education Association (PAEA) 2002-2003 and
37 2012-2013 annual surveys were analyzed.
38 Bivariate correlation coefficients and
39 multiple regression modeling were used to
40 identify relationships between program
41 characteristics and percentages of black and
42 Hispanic students.

43 **Results:** The percentage of white matriculants
44 in PA programs increased from 76.5% in 2002-
45 2003 to 81.8% in 2012-2013; the percentage of
46 black students decreased from 6.2% to 4.4%.
47 Multiple linear regression revealed a modest

48 negative relationship between master's degree
49 and percentage of underrepresented minority
50 students and a modest positive relationship
51 between percentages of underrepresented
52 minority employees and underrepresented
53 minority students.

54 **Conclusions:** Further research is needed to
55 identify strategies to increase
56 underrepresented minority participation in
57 healthcare professions programs.

58 **Keywords:** degree, diversity, physician
59 assistant, education, underrepresented
60 minorities, workforce

61

62 Racial and ethnic concordance between
63 healthcare professionals and patients is
64 associated with increased access, improved
65 compliance, better interpersonal care, and
66 greater patient satisfaction.¹⁻³ For several
67 years, however, the physician assistant (PA)
68 profession, like many others, has struggled
69 to recruit a workforce racially and
70 ethnically representative of the populations

71 it serves.^{2,4} In 1999, 12.1% of the US
72 population and 10.6% of PAs were black
73 (compared with 4.9% of physicians).⁵ Five
74 years later, in 2004, 6.8% of PAs were black
75 and 9.4% were Hispanic.⁶ As of 2015, 13.3% of
76 the US population was black and 17.6% was
77 Hispanic; however, just 3.7% of practicing
78 PAs were black and 6.5% were Hispanic.⁷ Among
79 physicians in 2015, 6.4% were black and 6.4%
80 were Hispanic.⁸

81 These numbers reflect the fact that,
82 despite active recruitment and the
83 increasingly diverse US population, the
84 percentage of underrepresented minorities
85 entering and being graduated from PA school
86 is decreasing.^{4,9} PA programs have used
87 various strategies to increase numbers of
88 underrepresented minority students, including
89 holistic admissions processes; however, a
90 report addressing the racial and ethnic
91 diversity of working health professionals
92 between 2004 and 2013 revealed that, among
93 more than 40 professions studied, PAs

94 experienced the highest rate of annual
95 decrease in blacks (0.495%).^{4,10} In 2014,
96 whites had the highest applicant-to-
97 matriculant ratio for PA school, and just
98 2.92 % of PA matriculants were black, and
99 7.10 % were Hispanic.¹¹

100 Although decreasing diversity is not unique
101 to the PA profession, it is especially
102 concerning for a profession whose history
103 reflects a commitment to caring for
104 underserved populations and educating
105 clinicians from diverse backgrounds. In
106 addition to the improved outcomes associated
107 with racial and ethnic concordance between
108 healthcare providers and patients,
109 underrepresented minorities are more likely
110 to serve underrepresented minority
111 populations.¹ Therefore, in order to fulfill
112 its historical mission to increase access and
113 improve healthcare for populations in need,
114 the PA profession must determine how to
115 effectively recruit and educate more students
116 from diverse backgrounds.

117 Until the 1990s, a higher percentage of
118 underrepresented minorities enrolled in PA
119 schools compared with other healthcare
120 professions programs such as medical
121 school.¹² Since 2000, PA education has
122 experienced substantive changes, including
123 the move to an entry-level master's degree, a
124 significant increase in the proportion of
125 programs housed in private institutions, and
126 substantial growth in the number of programs.
127 As of the fall of 2016, 218 programs were
128 accredited; of those, nearly a quarter
129 (24.3%) were new programs with initial
130 provisional accreditation. In addition, 52
131 new programs are scheduled to be evaluated
132 for provisional accreditation between now and
133 March 2020.¹³

134 Professional program characteristics, such
135 as location and percentage of
136 underrepresented minority faculty, may
137 influence student diversity. In their 2015
138 analysis of factors that influence students'
139 choice of PA programs, Klingler and Van Rhee

140 found that program location was a primary
141 consideration.¹⁴ Andersen and colleagues
142 found that, in addition to the population
143 demographics of a school's location,
144 percentage of underrepresented minority
145 faculty correlated with underrepresented
146 minority student recruitment to dental
147 schools.¹⁵ Academic preparedness of students
148 also may play a role. Educational
149 institutions report that students from
150 disadvantaged backgrounds often need
151 additional training in order to meet
152 prerequisites for healthcare professions
153 programs.² Notably, healthcare occupations
154 requiring several years of education tend to
155 be the least diverse.⁴ Thus, the level of
156 degree a PA program offers may also influence
157 the number of underrepresented minorities who
158 attend. With regard to the PA profession in
159 particular, in the midst of significant
160 expansion and change, understanding the
161 potential effects that program
162 characteristics have on student

163 characteristics may be necessary if the
164 profession is to increase diversity among its
165 ranks. The primary aims of this study were to
166 determine how underrepresented minorities'
167 participation in PA school has changed over
168 time and to identify PA program
169 characteristics that may be associated with
170 higher or lower percentages of
171 underrepresented minority students. The
172 identification of potential influences on
173 diversity among students may help the PA and
174 other healthcare professions recruit and
175 retain a greater proportion of
176 underrepresented minority healthcare
177 professionals.

178

179 **METHODS**

180 **Sample and instrument** Raw, de-identified data
181 from the Physician Assistant Education
182 Association (PAEA) program surveys for the
183 years 2002-2003 and 2012-2013 were analyzed.
184 The 2 years examined were chosen in order to
185 identify any changes over a 10-year period.

