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Dental caries prevalence among a sample of African American adults in New York City

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Disparities in the oral health status between minority groups and the majority white population in the United States have been documented in limited studies [1,2,19]. These limited studies have demonstrated that minorities in the United States suffer a disproportionate amount of untreated oral

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diseases in comparison with whites [2]. The National Survey of Oral Health in United States Employed Adults and Seniors (1985–1986) [3], found that 22% of adults blacks compared with 6.8% of whites had untreated dental caries. The survey further illustrated a higher prevalence and greater severity of periodontal disease between blacks and Hispanics than whites [3]. Disparities in oral health status were also found in Mexican Americans, who exhibited higher numbers of untreated carious teeth (mean of 1.4 versus 1.2) and more gingivitis (46.4% versus 7.9%) than did the general population [4]. The data collected from phase I of the Third National Health and Nutrition Examination Survey (NHANES III) [5], provided findings on the oral health of a sample of non-Hispanic blacks and found that they had a higher incidence of untreated coronal surfaces (3.4%) than did non-Hispanic whites (1.5%). In addition, the non-Hispanic blacks presented greater levels of untreated root caries (1.5%) compared with non-Hispanic whites (0.6%), who had the least amount of untreated caries of all groups represented in the sample population [5].

In the Detroit tri-county area, a research study [6] was conducted to investigate the dental caries experience in a sample of African American adults. The findings demonstrated that the African Americans represented in the sample population had a higher incidence of both coronal caries (4.4% in African Americans versus 1.8% in white Americans) and root caries (79% in African Americans versus 32% in white Americans) [6]. A national survey [7] conducted on the preventive dental behavior in families indicated that African Americans have dental checkups less often (and subsequently less treatment) than do whites. It follows that African Americans have a significantly lower percentage of filled surfaces than do white Americans (66.5% versus 91%, respectively) [6].

Overall, the findings from these studies on diverse populations demonstrate overwhelming evidence of oral health disparities in our nation. In addition, the Healthy People Objectives 2010 oral health objective [8] stated that by the year 2010 there is to be a reduction in the proportion of adults with untreated dental decay from 27% to 15% for adults aged 35 to 44 years. It is imperative to investigate the oral health status, attitudes toward dental care, and treatment needs of minority populations in order to evaluate the appropriateness of existing preventive and treatment plans and to develop new ones. According to the New York City 2000 Census results [9], the minority populations have increased considerably in the last decade, with Hispanics, African–Americans, and Asians comprising the largest minority groups. Although African Americans are the second largest minority group in the nation, few epidemiological studies have been conducted on the oral health of this racial/ethnic population, locally or nationally. To address the issue of limited oral health data on minority populations, the National Institutes of Dental and Craniofacial Research (NIDCR), National Institutes of Health provided funding opportunities for the establishment of Regional Research Centers for Minority Oral Health (RRCMOH). New York

University College of Dentistry (NYUCD), in collaboration with Forsyth Institute in Boston, was one of four funded RRCMOHs in the nation [10]. The primary aim of the NYUCD/Forsyth RRCMOH was to provide a comprehensive description of the oral health status of the largest minority groups in New York City [10]. The minority groups represented in the investigation were Chinese, Indian, African American, Caribbean, black non-Hispanic, Dominican, and Puerto Rican. The studies supported by the RRCMOH focused on the oral health differences between, as well as the determinants of the oral health and diseases among, minority and majority groups. The studies also addressed factors involved in differences between the minority subgroups themselves. The study reported in this article assessed caries, oral hygiene and calculus, gingival and periodontal condition, malocclusion, and oral treatment needs. We also tracked demographics, general health status, dental attitudes, and beliefs about and knowledge on oral health. A part of the study collected data pertaining to both oral health status and socioeconomic factors among a sample of African Americans in New York City.

