

Trends and Disparities in Black Student Enrollment across U.S. Schools of Medicine, Pharmacy, and Dentistry (2010–2019)

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Abstract

Increasing racial and ethnic diversity within the health care workforce is a critical component of achieving equity in health care delivery. This study examined longitudinal patterns in Black student enrollment across U.S. pharmacy, medical, and dental education programs; evaluated cross-disciplinary differences in enrollment levels; and assessed how closely institutional enrollment of Black students corresponded with state demographic distributions in 2010 and 2019. For the purposes of this analysis, professional students were defined as individuals pursuing MD, PharmD, or DMD/DDS degrees. Fall enrollment data from 2010 to 2019 were collected from national professional education organizations, including the American Association of Colleges of Pharmacy, the Association of American Medical Colleges, and the American Dental Association. Changes in the proportion of Black students over time were calculated, along with average enrollment levels across institutions. Schools were evaluated based on the degree to which Black student enrollment reflected the percentage of Black residents within their state. Nonparametric statistical tests, including the Kruskal–Wallis H test and Wilcoxon signed-rank test, as well as chi-square analyses, were used to compare enrollment patterns and institutional ratings. Over the study period, pharmacy and medical programs demonstrated measurable growth in Black student enrollment, while dental programs showed no significant change. In 2019, both pharmacy and medical schools enrolled a higher proportion of Black students than dental schools. Furthermore, the share of pharmacy and medical institutions classified as underperforming in Black student representation declined between 2010 and 2019. A health professions workforce that mirrors the demographic composition of the communities it serves is essential for improving access to care and addressing persistent disparities. Achieving this goal will require deliberate, sustained institutional commitments to equity-focused recruitment, admissions, and retention practices aimed at increasing Black student participation in health professions education.

Keywords: College of dentistry, Student enrollment, College of pharmacy, Diversity, College of medicine

Introduction

Demographic shifts in the United States, coupled with increasing recognition of racial injustice and inequities in health outcomes, have renewed attention on the composition of the health care workforce. Recent national discourse surrounding police violence, structural

racism, and unequal treatment of minoritized populations underscores the urgency of preparing health care professionals who are equipped to serve diverse communities. Central to this effort is the concept of diversity, defined by the Sullivan Commission on Diversity in the Healthcare Workforce as the inclusion of racial and ethnic groups that mirror the communities served by health care institutions and systems [1]. Despite long-standing acknowledgment of this principle, representation within health professions remains disproportionately low for several racial and ethnic groups.

National data highlight the extent of this imbalance. Although non-Hispanic Black individuals constituted

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13.4% of the U.S. population in 2019 [2], their presence among health care professionals was substantially lower. Black individuals accounted for fewer than 5% of licensed pharmacists [3] and approximately 4% of physicians and medical students [4]. Similar disparities are evident in dentistry, where Black dentists represented only 4.3% of the workforce, compared with 73.6% who identified as White [5]. These discrepancies are particularly concerning given that pharmacists and physicians represent two of the most frequently accessed points of care within the health system [6].

The underrepresentation of Black professionals has implications beyond workforce statistics. Research has consistently demonstrated that provider diversity and cultural competence influence patient experiences, trust, and quality of care, particularly for racially and ethnically diverse populations [1, 7–9]. Cultural competence involves more than factual knowledge; it encompasses effective communication, mutual understanding, and the ability to establish trust across cultural contexts [1]. Communication challenges between health care providers and Black patients remain prevalent, with nearly one in four Black patients reporting difficulty communicating with physicians [10]. In pharmacy settings, insufficient attention to cultural beliefs, language barriers, and variations in health literacy may increase the risk of medication-related problems, including errors and ineffective therapy [8].

Patient preferences further illustrate the importance of representative care. Studies indicate that patients often favor racial concordance when selecting providers [11]. Among Black patients, encounters with Black physicians have been associated with higher satisfaction ratings, stronger perceptions of care quality, and greater acceptance of medical recommendations [7, 9, 12]. These findings suggest that increasing representation within the health professions may directly influence patient engagement and outcomes.

