THEME ISSUE: MOVING FROM INJUSTICE TO EQUITY
RESEARCH
Comparison of Black Student Enrollment in Colleges of Pharmacy, Medicine, and Dentistry

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Submitted November 30, 2020; accepted June 16, 2021; ePublished June 2021

Objective. Promoting equity and diversity in health care must include increasing the prevalence of minority health care professionals. The purpose of this study was to: (1) evaluate changes in Black student enrollment in colleges of pharmacy, medicine, and dentistry; (2) determine if significant differences exist in Black student enrollment among these colleges; and (3) grade colleges on how well Black student enrollment reflects state populations and compare failing grades between 2010 and 2019.

Methods. Enrollment data were obtained through the American Association of Colleges of Pharmacy, Association of American Medical Colleges, and American Dental Association for Fall 2010 through Fall 2019. Average percentage of Black students and rate change was determined. Colleges were graded on their percentage of Black students relative to Black residents in their state. Kruskal-Wallis H test, Wilcoxon signed rank tests, and Chi square tests were performed to quantify differences in enrollment and college grades.

Results. Colleges of pharmacy and medicine experienced a significant increase in Black student enrollment between 2010 and 2019, but colleges of dentistry did not. Pharmacy and medicine also had significantly greater Black student enrollment in 2019 compared to dentistry. Proportion of colleges of pharmacy and medicine with failing grades decreased between 2010 and 2019.

Conclusion. To facilitate improved access and limit health and health care disparities, it is important health professions colleges reflect the diversity of the patient populations they serve. Serious and intentional efforts toward diversification, inclusivity, and equity are necessary to improve Black student enrollment.

Keywords: diversity, student enrollment, college of pharmacy, college of medicine, college of dentistry

INTRODUCTION

Recent events, including an increased awareness of police brutality, systemic racism, and health care disparities, along with growth seen in minority populations, highlights the need to focus on developing culturally diverse and culturally competent health care professionals (HCPs). The Sullivan Commission’s definition of diversity specifies the need for “representation of all racial and ethnic groups from the community within a given health care agency, institution, or system.” However, the current racial and ethnic makeup of HCPs is hardly representative. For example, in 2019, non-Hispanic Black individuals made up 13.4% of the United States population, but only 4.9% of licensed pharmacists and 4.2% of physicians and medical students. Similarly, only 4.3% of dentists in the United States were Black, compared to 73.6% who were White. Pharmacists and physicians are the most visited members of the health care team, and the diversity and cultural competency of both types of providers has been shown to be important in the care of a diverse patient population. Cultural competency is rooted in the ability of HCPs to communicate effectively and create a trusting relationship with patients. Communications between providers and patients of different races or ethnicities can be problematic, with nearly one out of every four Black patients reporting problems communicating with physicians. For example, communication between pharmacists and patients that do not take into account cultural differences in perceptions of illness and health literacy, along with the impact of race on drug metabolism and hardships faced by non-English speakers, could lead to inappropriate drug therapy, medication errors, and poor clinical outcomes. Furthermore, studies show that racial concordance in a physician is preferred if a choice is available. Black patients are more likely to rank the visit positively and accept physician recommendations if their physician is also Black. Implicit negative bias toward Black, Hispanic, and other minorities is present across health care professions. Recognizing, educating, and acting to limit this bias and its impacts on patient-provider interactions is key in all health care settings. Thus, an expanded pipeline of underrepresented minority (URM) HCPs, particularly Black, Hispanic, and
Native American HCPs, is crucial to address health care disparities and requires minority student enrollment in health professions programs. Increasing the diversity of HCPs has been associated with increased access to care for underserved minorities,\textsuperscript{14} as individuals who are URMs are more likely to provide care to underserved populations.\textsuperscript{15} Additionally, an increased number of minority HCPs could act as mentors for incoming or applying students and/or trainees. Further, increasing diversity in medical and pharmacy education has been highlighted as a critical part of developing culturally competent HCPs.\textsuperscript{16} Diversity within the classroom has been shown to help students work with people of differing backgrounds, and generates serious discussions of alternative viewpoints, challenging established value systems.\textsuperscript{17} Seeing issues from others’ perspectives can only be accomplished by encountering and interacting with others from differing racial and ethnic backgrounds.\textsuperscript{18} Efforts to recruit and retain a diverse faculty also increases student exposure to different backgrounds and viewpoints, and builds a culture of inclusion and community within the college.\textsuperscript{19,20} Student satisfaction is higher in diversified settings with interaction across multiple racial groups where racial and ethnic issues are discussed.\textsuperscript{21} Also important in the context of educating health care professionals, an increase in diversity within classes increases students’ perceived ability and concern for treating diverse populations and expanding access to care.\textsuperscript{17,22,23}