Methods

This study was conducted during the period of September 1998 to July 2000. The study population consisted of African Americans, 18 to 64 years of age, who resided in New York City. The African American population has been less likely to respond as participants in biomedical research studies—an unfortunate consequence of the Tuskegee study (see article by Katz et al, in this issue) and other perceived abuses felt by the African American population. As a result, gaining community trust and support has been difficult. Therefore, to ensure efficient sampling of the targeted group, a convenience sample was obtained utilizing creative recruitment strategies. The recruitment strategies focused on developing partnerships with leaders of African American community-based organizations, faith-based institutions, and social and political groups. Contacts were developed by compiling a list of community-based organizations, sending them letters, and using follow-up phone calls. To establish personal contacts with the interested community leaders, visits were made to the communities and presentations of the RRCMOH's mission were given. In addition, an oral health promotion program was initiated that consisted of distributing "Dental Lotto" cards (prepared by IDEAS Communications, Hollis, New York) in areas that are heavily populated by African Americans (upper Manhattan, Bronx, and Brooklyn). The "Dental Lotto" cards contained oral health messages, and when the areas on the cards were scratched off, the participants were entitled to a free dental examination at an NYUCD clinic.

The inclusion criteria for the study were age (between the ages of 18 and 65), medical history (individuals requiring antibiotic prophylaxis received only dental screening without periodontal probing), and willingness to sign the consent form or complete the demographic questionnaire. The New York

University Institutional Review Board approved the questionnaire and consent forms and the project protocol prior to establishing community contacts.

Study participants who met the inclusion criteria and completed the demographic survey received a comprehensive oral examination. Community members who participated in the study and required dental treatment were given a 25% discount off of selected dental services (not including dental implants) at NYUCD. Participants were reimbursed for their time and any expenses incurred as a result of their participation. All participants were given an oral hygiene kit containing a toothbrush, toothpaste, dental floss, and educational materials that provided information on dental decay and periodontal disease.

To characterize the oral health status of the African Americans in this study, the following clinical oral health assessments were obtained on each participant: a self-administered sociodemographic survey, a behavioral/lifestyle survey, a food frequency questionnaire, decayed, missing, filled surfaces (DMFS), root caries, periodontal probe depths, loss of attachment, plaque index, gingival index, soft tissue lesions, and malocclusion screening. The research team consisted of a core of five dental hygiene examiners who were trained and calibrated using NIDCR diagnostic criteria [11]. To ensure interexaminer reliability, the calibration was ongoing for the duration of the study. Interexaminer reliability was calculated for all of the examiners at the tooth surface level. The intraclass correlation coefficient was over .95 for all examiners. The majority of the dental examinations were conducted on site in the community, and at a dedicated dental clinic at NYUCD. The instruments used were the #23 Shepard's hook explorer, a #5 front surface mirror, and artificial light. Dental radiographs were not taken on the participants as a diagnostic measurement and teeth were not cleaned.

Data analysis

The dental indices decayed, missing, filled teeth (DMFT), DMFS, decayed filled surfaces (DFS), and percent of decayed teeth (%D/DFS) were calculated using the SAS computer program [12,13]. The descriptive statistics of the demographics variables and the clinical parameters were computed providing frequency distributions. A bivariate analysis was conducted correlating the demographic variables with the dental indices [12,13]. The variables used in the analysis were age, gender, income, and education.

Results

The study sample consisted of 951 adults of which 69% were males ($n = 662$), and 31% were females ($n = 289$). The mean age was 42 years ($SD = 11.04$), 55% reported an educational level of 12 years or less, and 64% reported an annual income below $10,000 (Table 1). When stratified