186 PAEA distributes the survey annually to all
187 accredited PA programs in the United States;
188 responses are generally provided by program
189 directors or their designees. The instrument
190 consists of multiple program-related
191 questions related to general information
192 (such as location and program length),
193 finances (such as budget and tuition),
194 personnel (such as demographic
195 characteristics and faculty workload), and
196 students (such as demographic
197 characteristics and graduation rates). PAEA
198 has modified the questions over time; a link
199 to the report associated with each of the
200 years included in this analysis can be found
201 at [http://paeaonline.org/research/program-](http://paeaonline.org/research/program-report/)
202 [report/](http://paeaonline.org/research/program-report/) Overall response rates for the
203 survey are generally high. Initial response
204 rates for the years analyzed were 84.1%
205 (111/132) in 2002-2003 and 100% (171/171) in
206 2012-2013.

207 **Analysis** Descriptive statistics were used
208 to determine the race and ethnicity

209 distribution of first-year students in
210 programs with different characteristics.
211 Bivariate correlation coefficients identified
212 relationships between these program
213 characteristics and percentage of Hispanic
214 and black first-year students. Finally,
215 multiple linear regression was performed to
216 determine the relative influence of each
217 program characteristic on variations in the
218 percentages of Hispanic and black students,
219 while accounting for the influence of all
220 characteristics included.^{15,16}

221 The program characteristics identified as
222 potential explanatory (predictor) variables
223 [such as funding status (public, private
224 nonprofit, private for-profit), geographic
225 region, highest credential awarded, and, for
226 2012-2013, percentage of Hispanic and black
227 PA program employees)] were chosen due to
228 their availability within the data and as
229 variables likely to effect the percentage of
230 underrepresented minority students in a
231 professional program. Because tuition costs

232 of public programs are generally lower than
233 those at private programs, the funding status
234 variable may be viewed as a proxy for program
235 cost. Hiring and funding standards also
236 frequently differ for public and private
237 institutions. In order to describe the
238 potential influence that the increase in the
239 proportion of privately funded programs has
240 had on percentage of underrepresented
241 minority students, public funding was
242 selected as the reference category for
243 funding status.

244 Region was included because students
245 frequently attend schools close to where they
246 live.^{14,15} Geographic locations consisted of
247 the US Census Bureau regions: Northeast,
248 Midwest, South, and West. Further delineation
249 of region was not possible due to the
250 potential that more specific location
251 information would inadvertently reveal the
252 identity of individual programs to the
253 researchers. Northeast is the most prevalent

254 region and was therefore chosen as the
255 reference category for this variable.

256 Level of highest credential was designated
257 as master's degree or non-master's degree
258 (such as certificate, associate's degree, and
259 bachelor's degree). To describe the potential
260 influence that transition to the master's
261 degree has had on percentage of
262 underrepresented minority students, non-
263 master's degree was used as the reference
264 category. Due to the construct of the PAEA
265 program survey in 2002-2003, extraction of
266 the percentages of Hispanic and black faculty
267 and staff was not feasible; therefore, this
268 potential explanatory variable was only
269 included in the 2012-2013 data analyses. Of
270 note, the percentages of Hispanic and black
271 faculty and staff were reported as single
272 variables in the PAEA survey: percentage of
273 Hispanic employees (faculty and staff
274 combined) and percentage of black employees
275 (faculty and staff combined).

276 We were interested in underrepresented
277 minority students other than Hispanics and
278 blacks; they include Native Americans, Alaska
279 Natives, Native Hawaiians, and Asians other
280 than those who are Chinese, Filipino,
281 Japanese, Korean, Asian Indian, or Thai.¹⁷
282 However, underrepresented Asians could not be
283 accurately differentiated from non-
284 underrepresented minority Asians in the data,
285 and the numbers of other underrepresented
286 minorities were too low for meaningful
287 analysis. Therefore, the outcome variables
288 were defined as percentage of Hispanic
289 students and percentage of black students.¹⁵

290 The 2002-2003 survey treated race and
291 ethnicity as a single characteristic.
292 Consistent with the 2010 change in federal
293 reporting requirements that identify
294 ethnicity (Hispanic/non-Hispanic) as separate
295 from race, the 2012-2013 PAEA program survey
296 differentiated the two. In response to the
297 2012-2013 survey, some programs provided
298 responses related to ethnicity while failing

299 to provide information about race and vice
300 versa; therefore, we completed two separate
301 analyses on the 2012-2013 data. Percentage of
302 Hispanic students served as the outcome
303 variable for evaluation of all of the
304 programs that provided sufficient data on
305 student ethnicity; percentage of black
306 students served as the outcome variable for
307 evaluation of all programs that provided
308 sufficient information on race. In all data
309 sets, outcome variable percentages were
310 skewed; therefore, base-10 logarithm (log10)
311 transformations were performed before the
312 analyses, resulting in normal or nearly
313 normal distributions in all cases.

314

315 **RESULTS**

316 Insufficient or unclear data resulted in the
317 elimination of some of the responding PA
318 programs from each year's analysis.

319 Accounting for excluded programs as well as
320 those that did not respond to the survey,
321 final response rates were 73% (96/132) for

322 2002-2003, 77.2% (132/171) for the 2012-2013
323 examination of Hispanic students and 80.1%
324 (137/171) for the 2012-2013 examination of
325 black students. Some variation existed in the
326 characteristics of the relatively small
327 number of programs that were excluded from
328 the final analyses compared to those that
329 were included (Table 4).

