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Dental health status and indicators of treatment needs of four Hispanic subgroups in New York City

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Since 1990, the Hispanic population in the United States has increased nearly 60%. Data from the United States Census 2000 [1] indicates that the total population of Hispanics numbered 35.2 million. This group is now the country's largest minority group, and its growth has implications for many

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aspects of United States society, including health and, subsequently, oral health. In New York City (NYC), Hispanics amount to 27% of the total population. This makes it the largest Hispanic community of any American city. The Hispanic population in NYC has increased not only in number, but in diversity. The Puerto Rican population, the largest group of Hispanics in the city, has actually declined during the last 10 years, whereas the number of immigrants from the Dominican Republic and Central and South America has soared. The Surgeon General's Report: Oral Health in America [2] and the Healthy People 2010 [19] document provide the most up-to-date data, which highlight the oral health problems faced by the Hispanic population in the United States. Salient points in these documents indicate that (1) only 30% of Mexican Americans 12 to 17 years of age were free of caries in their permanent teeth [3]; (2) only 63% of the dental caries in the permanent teeth of Mexican American children aged 12 to 17 had been treated or filled, compared with 87% in the non-Hispanic white population [3]; (3) generally, Latino children have more dental caries than do their counterparts [4]; (4) Hispanic adults are twice as likely to have untreated dental caries as non-Hispanic whites [5]; and (5) gingivitis and some periodontal problems (attachment loss) are more common problems among Hispanic adults compared with white and black adults [5].

Hispanics in the United States and in NYC are increasingly diverse. They come from more than 20 different countries with various cultural, socioeconomic, and political backgrounds. In addition, their composition is dramatically changing by city and region of the country. Recognition of this fact is of paramount importance to developing oral health promotion activities that address the particular needs of this population. Furthermore, the Surgeon General's Report points out that the dental profession does not have a sufficiently diverse workforce to address the disparities in oral health between Hispanics and other minority groups and the majority population. The importance of racial/ethnic diversity in the leadership and the health care workforce has been correlated both with the ability to provide quality care to diverse populations as well as improved access to care [1,6,7].

A variety of factors contribute to oral health problems. The effect of financial barriers and nonfinancial factors such as language, oral health literacy, culture, acculturation, dietary patterns, providers' cultural competency, and care-seeking behaviors must be addressed to improve the oral health of Hispanics. The increasing diversity of the Hispanic population presents a challenge to both policy makers and oral health care providers who may increasingly be called on to design, implement, and provide oral health services to this population. Culturally influenced values and the individual's attitudes and experiences with the dental care system affect decisions about whether to seek care and comply with a suggested treatment regimen or follow-up appointment [8]. Furthermore, many other barriers exist that can have a substantial effect on oral health care providers and providers and practices of both the health care providers and providers and providers of both the health care providers and providers and practices of both the health care providers and providers an

patients, language barriers, and lack of culturally competent oral health care personnel. The term "cultural competency" embodies not only a familiarity with the sociopolitical situations and culturally influenced health beliefs, values, and behaviors of the individuals in a community, but the ability to communicate properly in their own language if necessary [9].

One of the main obstacles for the development of appropriate oral health promotion for the United States Hispanic population is the dearth of available data on the oral health status and risk factors of the different subgroups of Hispanics living in the United States. National data are available mostly for Mexican Americans. The Hispanic Health and Nutrition Examination Survey [10], conducted in 1982 to –1984, sampled Puerto Ricans in NYC, Mexican Americans in the Southwest, and Cuban Americans in Miami, Florida. The data is somewhat outdated, primarily due to the dramatic shifts in the composition of the Hispanic population in the United States during recent years. Nevertheless, no studies have been conducted since then to examine the oral health status and the predictors of oral health outcomes and subgroups differences among the Hispanic population in the United States.

The objectives of this study were to characterize the dental health experience of four subgroups of Hispanic residents in NYC and to determine differences in indicators of treatment needs of these four Hispanic subgroups.

Methods

A convenience sample of 1010 individuals (418 Puerto Ricans, 225 Dominicans, 249 Central Americans, and 118 South Americans) aged 18 years and older was obtained through outreach activities during 1999 and 2000. Community-based organizations, churches, and other social and political groups were contacted, and examinations were conducted in the field by a team of calibrated examiners and trained recorders.

An Institutional Review Board approval from New York University was obtained prior to the inception of the study. Oral examinations were conducted using a mirror, a sharp #23 explorer, and artificial light. Teeth were not dried or cleaned prior to the examination and no radiographs were taken. National Institute of Dental and Craniofacial Research (NIDCR) diagnostic criteria, used in the Oral Health Survey of United States adults, also were used in this study [11]. Interexaminer reliability was calculated for all the examiners at the tooth surface level. The intraclass correlation coefficient was over .95 for all examiners.