Table 1
Clinical parameters and socio-demographic data

Variable	DMFT	DMFS	DFS	%D/DFS	F/DFS	Mean no. of missing teeth
Age						
18–34, n = 246	8.83 (0.36)	21.36 (1.25)	12.10 (0.64)	0.30 (0.01)	0.70 (0.02)	1.90 (0.20)
35–49, n = 523	14.03 (0.25)	48.21 (1.18)	18.76 (0.62)	0.30 (0.01)	0.70 (0.01)	6.04 (0.25)
50–64, n = 182	15.38 (0.48)	64.48 (2.39)	17.98 (1.27)	0.29 (0.03)	0.71 (0.03)	9.45 (0.57)
Gender						
Male, n = 680	13.16 (0.25)	45.34 (1.17)	15.33 (0.50)	0.34 (0.01)	0.66 (0.01)	6.21 (0.25)
Female, n = 307	12.64 (0.35)	44.83 (1.77)	20.44 (0.92)	0.20 (0.02)	0.80 (0.02)	4.81 (0.32)
Income						
$0–$9,999, n = 604	13.55 (0.37)	46.73 (1.26)	15.09 (0.50)	0.33 (0.01)	0.67 (0.01)	6.56 (0.26)
$10,000–19,999, n = 161	12.82 (0.51)	45.62 (2.52)	17.68 (1.22)	0.26 (0.03)	0.76 (0.04)	5.71 (0.52)
$20,000–$29,999, n = 173	12.08 (0.68)	43.45 (3.40)	22.29 (1.99)	0.24 (0.04)	0.76 (0.04)	4.3 (0.61)
$30,000+, n = 102	10.55 (0.53)	37.79 (2.91)	22.05 (1.78)	0.17 (0.02)	0.83 (0.02)	2.87 (0.04)
Education						
0–11, n = 227	13.58 (0.44)	46.90 (2.09)	14.20 (0.82)	0.34 (0.02)	0.66 (0.02)	6.83 (0.44)
12, n = 304	13.10 (0.37)	45.75 (1.78)	15.67 (0.75)	0.33 (0.02)	0.67 (0.02)	6.18 (0.37)
12+, n = 429	12.61 (0.30)	43.82 (1.45)	19.51 (0.75)	0.24 (0.02)	0.76 (0.02)	4.86 (0.28)

Values in parentheses represent standard errors.

Abbreviations: DMFT, decayed, missing filled teeth; DMFS, decayed, missing filled surfaces; DFS, decayed, filled surfaces; %D/DFS, percent of decayed teeth/decayed filled surfaces F/DFS, filled/decayed filled surfaces.

by the demographic variables of age, gender, income, and education, the overall mean scores for the group were: DMFT=13.00 (SE = 0.20), DMFS = 45.18 (SE = 0.98), DFS = 16.92 (SE = 0.45), %D/DFS = 29 (SE = 0.01), and mean number of missing teeth = 5.78 (SE = 0.20).

The mean DMFS values ranged from 21.36 (SE = 1.25) in the younger age group to 64.48 (SE = 2.39) in the 50 to 64 age group. The mean DFS was 12.10 (SE = 2.39) in the 18 to 34 age group, 18.76 (SE = 0.62) for the 35 to 49 age group, and 17.98 (SE = 1.27) for the 50 to 64 age group. The results of the mean values for DFMS and DFS when stratified by gender showed a mean DMFS of 45.34 (SE = 1.17) and 44.83 (SE = 1.77) for females. The mean DFS was higher in females than in males: 15.33 (SE = 0.50) for the males and 20.44 (SE = 0.92) for the females.

The mean DMFS was 46.73 (SE = 1.26) in the less than $9,999 income group and 37.79 (SE = 2.91) in the $30,000 and above groups. The mean DFS ranged from 15.09 (SE = 0.50) to 22.29 (SE = 1.99) by income. The mean DMFS was inversely related to income, but the relationship to income was not that clear for the mean DFS. The mean DFS increased between the

two lower groups, but was similar in the two higher income groups. The mean DMFS was 43.82 (SE = 1.45) for participants who reported 12 and above years of education and 46.9 (SE = 2.09) for individuals with less than a high school education. The %D/DFS was approximately 30 and was almost consistent across all age groups. The %D/DFS, however, was much higher in males than females, and decreased slightly with education and sharply with income. The overall mean number of missing teeth was 5.78. The mean number of missing teeth increased with age, was higher in males than females, and decreased with education and income.