Compounding these challenges is the presence of implicit bias toward Black, Hispanic, and other minoritized patient groups across health professions [13]. Such bias can shape clinical decision-making and interpersonal interactions, contributing to unequal treatment. Addressing these issues requires both institutional accountability and a sustained expansion of the pipeline of underrepresented minority (URM) professionals, particularly individuals who identify as Black, Hispanic, or Native American. Greater URM representation has been linked to improved access to care in underserved

communities, as these professionals are more likely to practice in settings serving vulnerable populations [14, 15]. In addition, minority professionals often assume mentorship roles, supporting future generations of students and trainees and reinforcing long-term workforce diversity.

Health professions education plays a pivotal role in this process. Diversity within educational environments has been identified as a foundational element in the development of culturally responsive practitioners [16]. Exposure to peers from diverse racial and ethnic backgrounds enhances students' ability to collaborate, encourages critical engagement with differing viewpoints, and promotes reflection on entrenched assumptions [17]. Such interactions foster perspective-taking that cannot be achieved in homogenous settings [18]. Faculty diversity further contributes to inclusive learning environments by broadening academic perspectives and strengthening institutional cultures of belonging [19, 20]. Students educated in racially diverse settings report higher satisfaction, increased engagement, and more frequent discussion of racial and ethnic issues [21]. Importantly, educational diversity has been associated with greater confidence and perceived preparedness to care for diverse patient populations and to address inequities in access to care [17, 22, 23].

Despite widespread recognition of these benefits, progress in diversifying health professions education has been uneven. National organizations, including the American Association of Colleges of Pharmacy (AACP), the Association of American Medical Colleges (AAMC), and the American Dental Education Association (ADEA), have issued calls for greater diversity within their respective fields [24–26]. Nevertheless, individual institutions continue to face challenges in recruiting and retaining URM students, particularly those who identify as Black or Hispanic. Previous investigations have demonstrated that medical school graduates from URM backgrounds did not proportionally reflect national demographics as of 2012 [27], while pharmacy school enrollment data from California between 2005 and 2014 showed minimal gains in URM representation overall or within specific racial and ethnic groups [28].

In the context of diversity-focused initiatives implemented in recent years [29] and heightened societal awareness of racial inequities affecting African American communities, reassessing institutional progress is essential. However, contemporary, cross-disciplinary evaluations of enrollment trends remain

limited. To address this gap, the present study aimed to: (1) analyze changes in Black professional student enrollment in U.S. schools and colleges of pharmacy, medicine, and dentistry; (2) compare levels of Black student enrollment across these disciplines; and (3) evaluate institutional performance by assessing the extent to which Black student enrollment aligns with state-level Black population demographics, including changes in failing ratings between 2010 and 2019. For the purposes of this study, professional students were defined as individuals enrolled in Doctor of Medicine (MD), Doctor of Pharmacy (PharmD), or Doctor of Dental Medicine (DMD)/Doctor of Dental Surgery (DDS) programs.

Materials and Methods

Enrollment data for students who self-identified as Black or African American, alongside total student numbers, were drawn from reports by the American Association of Colleges of Pharmacy (AACP Profile of Pharmacy Students Fall Enrollments), the Association of American Medical Colleges (AAMC data on U.S. medical school enrollment by race/ethnicity), and the American Dental Association (ADA Survey of Dental Education, Report 1) for the fall terms of 2010 through 2019. These figures were accessed either from publicly posted materials on the organizations' sites or through direct requests when needed. State-level Black population proportions came from U.S. Census estimates. [30]

Statistical analysis

All computations were carried out in Microsoft Excel and IBM SPSS version 26.0. For each institution, the Black student proportion was computed as (Black enrollees / total enrollees) $\times$ 100. Annual discipline-wide averages were obtained by taking the mean of these institutional proportions. Given the skewed distribution, differences

in 2019 Black enrollment proportions across pharmacy, medicine, and dentistry were tested via Kruskal-Wallis H test with Dunn's post hoc comparisons. Trends within each discipline from 2010 to 2019 were evaluated using Wilcoxon signed-rank tests, restricted to institutions with paired data from both years.

