Research

Missing Persons:
African Americans in Dental Hygiene

Elizabeth Onik, RDH, BSDH, MEd

Abstract

Purpose: The purpose of this research was to study some of the reasons why African Americans are underrepresented in dental hygiene. The purpose was to 1) describe African American representation in dental hygiene and dental hygiene education; 2) evaluate the relationship between the percentage of hygienists and the percentage of African Americans by state; and 3) evaluate how the professional practice environment of dental hygienists relates to African American demographics by state.

Methods: This descriptive study cross-linked secondary data from existing education, oral health, and population databases. This study included 1) the historical percentages of African American dental hygiene graduates over the last 10 years; 2) the percentages of dental hygienists per state, cross-referenced with race demographics by state, and 3) the Dental Hygiene Professional Practice Index (DHPPI) cross-linked with African American population statistics. (The DHPPI is a tool that summarizes the professional practice environment of dental hygienists by state.)

Results: 1) Results demonstrate that based on African American dental hygiene graduation rates from 1996 through 2003, and employment projection data from the U.S. Labor Review Board, African Americans will continue to be proportionately underrepresented in dental hygiene. 2) Four of the top five states with the highest density of dental hygienists are in the 10 states with the lowest proportion of African Americans (Vermont, New Hampshire, North Dakota, and Oregon). 3) Of the 10 states (and DC) with the lowest density of dental hygienists, 3 of them have the highest proportion of African Americans (Mississippi, Louisiana, District of Columbia). 4) The 10 states with the highest proportion of African Americans had an average DHPPI score of **28.5%**, which falls in the lowest "Restrictive" practice environment category. The 10 states with the lowest proportion of African Americans had an average DHPPI score of **46.9%**, which scores in the "Favorable" category. 5) Of the 17 states with a higher than average African American population, (>12.1%), 14 were in the Limiting or Restrictive categories, 2 were in the Satisfactory category, 1 was in the Favorable, and none were in the Excellent category.

Conclusions: African Americans are underrepresented in the dental hygiene profession. African Americans live in states that are disproportionately lacking dental hygienists. The professional practice environment for dental hygienists is more restrictive in states with high percentages of African Americans.

Introduction

The rationale for this study is rooted in the first *Surgeon General's Report on Oral Health in America*, which revealed that not only is there an epidemic of oral disease in this country, but that the burden of disease is disproportionately borne by minorities.[1] Among the many reasons cited for this is the fact that there is very little diversity among health care workers in the United States.[2,3]

This paper is inspired by the landmark 2004 Sullivan Commission Report on diversity in the health care workforce, *Missing Persons: Minorities in the Health Professions*, which details the lack of diversity and under-representation of minorities in the health professions.[4] However, the report does not mention the profession of dental hygiene, where lack of African Americans is especially pronounced. African Americans represented 12% of the United States population in 2004, but they represented only 4% of dental hygienists.[5] By 2014, the African American population will be 13.2% of the population.[6] This fact is important when one considers data that shows that not only do minorities disproportionately carry the burden of untreated dental disease, they also are more likely to seek treatment from people of their own race.[7] If there are no health practitioners of one's own race, this can stand as a barrier to access to care. This may be one reason that minorities do not receive the level

of dental care that the Surgeon General's report has set as its goal. Because dental hygienists will continue to be in great demand,[25] it is important to find ways to improve the diversity of this health profession in order to improve access to care for African Americans.

The problem of lack of diversity and underrepresentation of minorities exists in all of the health professions, but is particularly noticeable in the profession of dental hygiene. The problem of underrepresented minorities in the dental hygiene profession crosses educational, regulatory, and oral health care domains. Accountability to the diverse racial and ethnic communities served by these domains is at issue in addressing the Surgeon General's call for action.[1] This paper will look at how educational and regulatory variables might intersect in selecting (or de-selecting) students for dental hygiene education. Although most of the literature looks at minorities as a group when discussing underrepresentation in the health professions, this paper will focus on African Americans, as they are one of the most underrepresented of all the minorities in dental hygiene,[5] and they exhibit a flat graduation growth rate compared to other minorities (Table 1).

Several questions are addressed in this paper. Is lack of access to dental care for African Americans a barrier that translates into lack of exposure to dental hygiene as a career? Do African Americans live in states with low access to preventive care because there are fewer dental hygienists available to provide care? If so, what are some of the reasons that the percent of dental hygienists is lower in some states? Within the context of finding solutions to improving access to dental care, this study will look at reasons why African American students are underrepresented in dental hygiene, and what barriers to care for African Americans might exist based on dental hygiene demographic distribution.