330 Data available for 34 programs excluded
331 from the 2002-2003 analysis revealed that
332 excluded programs conferred a lower
333 percentage of master's degrees than included
334 programs (44.1% versus 58.3%). In addition,
335 data for 37 programs excluded from the 2012-
336 2013 analysis involving ethnicity showed that
337 a higher percentage of excluded programs were
338 private for-profit (13.5% versus 9.1%) and a
339 higher percentage conferred master's degrees
340 (94.6% versus 91.6%). Similarly, data for 32
341 programs excluded from the 2012-13 analysis
342 involving percentage of black students also
343 showed that a higher percentage of excluded
344 programs were private for-profit (25% versus

345 7.3%) and a higher percentage awarded
346 master's degrees (96.9% versus 92%).%).
347 Although most programs were included in the
348 analyses, the differences between the
349 characteristics of included and excluded
350 programs may have skewed study results.

351 Due to the 2010 change to reporting race
352 and ethnicity (Hispanic/non-Hispanic)
353 separately, comparisons from before and after
354 2010 are inexact. The data available,
355 however, showed that between 2002-2003 and
356 2012-2013, the percentage of white first-year
357 students in PA programs increased from 77.2%
358 to 79.6%. The percentage of underrepresented
359 minorities decreased; in 2002-2003, 6.2% of
360 first-year students were black and in 2012-
361 2013, 4.4% were (**Figure 1**). Among privately-
362 funded programs (nonprofit and for-profit),
363 which now account for 65.5% of PA student
364 enrollment, the percentage of white first-
365 year students increased from 76.5% in 2002-
366 2003 to 81.8% in 2012-2013.⁹ In comparison,
367 in publicly funded programs, the percentage

368 decreased slightly, from 78.5% to 78% (**Figure**
369 **2**). Analysis of diversity by region revealed
370 that, consistent with the demographics of
371 regional populations, PA programs in the West
372 had the highest percentage of Hispanic
373 students (12.2% in 2012-2013) and programs in
374 the South had the highest percentage of black
375 students (6.1% in 2012-2013). With regard to
376 degree, in 2012-2013, the percentage of white
377 students attending master's degree programs
378 was 82.7%; the percentage of white students
379 attending non-master's degree programs was
380 46.0% (**Figure 3**), compared to 2002-2003 when
381 the percentage of white students attending
382 master's degree programs was 80.8% and the
383 percentage attending non-master's degree
384 programs was 71.5% (Figure 4) **Overall in**
385 **2012-2013**, non-master's degree-granting
386 programs accounted for just 6.6% of all PA
387 students but for 28.4% of black students and
388 23.8% of Hispanic students.

389 In general, bivariate correlation analyses
390 revealed negligible or very modest

relationships between the variables tested and ethnicity or race of students. Consistent with population demographics, West region had a modest positive correlation and Midwest region a modest negative correlation with percentage of Hispanic/Latino students in both years tested (**Table 1**). In 2012-2013, the percentage of Hispanic program employees had a moderate positive correlation with percentage of Hispanic students ($r = 0.393$, $P < .01$); master's degree had a weak negative correlation ($r = -0.281$, $P < .01$). Master's degree had a moderate negative correlation with the percentage of black students in both years, and the 2012-2013 analysis showed that the percentage of black employees had a moderate positive correlation with black students (0.367 , $P < .01$) (**Table 1**).

Multiple linear regression performed on the 2002-2003 data set using funding status (public, private nonprofit, private for-profit), region, and highest credential (master's degree compared with non-master's

414 degree) as explanatory variables and
415 percentages of underrepresented minority
416 students as outcome variables indicated that
417 the three predictor variables explained 24.6%
418 of the variance in percentage of Hispanic
419 students (log10) [$R^2 = 0.246$, $F(6, 89) =$
420 4.831 , $P < .001$] and 21.2% of the variance
421 in percentage of black student (log10) [$R^2 =$
422 0.212 , $F(6, 89) = 3.980$, $P < .001$]. When
423 accounting for the effects of all of the
424 selected program characteristics, Midwest
425 region was negatively associated (beta = -
426 0.237 , $P = .034$) and West region was
427 positively associated (beta = 0.367 , $P =$
428 $.001$) with percentage of Hispanic students;
429 only master's degree was statistically
430 significantly associated with percentage of
431 black students (negative association: beta =
432 -0.384 , $P < .001$) (**Table 2**).

433 Multiple linear regression performed on the
434 2012-2013 data sets included an additional
435 explanatory variable (percentage of Hispanic
436 employees or percentage of black employees)

and indicated that the four predictor variables explained 32.9% of the variance in percentage of Hispanic students ($\log_{10}$) [$R^2 = 0.329$; $F(7, 124) = 8.676$, $P < .001$] and 24.5% of the variance in percentage of black students ($\log_{10}$) [$R^2 = 0.245$, $F(7, 129) = 5.965$, $P < .001$]. When accounting for the effects of all of the selected program characteristics, West region ($\beta = 0.31$, $P < .001$) and percentage of Hispanic employees ($\beta = 0.310$, $P < .001$) were positively associated with percentage of Hispanic students, whereas master's degree had a negligible association ($\beta = -0.144$, $P = .072$). Percentage of black employees was positively associated with percentage of black students ($\beta = 0.265$, $P = .002$); West region ($\beta = -0.194$, $P = .29$) and master's degree ($\beta = -0.262$, $P = .003$) had weak negative associations (**Table 3**).