Discussion

The National Survey of Oral Health in United States Employed Adults and Seniors 1985–1986 [3] reported three major differences between African American and white populations: African Americans had a higher rate of decayed teeth, were more likely to be episodic users of dental care, and had a greater perceived need for dental treatment. In a review of three national surveys [14], it was concluded that although the prevalence of dental disease in children was similar in both African American and white samples, the restorative treatment needs were much greater and more severe in both African American adults and children. This study showed that for all age groups the findings were consistent with the results reported from previous studies on the oral health status of minority populations. The percentage of unmet need—%D/DFS of about 30—was almost the same across all age groups and was similar to that reported by the NHANES III study [5], which was %D/DFS = 28.6 for the non-Hispanic blacks group. In two regional surveys [15,16], men were more likely than were women to have a greater percentage of untreated coronal surfaces. This finding was also evident in the present study, with males having a higher percentage of unmet needs than did females. The descriptive data presented in this article, however, are the results of an oral heath status investigation of a predominately male group of African Americans males in New York City and should not be used to make generalizations.

An educational level of 12 years or less was reported from 55% of the study sample. The percentage of whites who had had a permanent tooth extracted was more than three times greater for African Americans. Among all predisposing and enabling variables, low educational level often has been found to have the strongest and most conventional association with tooth loss [17]. The overall number of missing teeth for the African American participants in the present New York City study was 5.78, which decreased with higher educational level and income.

The disproportionate number of males (n = 662) as compared with females (n = 289) who participated in this study was a limitation. This can be attributed to the fact that the sample was a convenience sample. In the

various community-based organizations and other sites at which the investigation was conducted, many of the personnel who participated were male. The NYUCD is located in close proximity to the Veterans Administration Hospital where many of the participants' oral health data were collected at the RRCMOH dedicated "in house" clinic.

Clinical implications of this study

Many persons in the United States do not receive essential dental services. Barriers to care include cost; lack of dental insurance, public programs, or providers from underserved racial and ethnic groups; and fear of dental visits. Oral heath services, prevention, and restorative treatment needs should be available, accessible, and acceptable to all persons in the United States [8].

The reasons for the disparities in oral health are complex. In many instances, socioeconomic factors are the explanation. Lack of resources to pay for care, either out of pocket or through private or public dental insurance, is clearly another barrier. Fewer people have dental insurance than medical insurance, and public dental insurance programs are often inadequate [2]. Access to dental care for many individuals and communities is a problem. For example, about 125 million Americans have no dental insurance [8]. The cost of poor oral health to society is significant [18]. Employed adults lose more than 164 million hours of work each year due to dental disease. Slightly less than two third of adults report having visited a dentist in the past 12 months. Those with incomes at or above the poverty level are twice as likely as are those below the poverty level to report a dental visit in the past 12 months [2]. This study sample reported an annual income of below $10,000, with 55% reporting an educational level of 12 years or less. In New York State, of the 15,657 licensed dentists, only 18% participate in Medicaid [19].

Access may also be limited by the availability of providers, especially culturally competent providers [20]. Although African Americans constitute 12% of the general population they represent only 2.2% of professionally active dentists [21]. Minorities are more likely to receive services in areas in which there are racial/ethnic minority providers. Thus, minority, inner-city, rural, and low-income students must be recruited, mentored, and funded to attend schools of dentistry, dental hygiene, and public health [22]. More dentists, including those of minority backgrounds, should be trained in dental health. Given the magnitude of debt of recent graduates, this will not occur without changes.

No one can be truly healthy unless he or she is free from the burden of oral and craniofacial diseases and conditions [18]. The socioeconomic status of this study's group of African Americans may have been a contributing factor in their caries prevalence and unmet treatment needs, with slightly more than half reporting an education level of less than 12 years and a

yearly income of less than $10,000. The oral health status of the study participants provided evidence to support the fact that an oral health gap does exist between the African American and the white populations in this country. To eliminate the oral health inequity in our society, every individual should have access to primary preventive and early intervention services. Only then will underserved and vulnerable populations have the opportunity for early diagnosis, prevention, and treatment of oral and craniofacial diseases and conditions. Health care policies have to be addressed to remove the barriers to the dental care system so that minority communities can receive culturally appropriate professional dental treatment. The oral health discrepancies between majority and minority populations are a concern that runs deep in those who are affected and are an issue for the entire country [18]. Tooth loss can be prevented through education, early diagnosis, and regular dental care [18].