Review of the Literature

Former U.S. Surgeon General David Satcher, MD PhD, stated, "Without oral health, you do not have health."[1] He called upon dental professionals to study the problems of access to care and to find solutions to the astounding fact that 50% of the U.S. population receives no dental care at all.[1] Most of the burden of dental disease rests with underrepresented minorities who face barriers of affordability, transportation, utilization, and health literacy. The Institute of Medicine (IOM) report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care,* and its affiliated report *Implications for Academic Health Centers*, has identified lack of diversity in higher education as one of the causes of racial and ethnic disparities in health care.[8] The report points out that minorities (African Americans, Hispanics, and American Indians) together constitute 25% of the U.S. population. However, they only make up 9% of nurses, 6% of physicians, and 5% of dentists.[8] One of the recommendations in the IOM report on increasing diversity in the health professions calls on educators to establish and maintain outreach programs to increase student interest in the field and eligibility for admission.[8]

Table 1. Total Dental Hygienists in U.S. Workforce and Total of New DH Graduates in 2003 by Race

	Total % of Dental Hygienists in 2003	% Dental Hygienists graduated in 2003
African American	4	9
Hispanic	6	15
Native American	n/a	2
Asian	5	11
Caucasian	85	63
Total	100	100

Several authors and studies have recognized the critical benefits of educational diversity among health care workers in improving public health.[1,2,8-10] Tedesco argues for affirmative action in educating dental health professionals because this approach will improve the health status of minorities for several reasons, including the fact that minority health care professionals disproportionately serve minority and other underserved populations.[10] Tedesco also emphasizes that minority professional students are more likely to engage in community service and pro-bono work than white students, which would be a factor in improving the public's health.[10] Edmunds states that individuals in minority communities are more likely to seek treatment from people of their own race.[7] If there are no health practitioners of one's own race, this can stand as a barrier to access to care.[7] Dental practices in which the oral health care providers are black serve a patient population that is 61.8% black, practices in which the providers are Hispanic serve a 45.4% Hispanic population, practices in which the providers are Asian serve a 25% Asian population, and practices in which the providers are white serve a 76.6% white population.[11] Edmunds also points out that increasing diversity in dental schools can help motivate all students, not only minority students, to provide care to the underserved.[7] The IOM report also makes several recommendations to address ethnic and racial health disparities and concurs with Tedesco[3] that increasing the proportion of underrepresented minorities (URMs) in the health care workforce is critical.[8]

Although most of the literature on URMs in the health professions is focused on graduate-level medical and dental education programs, some authors try to extrapolate to dental hygiene.[9,10,12,13] Based on a review of

the literature, what is still missing is analytical information about URMs in *undergraduate* health professions programs such as dental hygiene. However, some of the literature on the nursing profession may be applicable to dental hygiene since they both have similar educational structures and organizations.[14] Both dental hygiene and nursing have various levels of training leading to licensure ranging from two-year community college programs to four-year baccalaureate and graduate degrees. However, dental hygiene has one practice barrier that nursing no longer faces. Unlike nurses, one dominant professional group (dentists) regulates dental hygienists. The American Dental Association promulgates curriculum guidelines and accreditation requirements, and state dental boards composed mainly of dentists and consumers generate licensing criteria regulations. In most states, dental hygienists are one of the few licensed health care professionals who are not self-regulated, and this results in practice laws that limit the scope of dental hygiene practice and access to care.[15]

In reviewing the literature concerning URMs in dental schools, another missing piece in the literature is lack of data that demonstrate the role that dental hygiene undergraduate programs can play as part of the pipeline for dental schools. Some dentists have started their careers in dental hygiene, just as some doctors have started their careers in nursing. If we can improve minority representation in dental hygiene, we may also see an increase in minority representation in dentistry. Although 90% of dental hygiene education programs are in community and technical colleges, most university programs have articulation agreements that allow the dental hygienist to continue the education to the baccalaureate level. Community colleges in general represent a possible pipeline for both advanced dental hygiene education and graduate dental school programs. Although there is not much data regarding dental hygiene minority education, some authors have described recruitment and retention strategies centered around community college articulation agreements, innovative curricula, success predictors, and remediation in dental hygiene higher education programs.[10,12,13]

Eleanor Schiff, in a *Spelling's Report Issue Paper: Preparing the Health Workforce*, noted that community colleges and associate degree programs are often the entry point for many professionals in health care fields.[9] Associate degree programs prepare 60% of the nation's RNs and 90% of our dental hygienists. Considering that 32% of the community college population are students of color,[16] we would expect to find a higher percentage of African Americans in dental hygiene (and nursing) programs. However only 10.2% of all associate degrees (and 8.3% of all bachelor's degrees), were earned by black students in 2000.[17] These figures speak to the low retention rates of African American students in community colleges.