Institutions received performance ratings adapted from Nichols,[31] calculated as (% Black students in the program / % Black population in the state) $\times$ 100 for 2010 and 2019 separately. Letter grades were assigned as: A ($\geq 90\%$), B (80–89%), C (70–79%), D (60–69%), F ($< 60\%$). Shifts in the frequency of F grades between the two years were assessed with chi-square tests, with statistical significance set at $p < .05$. State-by-state comparisons were preferred over national benchmarks due to wide regional differences in Black demographics. For broader context, however, deviations from the overall U.S. Black population share (13.0% in 2010, 13.4% in 2019) were calculated as institutional % Black students minus the national percentage; these were reported using means, standard deviations, medians, and ranges.

Results and Discussion

The decade saw steady expansion in professional programs: by 2019, the U.S. had 143 pharmacy schools (up 25 from 2010), 153 medical schools (up 19), and 66 dental schools (up 8). Total enrollment grew most sharply in medicine, from 79,070 students in 2010 to 92,758 in 2019, followed by smaller rises in dentistry (20,352 to 25,807) and pharmacy (56,841 to 60,594) (**Table 1**). Black enrollment also increased across all three fields: pharmacy gained 1,913 Black students (3,711 to 5,624), medicine gained 2,486 (5,548 to 8,034), and dentistry gained 269 (1,138 to 1,407) over the same period (**Table 1**).

Table 1. Comparison of black student enrollment in US colleges and schools of medicine, pharmacy, and dentistry, 2010–2019

Schools and Programs	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Dentistry										
Total enrolled students	20,352	21,142	21,853	22,776	23,589	24,117	24,677	25,010	25,381	25,807
Black/African American students	1,138	1,182	1,210	1,173	1,172	1,201	1,239	1,256	1,338	1,407
Pharmacy										
Total enrolled students	56,841	58,915	61,275	62,743	63,927	63,460	63,464	63,087	62,504	60,594
Black/African American students	3,711	3,964	4,226	4,376	4,690	5,031	5,308	5,673	5,719	5,624

Medicine										
Total enrolled students	79,070	80,279	82,067	83,424	85,260	86,746	88,304	89,904	91,391	92,758
Black/African American students	5,548	5,581	5,630	5,743	5,335	5,505	5,856	6,188	7,699	8,034

As illustrated in **Figure 1**, mean proportions of Black students enrolled in pharmacy, medical, and dental schools in 2010 were 7.6%, 7.4%, and 6.3%, respectively. By 2019, the average representation of Black students in pharmacy programs increased to 10.6%, reflecting an overall rise of 3 percentage points since 2010 and an estimated annual increase of 0.33%. Medical schools experienced a more modest increase, reaching 8.7% in 2019, which corresponds to a 1.3 percentage point gain over the study period and an average annual growth of 0.14%. In contrast, the proportion of Black students enrolled in dental schools slightly decreased to 6.2% in 2019, representing a net change of -0.1% . Trend analysis indicated growth slopes of 0.31 for pharmacy programs and 0.14 for medical programs, while dental programs demonstrated a negative slope of -0.02 over the same period.

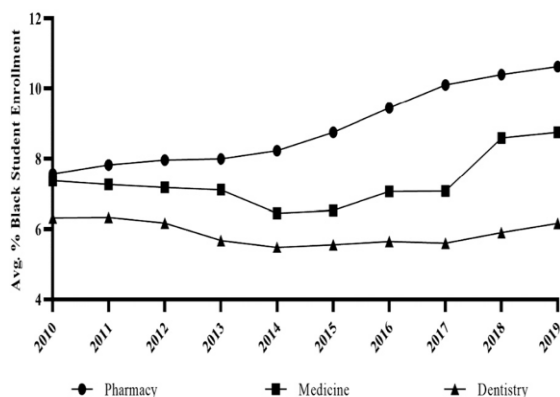


Figure 1. Mean proportions of black student enrollment in U.S. schools and colleges of pharmacy, medicine, and dentistry, Fall 2010–Fall 2019