Despite the American Association of Colleges of Pharmacy (AACP), the Association of American Medical Colleges (AAMC), and the American Dental Education Association (ADEA) recognizing the need for a diverse workforce,\textsuperscript{24-26} individual colleges face difficulties in expanding enrollment of URM, particularly Black or Hispanic students. A 2000 report from AACP found that Black individuals only made up 5.6% of recent graduates, whereas 11.5% of the United States population identified as Black or African American.\textsuperscript{24} Similarly, in 2012, the percentage of URM graduates from medical schools was found to not be representative of the U.S. population.\textsuperscript{27} While studies demonstrate benefits of diversified health care teams and health care education, little is known about the progress made by U.S. health professions colleges over the last decade, particularly for any particular racial or ethnic group. One recent study looking at barriers for URM students in applying to or attending pharmacy school in California between 2005 and 2014 found little change in collective URM or individual racial groups’ enrollment percentages.\textsuperscript{28} With additional initiatives put in place since 2015,\textsuperscript{29} and events highlighting the injustices of African Americans in this country, it is important to understand if colleges of pharmacy, medicine, and dentistry have increased their African American or Black student population, and how these disciplines compare. To address this knowledge gap, the purpose of this study is to: (1) evaluate changes in Black student enrollment in U.S. colleges of pharmacy, medicine, and dentistry; (2) determine if significant differences exist in Black student enrollment between colleges of pharmacy, medicine, and dentistry; and (3) grade colleges of pharmacy, medicine, and dentistry on how well Black student enrollment reflects state populations and compare changes in failing grades between 2010 and 2019.

**METHODS**

This study included enrollment numbers for Black or African American students, along with total student enrollment, obtained from AACP (Fall Enrollments-Profile of Pharmacy Students), AAMC (Total Enrollment by US Medical School and Race and Ethnicity), and the American Dental Association (ADA; Survey of Dental Education: Report 1) for Fall 2010 through Fall 2019. Data were collected from these organizations through their websites (if publicly available) and personal communications (if not publicly available). Racial population estimates were obtained from the United States Census Population Estimates.\textsuperscript{30}

**Statistical Analysis**

Data analyses were conducted using Microsoft Excel (Microsoft Corporation, Redmond, WA) and IBM SPSS Statistics 26.0 (Armonk, New York). Percent of Black students enrolled in each college of pharmacy, medicine, and dentistry was calculated ([number of Black students / total number of students] x 100), as was the average percentage per year of Black student enrollment for all colleges of pharmacy, medicine, and dentistry ([School A% + School B% + School C%] / (number of colleges)). Due to non-normal distribution of the data, Kruskal-Wallis H test with post hoc Dunn analysis was conducted to determine differences in percentage of Black student enrollment in 2019 among colleges of pharmacy, medicine, and dentistry. To examine changes in percentage of Black student enrollment in colleges of pharmacy, medicine, and dentistry between 2010 and 2019, Wilcoxon signed rank tests were conducted, comparing only those colleges with data available for both years.