The literature does demonstrate that the workforce adequacy of dental hygienists needs to be a large part of the solution to profound oral health disparities within the population. In order to serve the oral health needs of diverse segments of the population, dental hygiene higher education programs must increase the diversity of students wishing to be integral members of the dental health care workforce.[13,15,18] African Americans in particular have been deprived of educational access to dental hygiene programs, and these barriers may mirror the barriers to accessing personal dental care.

Much data exists that addresses the educational access and achievement gaps affecting minority students' participation in higher education. These include insufficient high school preparation, (including insufficient alignment between K-12), persistent financial barriers, narrow admissions practices, and lack of information about college opportunities.[19] Family income and the quality of high school education are the major factors in access and success in college, 2 factors that are lacking in the lives of many African American students.[17] Although all of these barriers likely affect African American enrollment in dental hygiene programs, other factors may contribute, such as student lack of information about dental hygiene college opportunities, lack of access to care for African Americans, and the related geographic distribution of dental hygienists in the United States.

Confusion about what a dental hygienist is and does may also be a barrier to choosing dental hygiene as a career, just as it is in nursing.[14] Public perception of dental hygiene may include misunderstanding about dental hygiene practice, role stereotypes, gender biases, and lack of mentors. Related to this, the Rand Health group funded a working paper, (nonpeer reviewed), for the U.S. Agency for Healthcare Research and Quality (AHRQ) designed to develop instruments that could rate consumers' dental care experiences.[20] Designed as a set of cognitive interviews, the authors explored the terms individuals use to describe and name dental care providers. Although this was a very small study, most participants identified the "person who cleans the child's teeth as a dentist, a dental assistant, or a nurse; only one participant mentioned the term 'dental hygienist.'" Previous focus groups indicated that the term dental hygienist is not universally used or understood.[18]

Public confusion about the profession of dental hygiene, especially among minority groups, may relate to access to dental care. If students do not have access to care, they may never interface with a dental hygienist, and may not be familiar with the preventive services that dental hygienists provide. Yu et al looked at factors associated with use of dental services among U.S. adolescents and found that lack of an annual dental

visit was associated with male gender; black, Hispanic, or mixed race; and lack of insurance.[21]

Barriers to dental care include lack of finances, but even when financial help does exist, many eligible minorities may not know how to navigate the system. For example, in some states, 80% of children who are eligible for dental benefits under the Medicaid program do not receive them.[22] In all, only 27% of African Americans used the oral health care system in 1996, whereas, 47% of whites visited a dentist.[1] Furthermore, when considering *preventive* care, the percent of low-income African American children and adolescents who received care in 1996 drops to 13%, compared to 25% for white children.[1] That same year, only 4% of hygienists were African American, whereas 87% were white.[23] These preventive visits are the only time low-income children might experience treatment from a dental hygienist.

The purpose of this study was to answer the following questions:

1. What are some of the reasons that African Americans are underrepresented in the profession of dental hygiene?
2. What is the relationship between the percentage of hygienists and the percentage of African Americans by state?
3. How does the Dental Hygiene Professional Practice Index (DHPPI) relate to African American demographics by state?

Methodology

The data sources used for determining African American and dental hygiene educational statistics for this study include the American Council on Education (ACE), the National Center for Educational Statistics (NCES), the American Dental Education Association (ADEA), the U.S. Bureau of Labor statistics, and the Community College Survey of Student Engagement (CCSSE). Statistics regarding African American access to dental care were derived from oral health databases: U.S. Department of Health and Human Services *Healthy People 2010* and the National Center for Health Statistics. Information on dental hygiene demographics was found in ADEA databases, the Health and Human Resources Administration, and the Bureau of Health Professions. In addition, the 2000 U.S. Census Report was accessed to gather data relative to African American population statistics. Secondary data sets were cross-referenced to produce a descriptive analysis of density of dental hygienists relative to density of African Americans by state. Also calculated were percentages of African Americans relative to the dental hygiene professional practice environment using the DHPPI.[24]

Results

I. Demographic Trends of African American Dental Hygienists

To ensure diversity, the proportion of minorities in the health professions should reflect the percentage of minorities in the general population. Figure 1 shows select population trends as derived from the U.S. Census.[6] These data show that the Hispanic population will grow to 15.5% by 2020, and 24.5% by 2050. The Caucasian population will decrease to approximately 61% by 2020, and to 50.1% by 2050. The African American population is slowly increasing and will be about 13.5% by 2020, and 14.6% by 2050.