Results from the Wilcoxon signed-rank tests indicated a statistically significant increase in the proportion of Black students enrolled in pharmacy programs from 2010 ($M = 7.6\%$, $SD = 13.2$, median = 4%) to 2019 ($M = 10.1\%$, $SD = 13.4$, median = 6.2%; $p < .001$). Medical schools also demonstrated a significant rise in Black student representation over the same period, increasing from 2010 ($M = 7.3\%$, $SD = 11.1$, median = 5.5%) to 2019 ($M = 8.95\%$, $SD = 10.1$, median = 7.5%; $p < .001$). In contrast, no statistically meaningful change was observed in dental schools, where the proportion of Black

students remained relatively stable between 2010 ($M = 6.3\%$, $SD = 13.8$, median = 2.9%) and 2019 ($M = 6.4\%$, $SD = 13.1$, median = 3.6%; $p = .76$).

Kruskal–Wallis testing revealed that, in 2019, pharmacy programs ($M = 10.6\%$, $SD = 12.6$, median = 6.9%) and medical programs ($M = 8.7\%$, $SD = 9.7$, median = 7.6%) had significantly higher average proportions of Black student enrollment compared with dental programs ($M = 6.2\%$, $SD = 12.5$, median = 3.3%), with both post hoc pairwise comparisons yielding p values below .001. No statistically significant difference was detected between pharmacy and medical programs ($p = .75$).

Institutions were further evaluated by comparing their percentage of Black student enrollment with the proportion of Black residents within their respective states. In 2019, failing grades (F) were assigned to 46.9% of pharmacy schools, 55.6% of medical schools, and 81.8% of dental schools (**Figure 2**). Pharmacy programs achieved the greatest number and share of top (A) ratings, with 44 institutions (30.8%), followed by medical schools with 36 institutions (23.5%). Dental schools recorded the fewest A ratings, totaling seven institutions (10.6%). Among institutions that earned an A rating in both 2010 and 2019, there were 17 pharmacy schools—including all six historically Black colleges and universities (HBCUs)—10 medical schools, including all three HBCUs, and three dental schools, two of which were HBCUs. In 2019, C ratings were assigned to 11 pharmacy schools (7.7%) and 10 medical schools (6.5%), whereas only one dental school (1.5%) received a C rating.

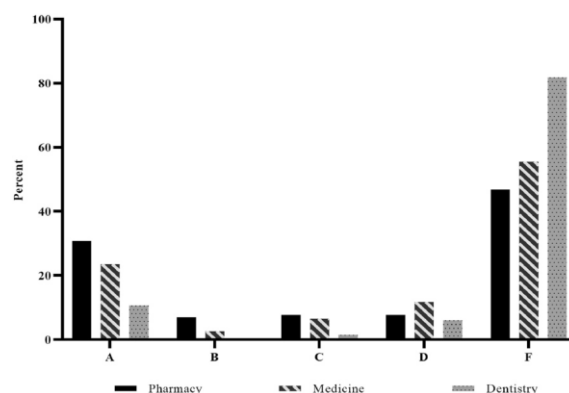


Figure 2. State-based performance ratings for black student representation in professional health programs, 2019

Figure 2 presents the distribution of institutional grades (A through F) assigned to colleges of pharmacy, medicine, and dentistry based on how closely Black student enrollment aligned with the proportion of Black residents in the state where each institution is located. The total number of institutions evaluated included 143 pharmacy programs, 153 medical schools, and 66 dental schools.

Chi-square testing revealed notable shifts in performance over time. Compared with 2010, a significantly smaller share of pharmacy and medical schools received failing (F) ratings in 2019 (**Table 2**), indicating improvement in state-level representation of Black students within these disciplines. In contrast, dental schools demonstrated the opposite trend: a significantly greater proportion of dental programs were assigned failing ratings in 2019 than in 2010. This pattern suggests an overall decline in the relative success of dental schools in enrolling Black students over the study period.