DISCUSSION

459 **Diversity in the healthcare professions** In
460 2004, the Institute of Medicine (IOM) and the
461 Sullivan Commission on Diversity in the
462 Healthcare Workforce, a group of leaders in
463 healthcare, business, higher education, and
464 law, called for increasing minority
465 representation in the healthcare professions
466 to reduce healthcare disparities and improve
467 the nation's healthcare.^{1,18} In its report,
468 *Missing Persons: Minorities in the Health*
469 *Professions*, the Sullivan Commission
470 identified three overarching issues to
471 address:

- 472 • culture change in the healthcare
- 473 professions
- 474 • new and nontraditional paths to healthcare
- 475 professions education
- 476 • commitment at the highest levels of
- 477 institutional and organizational
- 478 leadership.¹⁸

479 Through various funding programs,
480 government agencies have provided support to
481 increase the number of underrepresented

482 minorities in healthcare professions. Between
483 2008 and 2013, the Health Resources and
484 Services Administration (HRSA) Scholarships
485 for Disadvantaged Students program awarded
486 about 1,649 scholarships to PA students. From
487 2008 to 2013, the percentage of the program's
488 recipients who were underrepresented
489 minorities ranged from 51% to 60%.²
490 Additionally, HRSA Title VII PA training in
491 primary care grants give priority to
492 proposals designed to increase the proportion
493 of underrepresented minorities enrolled in PA
494 programs.¹⁹

495 Underrepresented minorities are well-
496 represented in healthcare professions that
497 require relatively lower levels of education
498 and training, including professions such as
499 medical assistant, from which the PA
500 profession draws some of its applicants. In
501 fact, racial and ethnic diversity has
502 increased in many of these healthcare
503 professions (such as licensed practical
504 nurse, medical assistant, and home health

505 aide) and exceeds that of the US population
506 in general.⁴ In past years, the PA profession
507 drew more heavily from other healthcare
508 professions, as opposed to drawing from large
509 numbers of applicants who have college
510 degrees but relatively little healthcare
511 experience. In 2002-2003, students entering
512 PA school had an average of 37.7 months of
513 healthcare experience; in 2012-2013, the
514 average was 26.1 months (19.3 months of
515 direct patient care and 6.8 months of other
516 healthcare experience, such as laboratory
517 technician or front office worker).^{20,21} The
518 requirement for a bachelor's degree to enter
519 most PA programs likely contributed to this
520 shift.

521 **Other healthcare professions** Like the PA
522 profession, occupational therapy (OT) and
523 physical therapy have been transitioning to
524 higher degrees over the last several years.
525 As previously discussed, the 2010 change to
526 reporting race and ethnicity (Hispanic/non-
527 Hispanic) separately makes it difficult to

528 compare, with complete accuracy, numbers
529 reported before and after 2010. Nonetheless,
530 the available data shows that during OT's
531 transition from bachelor to master's level
532 (between 2003 and 2013), the percentage of
533 white students increased from 79% (white) to
534 82% (white, non-Hispanic) while the
535 percentage of blacks decreased from 8% to
536 4%.²² The American Occupational Therapy
537 Association concludes that the transition to
538 the master's degree did not significantly
539 affect diversity in the profession; however,
540 others may view a 50% decrease in the
541 percentage of blacks as significant,
542 particularly considering the lack of
543 diversity in healthcare professions requiring
544 higher levels of education.²² Between 2004
545 and 2013, the percentage of PT programs
546 granting doctoral degrees increased from
547 about half to nearly 100%. During this
548 period, the percentage of white students
549 increased from 78.5% to 79.4%; the percentage
550 of Hispanic students remained relatively

551 constant (7.4% to 8%) and the percentage of
552 black students decreased from 9.2% to 4.9%.²³
553 Healthcare professions that have not changed
554 degrees also have lost ground in
555 underrepresented minority representation.⁴
556 However, considering the similarity among
557 professions that have changed degrees,
558 exploring the potential effect of entry-level
559 degree on underrepresented minority
560 participation in professions other than PA
561 may be worthwhile.

562 **PA profession** In 1998, the Association of
563 Physician Assistant Programs (APAP, now the
564 PAEA) commissioned a task force to examine
565 the issue of entry-level degree for the PA
566 profession. In its final report published in
567 2000, the task force recommended that PA
568 programs grant graduate degrees. However,
569 task force members recognized that, "...the
570 most serious potential consequence for the
571 profession may be disenfranchisement of its
572 members who lack the degree set as the
573 standard, and who lack the resources or

574 interest to seek a more advanced degree."⁶
575 Consequently, they acknowledged that some
576 institution's missions may be better served
577 by non-master's degree programs and pledged
578 to work with the American Academy of PAs
579 (AAPA) to create initiatives to increase the
580 representation of underrepresented minorities
581 in the PA profession.⁶ In 2010, PAEA
582 reaffirmed its commitment to support
583 community colleges and requested an
584 investigation of the potential effect that
585 community college PA programs have on
586 workforce diversity and access to
587 healthcare.²⁴ At this point, it appears that
588 the loss of community college PA programs
589 will result in a loss of diversity in the
590 profession, although the ultimate outcome of
591 the final transition to graduate level
592 remains to be seen.

593 Additionally, over the last decade the
594 Accreditation Review Commission on Education
595 for the Physician Assistant (ARC-PA) has
596 emphasized the need for PA program graduates

597 to achieve high Physician Assistant National
598 Certification Examination (PANCE) first-time
599 passing scores, thus encouraging programs to
600 work toward high pass rates. The resulting
601 pressure on programs to graduate students who
602 obtain high PANCE scores may encourage
603 program admissions committees to over-
604 emphasize applicant performance on
605 standardized examinations such as the
606 Graduate Record Examination (GRE), compared
607 with other criteria, potentially leading to
608 fewer underrepresented minority applicants
609 being selected for admission.^{25,26}

610 A variety of factors likely contribute to
611 the lack of diversity in some healthcare
612 professions; characteristics of educational
613 programs may be among them. Results of this
614 study reveal that privately funded PA
615 programs had slightly lower percentages of
616 underrepresented minority students than
617 publicly funded programs, although funding
618 status was not shown to significantly
619 influence a program's percentage of Hispanic

620 or black students. Nevertheless, due to the
621 significant increase in the proportion of
622 privately funded PA programs in recent years,
623 further study of the potential effect of
624 funding status and cost of program attendance
625 on underrepresented minority entrants into
626 the PA profession is warranted.