Coronal caries data were collected on all teeth except third molars. Counts of decayed surfaces (DS) and filled surfaces (FS) were recorded. Restorations that were affirmed to have been placed as a sequel to trauma or for purely esthetic reasons were not counted in the F component, to avoid overestimation of disease-related findings. Secondary decay was recorded separately, although it was included in the data used for analysis purposes. Missing teeth were also recorded separately. Decayed, missing, filled, surfaces (DMFS) scores were calculated for all the participants of the study. Decayed and filled surfaces (DFS), DS, and %DS/DFS were calculated only on dentate individuals to correct for the possible inclusion of teeth that were extracted due to periodontal disease. A questionnaire to assess sociodemographic information and knowledge, attitudes, and behavioral practices of the participants also was administered. This questionnaire was translated and backtranslated into and from Spanish according to Brislin's recommendations [12]. The original instrument and the translated version were pilot tested prior to the study.

The independent variables used for the multivariate analysis of DS/DFS were age, gender, education, income, dental insurance status, and regular source of dental care. All these variables were treated as categorical variables. Age was categorized into four groups: 18 to 34, 35 to 49, and 50+. Education level was categorized in the following way: 0 to 11 years, 12 years (equivalent to a high school level education), and more than 12 years. The income variable was categorized into three levels: annual family income below or equal to \$9999, \$10,000 to \$19,000, and \$20,000 and above. Having dental insurance and having a regular source of dental care were reduced to binary variables.

Analysis of variance (ANOVA) was used to test the hypothesis of equivalence among variable groups of each Hispanic subgroup for outcomes of DMFS and DFS scores over age groups, gender, education level, annual household income, place of birth, dental insurance, and having a regular source of dental care. To compare %DS/DFS between the variable groups one-way ANOVA was used; for multivariate regression modeling, binomial logistic regression was used. The SAS PROC ENMODE [13] was used to solve for the model.

Results

Table 1 shows the demographic and clinical characteristics of the four subgroups. Most of the participants in this study reported annual incomes below \$10,000. The vast majority of the participants were young; Central Americans and Dominicans were slightly younger than were participants in the other groups. With the exception of Puerto Ricans, most of the participants were female, were born outside of the United States, and did not have dental insurance. All of the subgroups reported low rates of regular source of dental care. The majority of the individuals was poor, and, with the exception of the South Americans, reported low educational levels.

The following is a description of the results by subgroups. For the Puerto Rican group, the overall mean DMFS was 38.63 (SE = 1.48), the mean DFS was 14.55 (SE = 0.60), and the mean %D/DFS was 15%. The mean number

			Central	South
	Puerto Rican	Dominican	American	American
Total ^a	418	225	249	118
Age ^a				
18–34	33% (139)	47% (106)	47% (118)	30% (35)
35–49	40% (165)	37% (83)	35% (86)	44% (52)
50+ years	27% (114)	16% (36)	18% (45)	26% (31)
Gender ^a				
Male	57% (240)	38% (95)	33% (75)	32% (38)
Female	43% (178)	62% (124)	67% (150)	68% (80)
Born in US ^a				
No	43% (176) P.R.,	90% (201)	92% (228)	95% (112)
Yes	57% (235) mainland	10% (23)	8% (20)	5% (5)
Income ^a				
\$0-9999	60% (249)	58% (131)	52% (130)	53% (67)
\$10-19,999	17% (72)	23% (52)	25% (61)	25% (30)
\$20,000+	23% (97)	19% (42)	23% (58)	22% (26)
Education ^a				
0-11 years	42% (170)	44% (98)	52% (126)	31% (36)
12 years	26% (105)	23% (52)	20% (48)	23% (27)
12+ years	32% (131)	33% (73)	28% (67)	46% (53)
Dental insurance ^a				
No	47% (194)	68% (149)	85% (210)	88% (101)
Yes	53% (218)	32% (71)	15% (36)	12% (14)
Regular source of denta	l care ^a			
No	73% (304)	75% (166)	85% (205)	87% (99)
Yes	26% (112)	25% (56)	15% (39)	13% (15)
Clinical variables ^b				
DMFS	38.63 (1.48)	28.78 (1.55)	29.12 (1.78)	43.47 (2.75)
DFS	14.55 (0.60)	13.23 (0.77)	12.18 (0.76)	20.86 (1.42)
DS/DFS	15%	10%	19%	6%
No. of missing teeth	4.85 (0.29)	2.95 (0.26)	3.21 (0.30)	4.10 (0.50)

Table 1 Sociodemographic characteristics

^a Values in parentheses represent number of participants.

^b Values in parentheses represent SEs.