Table 2. Temporal comparison of state-level F grades among U.S. pharmacy, medical, and dental schools in 2010 and 2019

Field	Chi-Square Statistic	2019: F Rating, n (%)	2010: F Rating, n (%)	p-value
Medicine	21.4	71 (54.2%)	90 (68.7%)	< 0.001
Pharmacy	32.2	59 (50.9%)	83 (71.6%)	< 0.001
Dentistry	7.6	48 (82.8%)	47 (81%)	0.006

^a Institutions were classified as failing when their proportion of enrolled Black students in either fall 2010 or fall 2019 reached less than three-fifths of the proportion of Black residents in the institution's home state.

^b The analytic sample was limited to programs reporting complete enrollment data for both time points: pharmacy (n = 116), medicine (n = 131), and dentistry (n = 58).

Institution-specific gaps were calculated by subtracting the national percentage of Black residents from each school's percentage of enrolled Black students for both 2010 and 2019. In 2010, schools across all three disciplines enrolled Black students at levels well below the national benchmark on average. Pharmacy programs demonstrated a mean deficit of -5.44 percentage points (SD = 13.16; median = -9.01), while medical and dental programs showed similar shortfalls of -5.64 (SD = 11.25; median = -7.5) and -6.68 (SD = 13.79; median =

-10.08), respectively. Considerable variability was evident that year, with institutional deviations ranging from -13 to $+67.78$ in pharmacy, -13 to $+68.94$ in medicine, and -13 to $+77.79$ in dentistry. By 2019, pharmacy programs showed measurable improvement relative to the national benchmark, with the mean difference narrowing to -2.79 (SD = 12.56; median = -6.46). Medical and dental schools continued to lag behind national representation, with average differences of -4.65 (SD = 9.65; median = -5.94) and -7.24 (SD = 12.52; median = -10.06), respectively. The spread of institutional performance in 2019 remained wide, extending from -13.4 to $+62.49$ for pharmacy schools, -13.06 to $+63.25$ for medical schools, and -13.4 to $+73.84$ for dental schools. When changes over time were examined, increases in the proportion of Black students were observed in 78 pharmacy schools, 93 medical schools, and 26 dental schools. Among pharmacy programs, 31 institutions—including all six historically Black colleges and universities (HBCUs)—surpassed the 2019 national Black population estimate of 13.4%. Fourteen medical schools, encompassing all three HBCUs, and three dental schools, two of which were HBCUs, also exceeded this threshold in 2019. Sustained enrollment levels above the national benchmark at both time points were uncommon and were observed in only 10 pharmacy schools (six HBCUs), three medical schools (all HBCUs), and two dental schools (both HBCUs).

This investigation evaluated decade-long patterns in Black student representation within U.S. programs of pharmacy, medicine, and dentistry. Between 2010 and 2019, enrollment of Black students increased significantly in pharmacy and medical education, whereas dental education showed no statistically meaningful change during the same period. Despite these gains, the large proportion of institutions receiving failing (F) ratings in 2019 indicates that schools across all three disciplines continue to fall short of reflecting the racial composition of their surrounding state populations. Encouragingly, the share of institutions earning the highest (A) rating improved over time in pharmacy education (rising from 16.4% to 30.8%) and medical education (from 11.2% to 23.5%), while dentistry demonstrated little change (10.3% in 2010 and 10.6% in 2019). When assessed against national benchmarks, average Black student enrollment in pharmacy, medicine, and dentistry remained below the overall U.S. Black population percentage in both years examined.

As demographic diversity within the United States continues to expand, the importance of cultivating a culturally responsive and representative health care workforce becomes increasingly evident. Achieving this goal begins with diversifying the student pipeline entering health professions education. Financial burden represents a substantial obstacle to this effort. Students from economically disadvantaged backgrounds often carry existing undergraduate debt, which may discourage pursuit of additional professional training [1]. This concern is particularly relevant for Black students from low- to moderate-income households, who, on average, incur more than \$7,000 in additional undergraduate debt compared with their White peers from similar income backgrounds [32]. Although long-term earning potential in health professions typically outweighs educational costs [33], debt-to-income ratios for pharmacists, physicians, and dentists have continued to rise, with dentistry showing the steepest annual growth in debt between 2010 and 2016 [34]. To meaningfully address these challenges, financial support strategies must extend beyond loans and include expanded access to scholarships for underrepresented minority students [1]. Additional expenses, such as application fees and seat deposits, may further restrict access for some prospective applicants.