627 The modest but statistically significant
628 association found between degree and PA
629 program student diversity also is notable. As
630 of 2013, undergraduate-level PA programs had
631 greater success matriculating
632 underrepresented minority students than
633 master's degree programs. By 2021, however,
634 PA programs will no longer confer
635 undergraduate level qualifications. The
636 transition of PA education to graduate level
637 is consistent with the PA profession's
638 endorsement of the PA master's degree (as
639 opposed to a clinical doctorate) that
640 resulted from a 2009 summit supported by PAEA
641 and the AAPA.²⁷ Yet, even as some PA programs
642 grapple with the challenge of converting to

643 master's level, calls for PA education to
644 move to doctoral level persist.

645 Despite the efforts of the federal
646 government and concerns amplified by the IOM,
647 the Sullivan Commission, and PA professional
648 organizations, the enrollment of
649 underrepresented minority PA students has
650 experienced a decade-long decline. This has
651 resulted in decreasing diversity in the PA
652 profession, as the graduating cohorts over
653 the last decade have been the largest of the
654 profession's history. If this trend is not
655 quickly addressed, the PA profession's
656 ability to provide culturally competent care
657 to America's increasingly diverse population
658 may be compromised.

659 **Potential solutions** Expansion of federal
660 programs that already exist is one potential
661 solution. The HRSA Scholarships for
662 Disadvantaged Students program gives
663 financial support to underrepresented
664 minority students in the healthcare
665 professions, and the HRSA Title VII PA

666 training in primary care grants support
667 programs that admit higher proportions of
668 underrepresented minorities. An additional
669 approach would be expansion of support for
670 "pipeline" programs, such as HRSA's Health
671 Career Opportunity Programs that are designed
672 to attract underrepresented minorities to
673 healthcare professions and provide support to
674 increase their preparedness to apply to PA
675 school. Increasing the number of programs
676 that accept students at the undergraduate
677 level and, after prerequisite and
678 baccalaureate degree completion,
679 automatically matriculate them into the
680 graduate PA program also may have an effect.
681 Finally, ARC-PA may be able to contribute by
682 de-emphasizing PA program first-time PANCE
683 pass rates in favor of emphasizing overall
684 pass rates and adding an accreditation
685 standard that encourages programs to increase
686 diversity.

687 Ultimately, strategies must go beyond
688 admitting a greater proportion of

689 underrepresented minority students to PA
690 programs. According to the 2016 PAEA By the
691 Numbers Program Report, in 2015, 94.7% of
692 white PA students graduated with their
693 original cohorts, compared with 90.9% of
694 Hispanic, 90.9% of Asian, 86.4% of Native
695 American or Alaska Native, 80.3% of black,
696 and 76.9% of Native Hawaiian or Pacific
697 Islander PA students.⁹ Additional research on
698 the factors associated with underrepresented
699 minority attrition is needed to inform
700 efforts to successfully educate and graduate
701 higher proportions of these students.

702

703 **LIMITATIONS**

704 The variables included in this analysis are
705 those shown to be associated with
706 underrepresented minority student
707 participation in healthcare professions;
708 however, the small number of variables
709 limited the ability to identify other factors
710 that may contribute to student diversity
711 within PA programs. In addition, although

712 most programs were included in the study,
713 insufficient data precluded examination of
714 all programs. Finally, the PAEA program
715 survey was not designed for inferential
716 statistics; therefore, data transformations
717 were necessary for analysis. Despite these
718 limitations, study results highlight the need
719 to learn more about factors that influence
720 underrepresented minority participation in PA
721 programs.

722 State and local population demographics in
723 the four US census regions vary. Therefore,
724 although the multiple linear regression
725 analyses accounted for US census region, the
726 relationship found between percentages of
727 Hispanic employees and students and between
728 percentages of black employees and students
729 may be partly attributable to local
730 demographics of PA program locations. Still,
731 the positive association is comparable to
732 research showing that underrepresented
733 minority representation among dental school
734 faculty positively influences

735 underrepresented minority student recruitment
736 and suggests that increases in the proportion
737 of underrepresented minority PA program
738 employees may similarly influence
739 underrepresented minority PA student
740 enrollment.¹⁵

741

742 **CONCLUSIONS**

743 Degree is not the only issue associated with
744 diversity in the healthcare professions;
745 however, this study's results support the
746 assertion that it is a contributing factor.
747 Therefore, support for existing diverse PA
748 programs, including those that will need to
749 transition to graduate level, will be
750 important for maintaining diversity in the
751 profession as a whole. Evidence for the
752 effectiveness of strategies to increase
753 diversity in healthcare professions education
754 is limited. However, the greatest potential
755 likely stems from comprehensive approaches
756 involving multiple interventions, for
757 example, restructuring admissions policies,

758 providing financial and social support, and
759 developing innovative training opportunities,
760 which will require clinicians to actively
761 engage in educating the profession's next
762 generation.⁴ Recruiting underrepresented
763 minority PAs to serve as educators also may
764 have a positive effect.

765 More than 12 years have passed since the
766 Sullivan Commission called for healthcare
767 professions to examine their culture, paths
768 to their profession, and leadership in order
769 to increase the proportion of minority
770 healthcare professionals.¹⁸ Although the PA
771 profession, like others, has failed to
772 adequately respond, the PA community remains
773 committed to diversity.²⁸ Still, reversing
774 the decline in underrepresented minority
775 representation among PAs will likely require
776 a concerted effort. In order to contribute to
777 a more diverse, and therefore more effective,
778 healthcare workforce the PA profession will
779 need to acknowledge the issue, continue to
780 study it, and take action.