Applying established methodology from Nichols,\textsuperscript{31} individual colleges were graded based on their percentage of Black students enrolled in Fall 2010 and Fall 2019 relative to the percentage of Black residents in their state or territory using the equation below:

\[
\text{Grade} = \frac{\text{[(% Black students)} / \text{(% Black residents)]}}{100}
\]
Grades were then grouped into categories using the following grading scale, A: ≥90%; B: 80-89%; C: 70-79%; D: 60-69%; and F: <60%. Changes in proportion of failing grades between 2010 and 2019 were compared using Chi square tests. An a priori alpha level of .05 was used. Given the variation in percentage of Black residents across states compared to the national population, application of grading based on the national percentage of Black residents was not considered a valid comparison. However, to provide information on the scope of Black student enrollment across the nation, differences between the percentage of Black students at individual colleges and the percentage of Black residents in the United States (2010: 13.0%; 2019: 13.4%) were determined using the equation below:

\[
\text{Difference} = (\% \text{ Black students}) - (\% \text{ Black residents})
\]

Differences between percentage of Black student enrollment and national percentage of Black residents were summarized with descriptive statistics (mean, standard deviation, and median) and a range was provided.

RESULTS

The number of colleges of pharmacy, medicine, and dentistry has steadily increased in the last decade, with 143 colleges of pharmacy, 153 colleges of medicine, and 66 colleges of dentistry in 2019, an increase of 25, 19, and 8, respectively, since 2010. The number of students enrolled in colleges of medicine consistently increased over this time period, from 79,070 in 2010 to over 90,000 in 2019. Smaller increases were observed in colleges of pharmacy, from 56,841 students in 2010 to 60,594 in 2019, and in colleges of dentistry, from 20,352 in 2010 to 25,807 in 2019 (Table 1). The number of Black students enrolled in colleges of pharmacy, medicine, and dentistry also increased between 2010 and 2019 from 3,711 in pharmacy, 5,548 in medicine, and 1,138 in dentistry programs in 2010 to 5,624 in pharmacy, 8,034 in medicine, and 1,407 in dentistry programs in 2019 (Table 1), an increase of 1,913, 2,486, and 269, respectively.

As displayed in Figure 1, the average percentages of Black students enrolled in colleges of pharmacy, medicine, and dentistry in 2010 were 7.6%, 7.4%, and 6.3%, respectively. Average percentage of Black student enrollment rose to 10.6% in 2019 in colleges of pharmacy, a total change of 3% from 2010 and an average change of 0.33% per year. Colleges of medicine grew to 8.7% in 2019, a change of 1.3% from 2010 and an average change of 0.14% per year. The average percentage of Black students enrolled in colleges of dentistry declined to 6.2% in 2019, a change of -0.1%. The slope for growth in average Black student enrollment between 2010 and 2019 was determined to be 0.14 for colleges of pharmacy, 0.14 for colleges of medicine, and -0.02 for colleges of dentistry.

In the Wilcoxon signed rank analysis, the percentage of Black students enrolled in colleges of pharmacy significantly increased (p<.001) between 2010 (M=7.6%, SD=13.2, Median=4%) and 2019 (M=10.1%, SD=13.4, Median=6.2%). The percentage of Black students enrolled in colleges of medicine also significantly increased (p<.001) between 2010 (M=7.3%, SD=11.1, Median=5.5%) and 2019 (M=8.95%, SD=10.1, Median=7.5%). However, the percentage of Black students enrolled in colleges of dentistry did not significantly differ (p=.76) between 2010 (M=6.3%, SD=13.8, Median=2.9%) and 2019 (M=6.4%, SD=13.1, Median=3.6%).

In the Kruskal-Wallis analysis, colleges of pharmacy (M=10.6%, SD=12.6, Median=6.9%) and colleges of medicine (M=8.7%, SD=9.7, Median=7.6%) had significantly greater average percentage of Black student enrollment in 2019 compared to colleges of dentistry (M=6.2%, SD=12.5, Median=3.3%; p<.001 for both post hoc pairwise comparisons). However, there was no significant difference in percentage of Black student enrollment between colleges of medicine and pharmacy (p=.75).