Although African Americans made up 12.1% of the population in the U.S in 2003, they represented only 4% of dental hygienists (Table 1). This is contrasted with Caucasians who represented 74.6% of the population, but made up 85% of hygienists.[1] Although graduation rates of African American dental hygienists are higher than the current population of African American dental hygienists, the graduation rate increased only 2% in 8 years (Table 2).

As seen in Table 2, dental hygiene graduation rates for African Americans improved only slightly in the 8 years from 1996 to 2003, from 7% of new dental hygiene graduates to 9%.[5] As opposed to some publications, these results reflect African Americans separately from other minority groups, providing a realistic rate of graduation.

By looking at dental hygiene employment projection data from the U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review,[25] we can determine what future workforce needs might be. (Table 3). The Monthly Labor Review projects a total need for the dental hygiene workforce to increase from 158,000 in 2004 to 226,000 in 2014, or about a 43% increase. If the African American population increases to about 13.2% of the population,

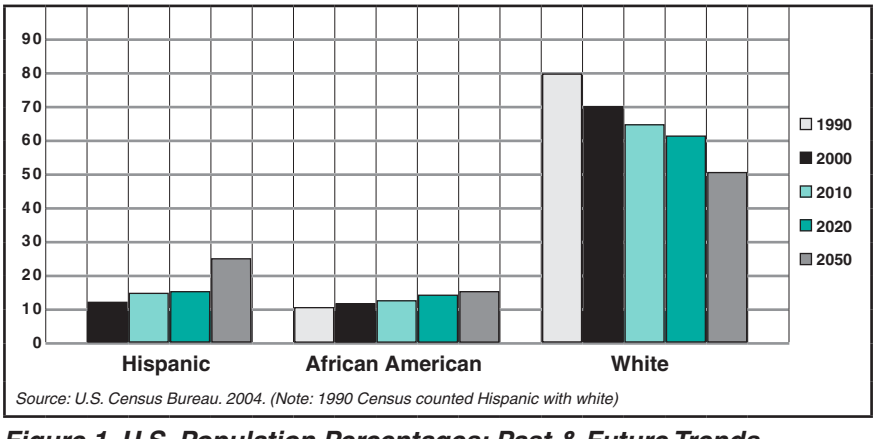

Figure 1. U.S. Population Percentages: Past & Future Trends

Table 2. Dental Hygiene Graduate Rates by Race[5]

	1996	2000	2002	2003
African American	7%	8%	9%	9%
White	67%	69%	64%	63%
Other	26%	23%	27%	28%

then the representative number of African American dental hygienists will need to be 29,832 (13.2% of 226,000). In 2004, there were only 6,320 African American dental hygienists, which suggests that we will need 23,500 more African Americans to enter dental hygiene by 2014 to ensure equitable representation.

II. Density of Dental Hygienists by State Relative to African American Population

Another variable that may influence access to dental hygiene care for African Americans is the density of practicing dental hygienists relative to the African American population (Figure 2). Data from the Health Resources and Services Administration Bureau of Health Professions summarizes the number of dental hygienists per 100,000 of the population for each state.[21] This data was linked with data from the U.S. Census Bureau (2000) that details the percent of blacks or African Americans per state, and the District of Columbia. Results indicate that states with some of the *highest* proportions of dental hygienists have the *lowest* percentages of African Americans. Four of the top 5 states with the highest density of dental hygienists are in the 10 states with the lowest proportion of African Americans. (Vermont, New Hampshire, North Dakota, and Oregon) (Figure 2). Conversely, the 2 states and 1 district that have the highest percentage of African Americans, also have the *lowest* proportions of dental hygienists. Of the 10 states (and DC) with the lowest density of dental hygienists, 3 have the highest proportion of African Americans (Mississippi, Louisiana, District of Columbia (Figure 3). In the 10 states with the lowest proportion of African Americans, the average number of dental hygienists per 100,000 residents is 73.3. In the 10 states with the highest proportion of African Americans, the average density of dental hygienists is 47.67.