781

782 REFERENCES

783 1. Smedley BD, Butler AS, Bristow LR; Institute of Medicine. *In the Nation's*
784 *Compelling Interest: Ensuring Diversity in the Healthcare Workforce*. Washington, DC:
785 National Academies Press, 2004.

786

787 2. Camacho A, Zangaro G, White KM. Diversifying the health-care workforce begins at
788 the pipeline: a 5-year synthesis of processes and outputs of the Scholarships for
789 Disadvantaged Students Program. *Evaluation & the Health Professions*. 2015;1-24.

790

791 3. US Department of Health and Human
792 Services, Health Resources and Services
793 Administration, Bureau of Health Professions.
794 The rationale for diversity in the health
795 professions: a review of the evidence.
796 [http://docplayer.net/255577-The-rationale-](http://docplayer.net/255577-The-rationale-for-diversity-in-the-health-professions-a-review-of-the-evidence.html)
797 [for-diversity-in-the-health-professions-a-](http://docplayer.net/255577-The-rationale-for-diversity-in-the-health-professions-a-review-of-the-evidence.html)
798 [review-of-the-evidence.html](http://docplayer.net/255577-The-rationale-for-diversity-in-the-health-professions-a-review-of-the-evidence.html)

799

800 4. Snyder CR, Stover B, Skillman SM, Frogner BK. *Facilitating Facial and Ethnic*
801 *Diversity in the Health Workforce*. Seattle, WA: University of Washington Center for
802 Health Workforce Studies, 2015.

803

804 5. Miller A, et al. Association of Physician Assistant Programs degree task force final
805 paper, September 28, 2000. *J Physician Assist Educ*. 2000;11(3):169-177.

806

807 6. US Bureau of Labor Statistics. Household data, annual averages. Employed persons by
808 detailed occupation, sex, race, and Hispanic or Latino ethnicity, 2004.
809 <http://www.bls.gov/cps/aa2004/cpsaat11.pdf>. Accessed November 28, 2017.
810
811 7. US Census Bureau. QuickFacts.
812 <https://www.census.gov/quickfacts/table/PST045215/00>. Accessed November 28, 2017.
813
814 8. US Bureau of Labor Statistics. Household data, annual averages. Employed persons by
815 detailed occupation, sex, race, and Hispanic or Latino ethnicity, 2015.
816 <http://www.bls.gov/cps/cpsaat11.pdf>. Accessed November 28, 2017.
817
818 9. Physician Assistant Education Association. By the Numbers: Program Report 31,
819 2014-2015. Washington, DC: PAEA, 2016. [http://paeaonline.org/wp-](http://paeaonline.org/wp-content/uploads/2016/10/Program-Survey-31.pdf)
820 [content/uploads/2016/10/Program-Survey-31.pdf](http://paeaonline.org/wp-content/uploads/2016/10/Program-Survey-31.pdf). Accessed November 28, 2017.
821
822 10. Felix H, Laird J, Ennulat C, et al. Holistic admissions process: an initiative to support
823 diversity in medical education. *J Physician Assist Educ*. 2012; 23(3):21-27.
824
825 11. Physician Assistant Education
826 Association. Central Application Service for
827 Physician Assistants. CASPA Resources for
828 programs.
829 [https://www.dropbox.com/scl/fi/qouk6tlzqb8wa](https://www.dropbox.com/scl/fi/qouk6tlzqb8wa8s33rgx/1%29%202013-2016%20Matriculant%20Comparison%20Report.pptx?dl=0)
830 [8s33rgx/1%29%202013-](https://www.dropbox.com/scl/fi/qouk6tlzqb8wa8s33rgx/1%29%202013-2016%20Matriculant%20Comparison%20Report.pptx?dl=0)
831 [2016%20Matriculant%20Comparison%20Report.pptx](https://www.dropbox.com/scl/fi/qouk6tlzqb8wa8s33rgx/1%29%202013-2016%20Matriculant%20Comparison%20Report.pptx?dl=0)
832 [?dl=0](https://www.dropbox.com/scl/fi/qouk6tlzqb8wa8s33rgx/1%29%202013-2016%20Matriculant%20Comparison%20Report.pptx?dl=0)

833 <http://paeaonline.org/caspa/program->
834 [resources/](http://paeaonline.org/caspa/program-resources/)

835

836 12. Mulitalo KE, Straker H. Diversity in physician assistant education. *J Physician Assist*
837 *Educ.* 2007;18(3):46-51.

838

839 13. Accreditation Review Commission on Education for the Physician Assistant. Notes to
840 programs, Fall 2016. [www.arc-pa.org/wp-content/uploads/2016/10/Notes-to-programs-](http://www.arc-pa.org/wp-content/uploads/2016/10/Notes-to-programs-fall-2016S-FNL.pdf)
841 [fall-2016S-FNL.pdf](http://www.arc-pa.org/wp-content/uploads/2016/10/Notes-to-programs-fall-2016S-FNL.pdf). Accessed November 28, 2017.

842

843 14. Klingler GL, Van Ree J. Factors influencing physician assistant program choice
844 among physician assistant applicants. Paper presented at Physician Assistant Education
845 Association Forum, November 11-15, 2016, Washington, DC.

846

847 15. Andersen RM, et al. What enhances underrepresented minority recruitment to dental
848 schools? *J Dental Educ.* 2007;71(8):994-1008.

849

850 16. Eduventures. Retention ratings: the
851 methodology.

852 [www.eduventures.com/retention/retention-](http://www.eduventures.com/retention/retention-ratings-methodology)
853 [ratings-methodology](http://www.eduventures.com/retention/retention-ratings-methodology).