Individual colleges were graded based on how the percent of Black students enrolled compared to the percent of Black residents within their state. The percentage of colleges of pharmacy, medicine, and dentistry receiving a grade of F in 2019 when compared to the state in which they are located were 46.9%, 55.6%, and 81.8%, respectively (Figure 2). Colleges of pharmacy had the highest number and percentage of colleges with A grades in 2019, 44 schools or 30.8%, followed by colleges medicine, 36 schools or 23.5%. Colleges of dentistry had the lowest number and percentage of colleges with A grades, seven schools or 10.6%. When examining number of colleges receiving a state grade of A in both 2010 and 2019, there were 17 colleges of pharmacy (including all six Historically Black Colleges and Universities [HBCUs]), 10 colleges of medicine (including all three HBCUs), and three colleges of dentistry (including two HBCUs). Colleges of pharmacy and medicine had 11 schools (7.7%) and 10 schools (6.5%), respectively, with C grades in 2019 (Figure 2). Colleges of dentistry had one school, or 1.5%, with a grade of C.

In Chi square analysis, a significantly higher proportion of colleges of pharmacy and colleges of medicine received failing state grades in 2010 compared to 2019 (Table 2). A significantly lower proportion of colleges of dentistry received failing state grades in 2010 compared to 2019, thus demonstrating colleges of dentistry collectively did worse over time in matriculating Black students between 2010 and 2019.

Differences were calculated between the percentage of Black students enrolled at individual colleges and percentage of Black residents in the United States in 2010 and 2019. For 2010, the mean difference from the national percentage was
individuals who identified as Black or African American made up 13.4% of the United States population, and medicine, and dentistry is still generally not representative of state and national populations as of 2019. In 2019, pharmacy increased their percentage of Black students, with 31 schools (including six HBCUs) exceeding the 2019 national percentage of Black residents, 13.4%. A total of 93 colleges of medicine and 26 colleges of dentistry increased their percentage of Black students, and 14 colleges of medicine (including three HBCUs) and three colleges of dentistry (including two HBCUs) exceeded the 2019 national percentage of Black residents. In both 2010 and 2019, 10 colleges of pharmacy (including six HBCUs), three colleges of medicine (all HBCUs), and two colleges of dentistry (both HBCUs) exceeded the national percentage of Black residents.

DISCUSSION

In the current study, we examined changes in Black student enrollment in the last 10 years within colleges of pharmacy, medicine, and dentistry. Colleges of pharmacy and medicine experienced significantly increased percentages of Black student enrollment between 2010 and 2019, however there was no significant difference between 2010 and 2019 percentages of Black student enrollment among colleges of dentistry. AACP, AAMC, and ADEA have recognized the need for increased diversity within their programs; however, overall enrollment of Black students in pharmacy, medicine, and dentistry is still generally not representative of state and national populations as of 2019. In 2019, individuals who identified as Black or African American made up 13.4% of the United States population, which is 4.1%, 4.7%, and 7.9%, respectively, higher than total Black enrollment in colleges of pharmacy, medicine, and dentistry (Table 1).

Additionally, we utilized an established methodology to grade colleges of pharmacy, dentistry, and medicine on Black student enrollment in comparison to state population. Per a literature search of PubMed and Google Scholar (years unlimited), this is the first published study to apply this methodology to pharmacy, medicine, and dentistry programs. The high percentage of F grades received by colleges of pharmacy, medicine, and dentistry in 2019 emphasizes that none of the college types studied are completely representative of state populations. However, percentage of A grades grew between 2010 and 2019 among colleges of pharmacy (from 16.4% to 30.8%) and medicine (from 11.2% to 23.5%), with colleges of dentistry having 10.3% and 10.6% in 2010 and 2019 respectively. All HBCUs earned grades of A in state-level comparisons, and colleges of pharmacy and medicine had 38 of 137 schools (27.7%) and 33 of 150 (22%) non-HBCUs, respectively, receive A grades in 2019.