Table 3. U.S. Dental Hygiene Employment: Current and Projected

Dental Hygienists	Current[1] 2004	Needed[2] 2014
African American	6,320 (4%)	29,832 (13.2%)
White	134,000 (85%)	142,380 (63%)
Other, Asian & Hispanic	27,680 (11%)	53,788 (24%)
Totals	158,000[1]	226,000[3]

1. *Bureau of Health Professions, 2006*
2. *Author's estimated projections based on Monthly Labor Review total projections*
3. *Total projection, Monthly Labor Review, Nov. 2005*

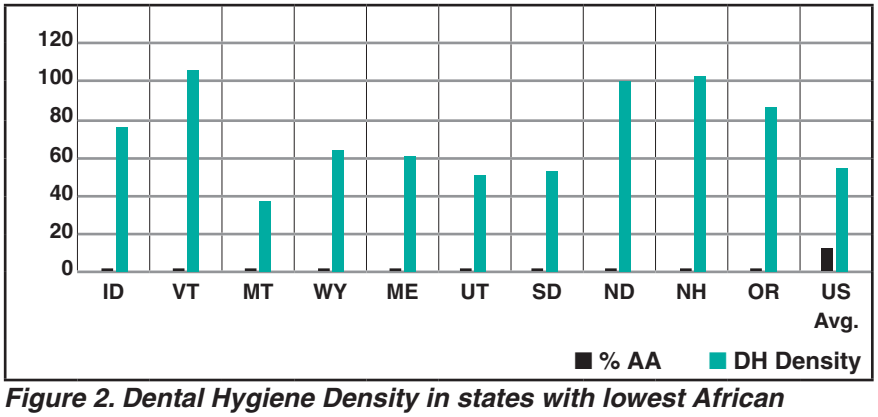

Figure 2. Dental Hygiene Density in states with lowest African American population

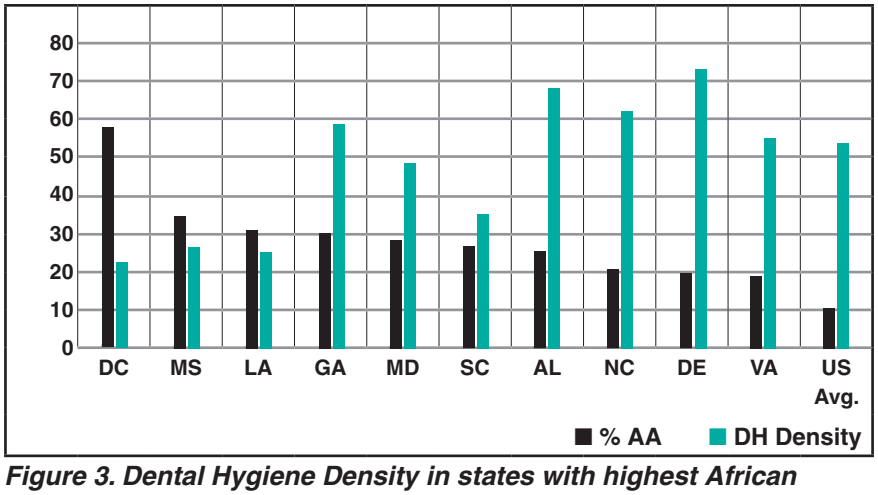

Figure 3. Dental Hygiene Density in states with highest African American population

III. African American Demographics by State: Relationship to the DHPPI

The third purpose of this paper was to evaluate how the professional practice environment of dental hygienists relates to African American demographics by state. The DHPPI is an index that was funded by the Bureau of Health Professions of the Health Resources and Services Administration to document the professional practice environment for the profession in each of the 50 states and the District of Columbia.[24] The index looks at 4 factors that impact the practice environment for dental hygienists: regulatory environment, dental supervision requirements, tasks and services permitted, and the reimbursement environment. These 4 factors are then evaluated and a rating (1-100) is assigned for each state based on the following categories: excellent (80-97), favorable (60-80), satisfactory (40-60), limiting (30-40), or restrictive (10-30). Cross-referencing these ratings with the percentage of African Americans by states found that 14 of the 17 states that have a higher than average African American population (12% or greater) fall into the most restrictive or limiting categories for dental hygiene practice, 2 fall into the satisfactory category, 1 is in the favorable category, and none are in the excellent category. The 10 states with the highest proportion of African Americans had an average DHPPI score of 28.5%, which falls in the lowest "restrictive" practice environment category (Figure 4). This is contrasted with the 10 states having the lowest percentage of African Americans, none of which fall into the restrictive category, and which had an average DHPPI score of 46.9%, which falls in the favorable category (Figure 5). Thirteen of the 17 states that have a higher-than-average African American population (12.1% or greater) fall into the most restrictive or limiting categories for dental hygiene practice, 2 fall into the satisfactory category, 1 is in the favorable category, and none are in the excellent category.