854

855 17. Health Resources and Services Administration. Centers of Excellence.
856 <http://bhpr.hrsa.gov/grants/diversity/coe.html>. Accessed November 28, 2017.

857

858 18. Sullivan Commission on Diversity in the Health Workforce. *Missing Persons:*
859 *Minorities in the Health Professions*. Washington, DC, 2004.

860

861 19. Health Resources and Services Administration. Grants for primary care training and
862 enhancement.

863 [https://www.cfda.gov/index?s=program&mode=form&id=7e43e3c7fdb9f9e396b13e68d7](https://www.cfda.gov/index?s=program&mode=form&id=7e43e3c7fdb9f9e396b13e68d7592d9e&tab=core&tabmode=list)
864 [592d9e&tab=core&tabmode=list](https://www.cfda.gov/index?s=program&mode=form&id=7e43e3c7fdb9f9e396b13e68d7592d9e&tab=core&tabmode=list). Accessed November 28, 2017.

865

866 20. Physician Assistant Education

867 Association. Physician Assistant Educational

868 Programs in the United States: 19th Report,

869 2002-2003. Alexandria, VA.

870 [http://paeaonline.org/wp-](http://paeaonline.org/wp-content/uploads/2016/10/19th-Annual-Report-on-Physician-Assistant-Educational-Programs-in-the-United-States-2002-2003.pdf)

871 [content/uploads/2016/10/19th-Annual-Report-](http://paeaonline.org/wp-content/uploads/2016/10/19th-Annual-Report-on-Physician-Assistant-Educational-Programs-in-the-United-States-2002-2003.pdf)

872 [on-Physician-Assistant-Educational-Programs-](http://paeaonline.org/wp-content/uploads/2016/10/19th-Annual-Report-on-Physician-Assistant-Educational-Programs-in-the-United-States-2002-2003.pdf)

873 [in-the-United-States-2002-2003.pdf](http://paeaonline.org/wp-content/uploads/2016/10/19th-Annual-Report-on-Physician-Assistant-Educational-Programs-in-the-United-States-2002-2003.pdf)

874

875 21. Physician Assistant Education

876 Association. Physician Assistant Educational

877 Programs in the United States: 29th Report,

878 2012-2013. Alexandria, VA.

879 [http://paeaonline.org/wp-](http://paeaonline.org/wp-content/uploads/2016/10/29th-Annual-Report.pdf)

880 [content/uploads/2016/10/29th-Annual-](http://paeaonline.org/wp-content/uploads/2016/10/29th-Annual-Report.pdf)

881 [Report.pdf](http://paeaonline.org/wp-content/uploads/2016/10/29th-Annual-Report.pdf)

882

883 22. American Occupational Therapy Association. FAQs: AOTA Board of Directors

884 position statement on doctoral-level single point of entry for occupational therapists.

885 www.aota.org/aboutaota/get-involved/bod/otd-faqs.aspx. Accessed November 28, 2017.

886

887 23. Commission on Accreditation in Physical Therapy Education. 2012-2013 fact sheet.

888 Physical therapist education programs. www.capteonline.org/AggregateProgramData.

889 Accessed November 28, 2017.

890

891 24. Physician Assistant Education

892 Association. 2010 PAEA Business Meeting:

893 Summary of Actions.

894 <http://www2.paeaonline.org/index.php?ht=a/GetDocumentAction/i>

895 [/114557](http://www2.paeaonline.org/index.php?ht=a/GetDocumentAction/i/114557).

896

897 25. Posselt JR. Toward inclusive excellence in graduate education: Constructing merit

898 and diversity in PhD admissions. *Am J Educ*. 2014;120(4):481-514.

899

900 26. Pacheco WI, Noel RJ, Porter JT, Appleyard CB. Beyond the GRE: using a composite

901 score to predict the success of Puerto Rican students in a biomedical PhD program. *CBE-*

902 *Life Sciences Education*. 2015;14(2):ar13.

903

904 27. [2001 to 2010: 2009. Physician Assistant History Society](http://pahx.org/period-07/)

905 [Web site](http://pahx.org/period-07/). <https://pahx.org/period-07/>

906 28. Physician Assistant Education Association. About PAEA.

907 <http://paeaonline.org/about-paea>. Accessed November 29, 2017.

Figure 1. PA students by race and ethnicity demographics compared with US census data

Due to rounding, race total percentages may not equal 100. Other race includes American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, ≥ 2 races, other, and unknown (In all cases: American Indian/Alaska Native ≤ 1%; Native Hawaiian/other Pacific Islander < 1%).

Race and ethnicity were treated as a single category in PA 2002-3 and as separate categories in PA 2012-13 and in US census data. When treated separately, the Hispanic ethnicity category includes Hispanic individuals of any race.

1 **Figure 2. Race and ethnicity of PA students across institution types (funding source), 2012-2013**

2 Race and ethnicity were treated as separate categories. Due to rounding, **race total percentages** may not equal 100. *Other race* includes American

3 Indian/Alaska Native, Native Hawaiian/other Pacific Islander, ≥ 2 races, other, and unknown (In all cases: American Indian/Alaska Native $\leq 1\%$; Native

4 Hawaiian/other Pacific Islander < 1%).

5

1 **Figure 3. Race and ethnicity of PA students by degree type, 2012-2013**

- 2 Race and ethnicity were treated as separate categories. *Other race* includes American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, ≥ 2 races,
3 other, and unknown (In all cases: American Indian/Alaska Native $\leq 1\%$; Native Hawaiian/other Pacific Islander $< 1\%$).

PA Programs & Diversity

Figure 4: **Race and Ethnicity*** of PA Students by Degree Type, 2012-2013

Source: PAEA annual report raw data

*Race and ethnicity treated as separate categories

**Other Race includes: American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, other, and unknown (In all cases: American Indian/Alaska Native < 1%; Native Hawaiian/other Pacific Islander < 1%).