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References

[1] Bolden AJ, Henry JL, Allukian M. Implications of access, utilization and need for total health care by low income groups and minorities on the dental delivery system. J Dent Edu 1993;57:888–97.

[2] Oral health in America. A report of the Surgeon General. Rockville, MD: US Dept of Health and Human Services, Public Health Service; 2000. Publication #NIH00–4713.

[3] Oral health of United States adults. The national survey of oral health in US employed adults and seniors. Rockville, MD: US Dept of Health and Human Services, Public Health Service; 1995–1996. NIH Publication #87-2868.

[4] Ismail AI, Burt BA, Brunelle JA. Prevalence of tooth loss, dental caries and periodontal disease in Mexican American adults: results from Southwestern NHANES. J Dent Res 1987;66:1183–8.

[5] Winn DM, Brunelle RH, Selwitz LM, Kaste RJ, Oldakowski A, Kingman A, Brown LJ. Coronal and root caries in the dentition of adults in the United States, 1988–1991. J Dent Res 1996;75(special issue):642–5.

[6] Woolfolk WM, Lang P, Borgnakke WS, Taylor G. Dental caries experience of African Americans in the Detroit tri-county area. Available at: http://informatics.dent.umich.edu/health/research/caries.html. Accessed May 20, 2002.

[7] Chen M, Robinson L. Preventive dental behavior in families: a national survey. J Am Dent Assoc 1982;105:43–6.

[8] US Department of Health and Human Services. Healthy people objectives 2010. Rockville, MD: US Department of Health and Human Services Centers. National Institutes of Dental and Craniofacial Research, National Institutes of Health; 2000.

[9] New York City Department of City Planning Population. 2000 census tables. Available at: http://www.nyc.gov/htm/dcp/html/poptable.html. Accessed May 20, 2002.
[10] LeGeros RZ, Margolis H, Spielman A, Bivona P. Minority oral health research center: improving oral health and expanding opportunities. N Y State Dent J 1996;62:47–52.
[11] Epidemiology and Oral Disease Prevention Program. National Institute of Dental Research oral health surveys of the National Institute of Dental Research: diagnostic criteria and procedures 1991. Bethesda, MD: National Institutes of Health; 1991. NIH Publication #91-2870.
[12] Hatcher L, Stepanski EJ. A step-by-step approach to using the SAS system for univariate and multivariate statistics. Cary, NC: SAS Institute Inc.; 1994.
[13] SAS Institute Inc. SAS/STAT user's guide. 7th edition. Cary, NC: SAS Institute Inc.; 1998.
[14] Sinkford JC. Status of dental health in black and white Americans. J Natl Med Assoc 1988;80:1127–31.
[15] Beck JD, Hunt RJ, Hand JS, Field HM. Prevalence of root and coronal caries in a non-institutionalized older population. J Am Dent Assoc 1993;111:964–7.
[16] Douglass CW, Jette AM, Fox CH, Tennstedt SL, Joshi A, Feldman HA, et al. Oral health status of the elderly in New England. J Gerontol 1993;48:M39–46.
[17] Burt BA, Eklund SA. Dentistry, dental practice and the community. 5th edition. Philadelphia, PA: WB Saunders; 1999.
[18] White BA, Weintraub JA, Caplan DJ, Hollister MC, McKaig RG. Toward improving the oral health of Americans: an overview of oral health status, resources, and care delivery. Public Health Rep 1993;108:657–72.
[19] National Center for Chronic Disease Prevention and Health Promotion. Oral health resources, synopses of state and territorial dental public health programs. Available at: http://www2.cdc.gov/nccdphp/doh/synopses/StateDataV.asp? State = NY & Year = 2001. Accessed May 20, 2002.
[20] Allukian M. The neglected epidemic and the Surgeon General's report: a call to action for better oral health. Am J Public Health 2000;90:843–5.
[21] Brown LJ, Lazar V. Closing the gap. Minority dentists: why do we need them? Washington, DC: Office of Minority Health, US Dept of Health and Human Services; 1999.
[22] Health care Rx. Access for all. The President's initiative on race. Rockville, MD: Health Resources and Services Administration, US Dept of Health and Human Services; 1999.