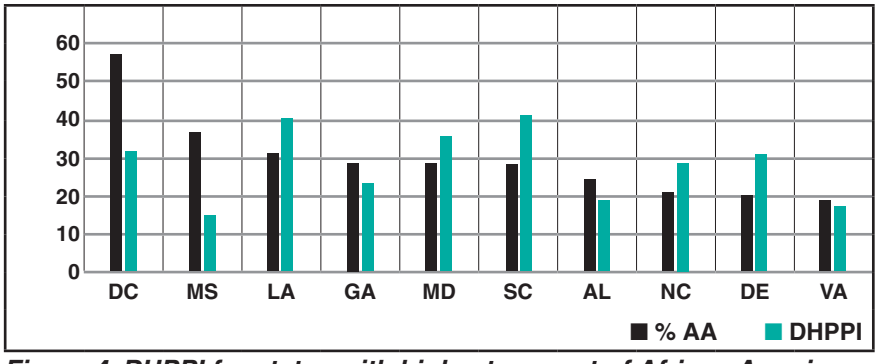

Figure 4. DHPPI for states with highest percent of African Americans

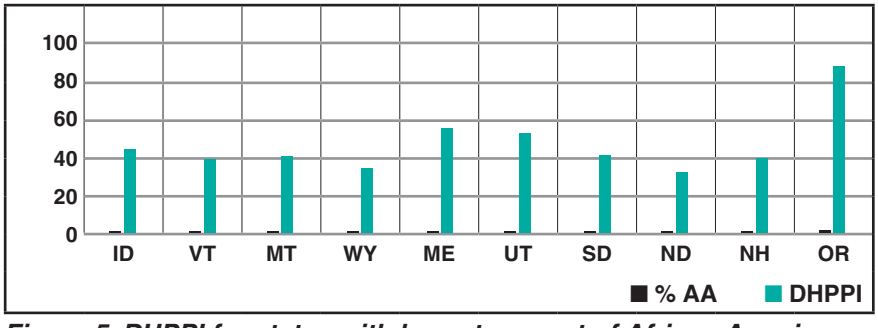

Figure 5. DHPPI for states with lowest percent of African Americans

Discussion

The problem of African Americans missing in dental hygiene has been persistent over time. Although African Americans are not proportionally represented in any of the health professions, they are less represented in dental hygiene than in medicine, nursing, or dentistry, making up only 4% of dental hygienists.[5] Despite the fact that African Americans make up 12.1% of the U.S. population,[6] they continue to be missing in the health care workforce because they are underrepresented in higher education health professions programs. Although African American dental hygiene graduation rates improved to 9% in 2003, these rates are still not keeping up proportionally with projected increases in population. Some authors include African Americans with all minority groups in analyses of minority representation, but combining them together can give the false impression that educational access for African Americans in the dental hygiene profession is improving when in reality it is flat. Based on this data, African Americans will continue to be proportionately underrepresented in dental hygiene.

In looking at DHPPI data, it becomes obvious that the density of dental hygienists in states with more progressive practice environments is high. By linking this data with African American state demographics, we can demonstrate a restrictive practice environment for dental hygienists in states that have a high percentage of African Americans. In other words, African Americans are living in states with the most restrictive environments for the practice of dental hygiene, and this could be viewed as another barrier to access to dental care for this population. The point of linking this data is to demonstrate that the availability of dental hygienists could be

one factor related to access to dental hygiene care for African Americans. Why do areas with the most African Americans have the fewest hygienists in the country? Does this relate to the overall lack of African American dental hygienists? Why are there more hygienists per capita in precisely the states that have the fewest African Americans?

The *Surgeon General's Report* emphasized the importance of oral health to overall health and challenged the dental professions to create solutions to the devastating effects of poor oral health. When considering the African American population, the connections studied between oral diseases and systemic diseases make these solutions even more compelling. Many of these are diseases that are also disproportionately borne by African Americans.[1]

Although dental hygiene was not specifically mentioned in the Sullivan Commission report, this data supports the Commission's findings that without dramatic change, "health professions training will remain entrenched in the status quo and become increasingly out of touch with the demographic realities and health needs of the nation…."[4] Much more needs to be done to improve the total numbers of dental hygienists graduating by 2014 and beyond, as well as increasing the proportion of African American graduates.

When looking at the dearth of African Americans in dental hygiene, one factor to consider is the lack of access to dental care for minorities. If high school students as dental care consumers lack exposure to dental hygienists, such students probably do not have enough information to consider dental hygiene as a possible career. The nursing literature identifies "confusion and misunderstanding about nursing practice" as a barrier to pursuing nursing.[14] This problem may be even more compelling for dental hygiene, since high school students may have more exposure to nurses in schools and emergency rooms than they do to dental hygienists in a clinic setting.