Although many students attend school in their home state, it is also important to recognize the mobility of health professions student populations in states other than their state of origin. For example, colleges of medicine and dentistry enrolled nearly 40% out-of-state students in their entering classes of 2020, and out-of-state students comprised 27% of students enrolled in colleges of pharmacy in 2019. Therefore, we examined differences between Black student enrollment in colleges of pharmacy, dentistry and medicine and the percentage of Black residents in the United States. On average, colleges of colleges of pharmacy, medicine, and dentistry had Black student enrollment below the national percentage of Black residents for both 2010 and 2019. Of note, in contrast to medicine and dentistry, colleges of pharmacy had four non-HBCU schools exceeding the 2010 and 2019 national percentages for Black residents.

To provide the best care for the growing number of racially and ethnically diverse patients, colleges of pharmacy, medicine, and dentistry must produce HCPs representative of the patient populations they will serve. Previous studies show that racially concordant HCPs increase the likelihood of patients, particularly Black and Hispanic patients, seeking preventative care and more likely accepting physician recommendations. Interestingly, no similar association was found for White patients, potentially due to the high prevalence of White HCPs. Furthermore, since HCPs from underrepresented minorities are more likely to practice in underserved areas, increasing the diversity of future HCPs in health care training programs should lead to more HCPs providing care to underserved communities. As the United States continues to become more diverse, the need for culturally competent and diverse HCPs is critical, and that begins with having a more diverse student body. Future studies should examine the graduation and employment rates of URM graduates to determine if changes in student enrollment are reflected in progression through professional school and job placement.

One potential barrier to increasing student diversity is debt incurred by students during their training. If students from lower socioeconomic status backgrounds already have debt accumulated from undergraduate education, the need to accrue
additional debt may deter students from even considering further education. This may be particularly important for Black students from low to moderate income families as they can accumulate over $7,000 more in educational debt during undergraduate education when compared to White students from low to moderate income families. Although the potential earned income far surpasses educational debt, debt-to-income ratios continue to increase for pharmacists, physicians, and dentists, with dentists having the largest per-year increase in debt between 2010 and 2016. It is critical that scholarships, not just loans, are made available for minority students to finance their education as a major strategy to increase diversity. Other fees, including application fees and fees to secure your place in the program, could also be barriers for some students.

Pipeline programs and associated strategies are a valuable component of growing minority involvement in health care education programs. Pipeline programs provide support such as test preparation, application assistance, and mentorship to assist in application to health care programs. These can be developed within universities or by corporations, foundations, or other university partner organizations. Some pipeline programs developed by organizations external to universities have proven effective at boosting the chances of admission to health care programs by 50%-70%. Further, universities are supplementing these programs with additional mentoring and support services for enrolled minority students to aid in student retention. Providing support to low income, primarily minority students even earlier, such as in high school, dramatically increases their success in undergraduate education and increases the likelihood of entering health care professions.

Current events make college pipeline programs even more crucial to recruiting URM students. The Fall 2019 Black student enrollment numbers were decreased for colleges of pharmacy relative to 2018 (Table 1, Figure 1), and Fall 2020 enrollment could be further reduced due to complications surrounding the COVID-19 pandemic. In early 2020, 17% of surveyed high school seniors were putting plans on hold to attend a four-year undergraduate institution due to the pandemic, and 63% of survey respondents said that the pandemic could change their first-choice institution, a factor that was driven by changes in family financial situations for 21%. This report did not differentiate between students attending in-state versus out-of-state institutions; however, due to continued concerns about viral spread and increased cost of out-of-state institutions, it is reasonable to believe the percentage of students altering college plans to stay close to home could factor into the 63% of respondents changing their college plans. Additionally, a recent report revealed that Fall 2020 undergraduate enrollment is down 4% compared to Fall 2019 enrollment. First-time student enrollment, or students with no previous college experience, had the largest decline with a 16.1% reduction, which was even more pronounced at community colleges, down 22.7% from Fall 2019. When enrollment of different racial/ethnic groups was examined in another report, Black student enrollment in undergraduate education decreased by 8.9%, or 200,000 fewer enrolled students, between 2014 and 2018. Additionally, increased reliance on technology during the 2020-2021 school year could hinder students without access to high-speed internet or a personal laptop or computer, a significant cost for students with low socioeconomic status. While this data is focused on undergraduate institutions, the prerequisites for pharmacy, medicine, and dentistry require a substantial undergraduate course load, if not an entire bachelor’s degree. Reductions in undergraduate enrollment will be felt by health care programs in the coming years as the undergraduate pipeline is reduced. Based on these patterns in undergraduate education, students entering pharmacy, medicine, and dentistry programs may have similar concerns as undergraduates, and could delay beginning applications, defer starting programs, or halt their progression toward degree completion until the pandemic is over.