PA Programs & Diversity

Table 1:

Bivariate correlation coefficients of PA program characteristics with % Hispanic/Latino or % African American students (log 10) as the outcome variables

Program Characteristic	2002-2003		2012-2013	
	Outcome = %Hispanic (n = 96)	Outcome = %African American (n = 96)	Outcome = %Hispanic (n = 132)	Outcome = %African American (n = 137)
Public	0.068	-0.003	0.113	0.148*
Private Nonprofit	-0.023	-0.050	-0.115	-0.147*
Private For-profit	-0.098	0.109	0.010	0.004
Northeast	-0.088	0.084	-0.141*	0.054
Midwest	-0.327***	-0.187*	-0.285***	-0.141*
South	0.046	0.199*	0.099	0.158*
West	0.397***	-0.129	0.378***	-0.107
Master's (reference Non-Master's)	-0.056	-0.361***	-0.281***	-0.332***
% Hispanic Employees	---	---	0.393***	0.079
% African American Employees	---	---	0.137	0.367***

* $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$

--- Variable not included in data set.

Table 2.

Multiple Linear Regression Analysis to Predict the Impact of PA Program Characteristics on URM Matriculation, 2002-2003

Program Characteristics	Outcome Variable % Hispanic Students (log 10)				Outcome Variable % African American Students (log 10)			
	b (95% CI)	SE	β	p value	b (95% CI)	SE	β	p value
Private Nonprofit	-0.050 (-0.257 to 0.157)	0.104	-0.050	0.633	0.059 (-0.147 to 0.266)	0.104	0.062	0.568
Private For-profit	-0.228 (-0.633 to 0.178)	0.204	-0.111	0.268	0.080 (-0.324 to 0.483)	0.203	0.040	0.696
Midwest	-0.289 (-0.556 to -0.022)	0.134	-0.237*	0.034	-0.172 (-0.438 to 0.093)	0.134	-0.145	0.201
South	0.098 (-0.155 to 0.351)	0.127	0.086	0.444	0.207 (-0.045 to 0.459)	0.127	0.186	0.106
West	0.465 (0.193 to 0.736)	0.137	0.367*	0.001	-0.071 (-0.342 to 0.200)	0.136	-0.058	0.603
Master's	-0.126 (-0.321 to 0.069)	0.098	-0.125	0.203	-0.375 (-0.569 to 0.181)	0.098	-0.384*	< 0.001

Reference region: Northeast; reference funding status: public; reference degree: non-master's

b = Unstandardized regression coefficient; β = Standardized regression coefficient

Standardized regression coefficients permit comparison across factors

*Statistically significant

Table 3.
Multiple Linear Regression Analysis to Predict the Impact of PA Program Characteristics on URM Matriculation, 2012-2013

Program Characteristics	Outcome Variable % Hispanic Students (log 10)					Outcome Variable % African American Students (log 10)			
	b (95% CI)	SE	β	p value		b (95% CI)	SE	β	p value
Private Nonprofit	-0.042 (-0.216 to 0.132)	0.088	-0.040	0.633		-0.120 (-0.276 to 0.036)	0.079	-0.132	0.131
Private For-profit	-0.006 (-0.219 to 0.280)	0.144	-0.003	0.969		-0.178 (-0.459 to 0.103)	0.142	-0.102	0.212
Midwest	-0.148 (-0.368 to 0.073)	0.111	-0.115	0.187		-0.137 (-0.334 to 0.061)	0.100	-0.127	0.175
South	0.139 (-0.059 to 0.338)	0.100	0.124	0.166		0.014 (-0.172 to 0.201)	0.094	0.015	0.878
West	0.449 (0.204 to 0.694)	0.124	0.310*	< 0.001		-0.249 (-.472 to -0.025)	0.113	-0.194*	0.029
Master's	-0.270 (-0.566 to 0.025)	0.149	-0.144*	0.072		-0.420 (-0.698 to -0.143)	0.140	-0.262*	0.003
% Hispanic/Latino Employees (log 10)	0.256 (0.132 to 0.381)	0.063	0.308*	< 0.001	% African American Employees (log 10)	0.195 (0.074 to 0.316)	0.061	0.265*	0.002

Reference region: Northeast; reference funding status: public; reference degree: non-master's.

b = Unstandardized regression coefficient; β = Standardized regression coefficient

Standardized regression coefficients permit comparison across factors

*Statistically significant

1 **Table 4. Comparison of characteristics of programs included and excluded from analyses**

2 Reported as percentages of the total in each category. Due to insufficient data, characteristics are not reported for all excluded programs. Due to rounding,
 3 percentages may not equal 100. Two analyses were completed using the 2012-13 data set: one with percentage of Hispanic/Latino students as the outcome
 4 variable and one with percentage of black students as the outcome variable.

5

6

Survey year	2002-2003		2012-2013: outcome variable = % Hispanic/Latino		2012-2013: outcome variable = % black	
	Included (N=96)	Excluded (N=34)	Included (N=132)	Excluded (N=37)	Included (N=137)	Excluded (N=32)
Public	40.6	41.2	36.4	35.1	39.4	18.8
Private nonprofit	53.1	47.1	54.5	51.4	53.3	56.3
Private for profit	6.3	11.8	9.1	13.5	7.3	25.0
Non- master's	41.7	55.9	8.3	5.4	8.0	3.1
Master's	58.3	44.1	91.6	94.6	92.0	96.9
Northeast	35.4	23.5	33.3	18.9	32.1	21.9
Midwest	20.9	32.4	20.5	35.1	23.4	25.0
South	25	35.3	31.1	37.8	29.9	43.8
West	18.8	8.8	15.2	8.1	14.6	9.4