Several programming ideas are being tested that could work in dental hygiene education to increase the student pipeline. For example, the Achieving Diversity in Dentistry and Medicine (AADM) Project[26] has obtained federal funds from HRSA to implement *Kids into Health Careers*.[27] This program has several purposes, including how to inform students and parents about careers in the health professions, create optimism about accessibility of health careers, increase awareness about the need for minorities in the health professions, and increase the applicant pool for health professions training. Based on increased future needs projections for dental hygienists, it remains to be seen if the gap between current numbers and future needs can be narrowed.

The American Dental Education Association also has a website designed to address workforce shortages in the health professions with the mission of solving the problem of under-representation of minorities in the workforce.[28] It is targeted specifically for students to access current information about a variety of health professions including dental hygiene. These are comprehensive websites, but no data could be found to determine whether students in educationally disadvantaged schools have access to such sites.

Strategies to enhance diversity in health professions education has mostly been targeted to medicine, dentistry and nursing. However, ADEA has a policy document detailing 19 different strategies for enhancing diversity, and some are applicable to dental hygiene.[11] For example, recruiting minority faculty, collaborating with other organizations with similar goals, summer education programs and participating in minority career fairs would all be strategies that would help educate African American minority students about the career of dental hygiene. At the same time, the repetitive cycle of no access to dental care and lack of knowledge about dental hygiene careers must be broken if we are to improve access to care for all minority citizens.

Conclusion and Future Research

The lack of African Americans in dental hygiene, the lack of dental hygienists in states with high numbers of African Americans, and the restrictive nature of dental hygiene practice in states with high African American populations are all factors that may contribute to the epidemic of oral disease in this country, which is disproportionately borne by minorities. Strategies to improve the density of dental hygienists and the professional practice environment of dental hygienists (as defined by the DHPPI), in states with high numbers of African Americans need to be studied. Future research may uncover more reasons why the DHPPI is so poor in states with the highest African American populations. The inverse relationship between the African American population and the density of dental hygienists needs to be explored further to determine the reasons why this startling statistic exists. Future research needs include an analysis of how to improve access to dental hygiene education for African Americans, which may help alleviate the epidemic of oral disease borne by African Americans.

Acknowledgement

The author would like to thank Consuella Lewis, PhD, of the University of Pittsburgh Graduate School of Education for her inspiration and support of this study

Elizabeth Gorvin Onik, RDH, BSDH, MEd, is a full-time faculty member at the School of Dental Medicine, Department of Dental Hygiene, University of Pittsburgh.