Pipeline initiatives play a critical role in strengthening minority participation in health professions education. These programs commonly provide academic preparation, admissions guidance, and mentoring to support students through the application process [35, 36]. Such initiatives may be housed within academic institutions [37, 38] or developed through collaborations with external partners, including corporations and nonprofit organizations [36]. Evidence suggests that some externally developed pipeline programs substantially increase admission success, with reported gains of 50%–70% [36]. Universities have also enhanced these efforts by implementing mentoring and academic support services for enrolled minority students to improve retention [35]. Early intervention—particularly during high school—has been shown to significantly improve academic outcomes for low-income, predominantly minority students and to increase the likelihood of entry into health-related careers [38].

Current sociopolitical and public health conditions further underscore the importance of sustaining and expanding pipeline programs aimed at underrepresented racial and ethnic groups. Notably, Black student

enrollment in pharmacy programs declined slightly in fall 2019 compared with 2018 (**Table 1, Figure 1**), and enrollment levels in fall 2020 may have been further affected by disruptions associated with the COVID-19 pandemic. Survey data from early 2020 indicated that 17% of high school seniors postponed plans to attend four-year institutions, while 63% reported reconsidering their first-choice college—decisions influenced in part by changes in family financial stability for 21% of respondents [39]. National reports also documented a 4% decline in undergraduate enrollment from fall 2019 to fall 2020, with first-time students experiencing the most pronounced reductions (16.1%), particularly within community colleges (22.7%) [40]. Additional analyses revealed that Black undergraduate enrollment decreased by 8.9%—approximately 200,000 students—between 2014 and 2018 [41]. Moreover, increased reliance on remote learning technologies may disproportionately disadvantage students lacking access to high-speed internet or personal computing devices, which represent significant financial barriers for students from lower socioeconomic backgrounds [42]. Although these data pertain primarily to undergraduate education, pharmacy, medical, and dental training pathways depend heavily on undergraduate preparation or degree completion. Consequently, declines in undergraduate enrollment are likely to affect the applicant pool for health professions programs in subsequent years. Similar financial and logistical concerns may lead prospective students to delay applications, defer matriculation, or discontinue training during and after the pandemic period.

Several limitations should be considered when interpreting these findings. As a secondary analysis of existing data, this study cannot establish causal relationships related to changes in Black student enrollment. Additionally, retention outcomes were not examined; it is possible that institutions enrolling smaller proportions of underrepresented minority students may demonstrate stronger retention once students matriculate. While this analysis highlights enrollment trends across pharmacy, medicine, and dentistry, it does not directly evaluate individual-level factors (such as socioeconomic status), institutional characteristics, or systemic influences that may shape application, enrollment, and persistence decisions. Future research should seek to identify these barriers and assess strategies to mitigate their effects. Finally, this study did not analyze institutional recruitment or admissions practices, which may contribute substantially to observed enrollment

patterns. Subsequent investigations should explore how admissions and recruitment policies facilitate or impede the enrollment of Black students within health professions education.

Conclusion

The convergence of the COVID-19 pandemic and increased national attention to racial injustice has intensified scrutiny of persistent inequities in the United States, particularly within the health care system. Over the past decade, Black student representation declined in dental education and increased only slightly in pharmacy and medical training programs. Although pharmacy schools demonstrated comparatively stronger performance than medical and dental schools, a large proportion still failed to enroll Black students at levels reflective of their surrounding state populations. These findings highlight the urgent need for deliberate, sustained strategies aimed at advancing diversity, equity, and inclusion across schools of pharmacy, medicine, and dentistry in order to meaningfully improve Black student enrollment.

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