This study has limitations. The design of the study was a secondary data analysis, and therefore, no inferences can be made regarding causality concerning Black student enrollment in colleges of pharmacy, medicine, and dentistry. While the current study identifies trends in Black student enrollment across colleges of pharmacy, medicine, and dentistry, it does not address various personal (e.g., socioeconomic status), institutional, or systemic barriers which may limit student application, enrollment, or retention. Future studies should focus on identification of these barriers and ways to overcome them. An additional limitation of the study is that it does not evaluate student recruitment and admissions practices across institutions, which may contribute to the trends noted in our findings. Future studies should address the role of student recruitment and admissions processes in facilitating or obstructing enrollment of Black students in health professions colleges.

CONCLUSION

The combination of a pandemic and heightened awareness of police brutality has renewed focus on racial inequality within the United States, particularly in the area of health care disparities. Although better than colleges of dentistry, where Black student enrollment decreased over the decade, colleges of pharmacy and medicine experienced only modest increases in Black student enrollment over the last 10 years. While colleges of pharmacy earned more passing grades than either colleges of medicine or dentistry, a substantial number of colleges earned failing grades when comparing the
percent of Black student enrollment to the percent of Black residents at the state level. Thus, serious and intentional efforts toward diversification, inclusivity, and equity in colleges of pharmacy, medicine, and dentistry are necessary to improve Black student enrollment.

ACKNOWLEDGMENTS

The authors would like to thank the Association of Colleges of Pharmacy, the Association of American Medical Colleges, and the American Dental Association for providing the enrollment data used in this analysis.

Conflicts of Interest: Marie Chisholm-Burns serves on the Board of Directors for the Accreditation Council of Pharmacy Education (ACPE). This manuscript does not represent ACPE or the Board’s opinions or views.

REFERENCES


Table 1. Black Student Enrollment in Colleges of Pharmacy, Medicine, and Dentistry, 2010-2019

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<td>24 677</td>
<td>25 010</td>
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Table 2. Comparison of State-level F Grades in Colleges of Pharmacy, Medicine, and Dentistry Between 2010 and 2019

<table>
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<tr>
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<th>F Grade 2019, n (%)</th>
<th>Chi Square Statistic</th>
<th>p value</th>
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<td>83 (71.6)</td>
<td>59 (50.9)</td>
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<td>Medicine</td>
<td>90 (68.7)</td>
<td>71 (54.2)</td>
<td>21.4</td>
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<td>Dentistry</td>
<td>47 (81)</td>
<td>48 (82.8)</td>
<td>7.6</td>
<td>.006</td>
</tr>
</tbody>
</table>

Analysis includes colleges with data for 2010 and 2019 (pharmacy, n=116; medicine, n=131; dentistry, n=58)

Figure 1. Black student enrollment in colleges of pharmacy, medicine, and dentistry.

The average percentage of Black students enrolled per college of pharmacy, medicine, and dentistry from Fall 2010 to Fall 2019.
The percentage of colleges of pharmacy, medicine, and dentistry that received an A, B, C, D, or F grade for Black student enrollment in comparison to the state-level percentage of Black population in which a given college resides. Pharmacy N=143; Medicine N=153; and Dentistry N=66.
This study utilizes secondary analysis of retrospective data and does not include human subjects research. Therefore, this study does not require IRB approval.