References

1. U.S. Department of Health and Human Services. Oral health in America: a report of the Surgeon General. [Internet]. 2000 [cited 2007 Nov 30]. Available from: http://www.surgeongeneral.gov/library/oralhealth
2. Health Resources and Services Administration. The rationale for diversity in the health professions: a review of the evidence. A report of the U.S. Department of Health and Human Services, Bureau of Health Professions [Internet]. 2006 [cited 2007 Jan 7]. Available from: ftp://ftp.hrsa.gov/bhpr/workforce/diversity.pdf
3. Tedesco LA. The role of diversity in the training of health professionals. In: The right thing to do, the smart thing to do: enhancing diversity in the health professions. Smedley B, Stith A, Coburn L, Evans C, editors. Washington (DC): Institute of Medicine, National Academies Press; 2001, pp. 36-56.
4. Sullivan Commission. Missing persons: minorities in the health professions. A report of the Sullivan Commission on diversity in the healthcare workforce [Internet]. 2004 [cited 2007 Jan 6]. Available from: http://www.jointcenter.org/healthpolicy/docs/SullivanExecutiveSummary.pdf
5. American Dental Education Association. Allied dental education in the U.S. at-a-glance [Internet]. ADEA Institute for Policy and Advocacy; 2005 [cited 2007 Jan 6]. Available from: http://www.adea.org.
6. U.S. Census Bureau, U.S. Department of Commerce, Economics, and Statistics Administration [Internet]. 2000 [cited 2007 March 9]. Available from: http://www.census.gov/main/www/cen2000.html
7. Edmunds RK. Increasing access to care with diversity. J Dent Educ. 2006;70(9):918-920.
8. Smedley BD, Butler AS, Bristow L. In the nation's compelling interest: ensuring diversity in the health-care workforce. Washington (DC): Institute of Medicine of the National Academies, National Academies Press; 2004.
9. Schiff E. Issue paper: preparing the health workforce [Internet]. The Secretary of Education's Commission on the Future of Higher Education; 2006 [cited 2006 Nov. 2]. Available from: http://www.ed.gov/about/bdscomm/list/hiedfuture/reports/schiff.pdf.
10. Tedesco LA. Post-affirmative action Supreme Court decision: new challenges for academic institutions. *J Dent Educ.* 2005;69(11):1212-1221.
11. American Dental Education Association. Statement on the roles and responsibilities of academic dental institutions in improving the oral health status of all Americans. *J Dent Educ.* 2004;68:752-758.
12. Haden NK, Morr KE, Valachovic RW. Trends in allied dental education:an analysis of the past and a look to the future [Internet]. *J Dent Educ.* 2001;65:480-494 [cited 2006 Nov. 2]. Available: from http://www.scholar.google.com.
13. Skaff KO, Wilder R, McCombs G, Green ML, Amyot CC. Defining the impact of dental hygienists on the nation's oral health. *Access.* 2006;20(4):30-35.
14. Garcia G, Nation C, Parker N. Paper contribution A, increasing diversity in the health professions: a look at best practices in admissions. In the nation's compelling interest: ensuring diversity in the health-care workforce. Washington (DC): Institute of Medicine of the National Academies, National Academies Press; 2004.
15. Institutes of Medicine (IOM). Dental education at the crossroads: challenges and change. Washington (DC): IOM Committee on the Future of Dental Education, National Academy Press 1995.
16. Community college survey of student engagement, CCSSE [Internet]. 2005 [cited 2007 Jan 14]. Available from: http://www.ccsse.org
17. ACE American Council on Education. Percentage of degrees conferred to racial/ethnic minorities: 1999-2000 [Internet]. 2002 [cited 2007 Feb 25]. Available from: http://www.acenet.edu//AM/Template.cfm?Section=Home
18. Pennsylvania Department of Health. Oral Health Strategic Plan for Pennsylvania [Internet]. 2002 [cited 2005 Oct 30]. Available from: http://www.health.state.pa.us.
19. Spellings M. Highlights of the final report of the U.S. Secretary of Education's Commission on the future of higher education. A test of leadership: charting the future of U.S. higher education [Internet]. 2006 [cited 2008 Mar 3]. Available from: http://www.ed.gov/about/bdscomm/list/hiedfuture/reports.html
20. Brown J, Hays R, Crall J. Rand health: working paper: summary of cognitive interviews for CAHPS dental care project [Internet]. 2003 [cited 2007 Feb 23]. Available from: www.rand.org/pubs/working_papers/WR101
21. Yu S, Bellamy H, Schwalberg R, Drum M. Factors associated with use of preventive dental and health services among U.S. adolescents [Internet]. *J Adolescent Health.* 2001;29(6):395-405 [cited 2007 Mar 9]. Available from: http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed&uid=11728889&cmd=showdetailview&indexed =google
22. Pennsylvania Department of Health. Status of oral health in Pennsylvania [Internet]. 2002 [cited 2006 Oct 30]. Available from: http://www.dsf.health.state.pa.us/health/libhealth/oralhealth/OralHealthInPAReport.pdf
23. Health Resources and Services Administration. The United States health workforce profile. A report of the New York Center for Health Workforce Studies [Internet]. School of Public Health, University at Albany, State University of New York; 2006 [cited 2007 Jan 6]. Available from: http://www.bhpr.hrsa.gov/healthworkforce/
24. Health Resources and Services Administration. The professional practice environment of dental hygienists in the fifty states and the district of Columbia, 2001. Report of the National Center for Health Workforce Analysis, Bureau of Health Professions; 2004 [cited 2006 Jan 6]. Available from: ftp://ftp.hrsa.gov/bhpr/workforce/dentalhygen.pdf.
25. U.S. Department of Labor, Bureau of Labor Statistics. Occupational employment projections to 2014 [Internet]. Monthly Labor Review Online; 2005 [cited 2006 Nov 20]. Available from: http://www.bls.gov/opub/mlr/2005/11/art-5full.pdf
26. Achieving Diversity in Dentistry and Medicine (ADDM). Cultural competency curriculum. A project of the Department of Health and Human Services, Bureau of Health Professions, Division of Medicine and Dentistry [Internet]. American Medical Student Association Web site; 2003 [cited 2007 Jan 15]. Available from: http://www.amsa.org/addm
27. Bureau of Health Professions Division of Health and Human Resources Administration. Kids into health careers [Internet]. 2007 [cited 2007 Jan 7]. Available from: http://bhpr.hrsa.gov/kidscareers
28. American Dental Education Association. Explorehealthcareers.org: a free resource on health careers, enrichment programs, and financial aid [Internet]. American Dental Education Association; 2007 [cited 2007 Jan 30]. Available from: http://www.explorehealthcareers.com