Abbreviations: DMFS, decayed, missing, filled surfaces; DFS, decayed and filled surfaces; %DS/DFS, percentage of decayed surfaces over the total number of decayed and filled surfaces.

of missing teeth was 4.85 (SE = 0.29). Table 2 presents the bivariate analysis for mean DMFS, DFS, and DS/DFS. The DMFS values ranged from 16.72 in the younger age group to 64.43 in the 50+ age group. As expected, there was a significant difference (P < 0.0001) in DMFS between age groups; there was also a significant difference between gender (P < 0.05), educational level (P < 0.05), place of birth (P < 0.0001), and having a regular source of dental care (P < 0.0001). Those participants who were older, female, born outside of

Variable	n	DMFS	DFS	%DS/DFS
Age				
P value		< 0.0001	< 0.0001	
18–34	139	16.72 (14.86)	9.6 (8.57)	17%
35–49	165	39.24 (23.34)	17.23 (11.65)	14%
50+ years	114	64.43 (32.38)	16.70 (14.72)	15%
Gender				
P value		< 0.05	< 0.05	
Female	178	45.68 (32.10)	16.69 (13.20)	13%
Male	240	35.62 (28.45)	12.96 (11.17)	17%
Born in US				
P value		< 0.05		
No	176	45.21 (31.18)	14.94 (12.94)	15%
Yes	235	33.38 (28.31)	14.02 (11.46)	15%
Income				
P value			< 0.05	
0–9999	249	39.29 (30.87)	13.55 (10.41)	17%
10,000-19,999	72	37.19 (28.87)	13.50 (11.95)	18%
20,000	97	37.99 (29.79)	17.90 (15.68)	9%
Education				
P value		< 0.05		
0-11 years	170	42.84 (32.98)	13.11 (10.81)	15%
12 years	105	39.71 (30.54)	15.63 (12.55)	11%
12+years	131	32.19 (24.76)	15.41 (12.55)	17%
Dental insurance				
No	194	35.97 (29.34)	14.22 (12.43)	17%
Yes	218	41.10 (30.90)	14.76 (11.90)	14%
Regular source of de	ental care			
P value			< 0.05	
No (0)		36.19 (29.73)	13.48 (11.21)	18%
Yes (1)		45.32 (30.83)	17.33 (14.22)	5%

 Table 2

 Bivariate analysis of clinical variables for the Puerto Rican subgroup

Values represent means and standard errors (in parentheses), unless otherwise indicated. *Abbreviations:* DMFS, decayed, missing, filled surfaces; DFS, decayed and filled surfaces; %DS/DFS, percentage of decayed surfaces over the total number of decayed and filled surfaces.

the mainland United States, and did not have a regular source of dental care exhibited higher DMFS. When the M portion (denoting missing teeth) of the DMFS index was eliminated from the analysis, the DFS values dropped considerably, with values ranging from 9.6 in the 18 to 34 age group to 16.70 in the 50 to 64 age group. There was a significant difference in the DFS index between age groups (P < 0.0001), gender (P < 0.05), income (P < 0.05), and having a regular source of dental care (P < 0.05). The %DS/DFS values, indicating restorative treatment needs as well as access to care, were significantly

higher in those who did not have a regular source of dental care (P < 0.0001).

The results of the multivariate analyses of %DS/DFS, controlling for age, gender, income, place of birth, dental insurance, and regular source of dental care (Table 3), showed that education, income, place of birth, and having a regular source of dental care were predictors of unmet need for this group. Those who had lower income, less than 12 years of education, were born in

	Puerto Ricans $(n = 360)$	Dominicans $(n = 196)$	Central Americans $(n = 206)$	South Americans $(n = 107)$	
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	
Age 18–34 35–49 50+ years <i>P</i> value*			1.23 (0.87 1.74) 0.80 (0.58, 1.13) Reference 0.0320	0.68 (0.38, 1.19) 0.46 (0.27, 0.78) Reference 0.0147	
Gender Female Male P value*		0.55 (0.37, 0.81) Reference 0.003		0.35 (0.22, 0.54) Reference < 0.0001	
Born in US No Yes P value*	0.47 (0.38, 0.58) Reference < 0.0001	2.36 (1.09, 5.11) Reference 0.0170			
Income \$0-9999 \$10-19,999 \$20,000+ <i>P</i> value*	2.23 (1.73, 2.90) 1.94 (1.43, 2.64) Reference <0.0001	2.61 (1.44, 4.70) 0.81 (0.40, 1.67) Reference < 0.0001	0.64 (0.45, 0.90) 0.95 (0.66, 1.37) Reference 0.0088	0.67 (0.37, 1.18) 2.09 (1.14, 3.84) Reference 0.0002	
Education 0–11 years 12 years 12+ years P value*	1.32 (1.07, 1.63) 0.81 (0.63, 1.03) Reference <0.0001		1.68 (1.23, 2.29) 0.71 (0.47, 1.06) Reference < 0.0001	1.64 (0.85, 3.13) 4.33 (2.59 7.22) Reference < 0.0001	
Dental insurar No Yes P value*	ice	1.78 (1.16, 2.73) Reference 0.0068	0.66 (0.45, 0.94) Reference 0.0280	2.81 (1.25, 6.32) Reference 0.0082	
Regular source No Yes P value*	e of dental care 4.30 (3.23, 5.71) Reference < 0.0001		2.38 (1.55, 3.64) Reference < 0.0001	0.31 (0.16, 0.62) Reference 0.0013	

Table 3 Multivariate logistic regression for DS/DFS

* P vaules for trend.

Abbreviations: CI, confidence interval; OR, odds ratio; DS/DFS, decayed surfaces over the total number of decayed and filled surfaces.

the mainland United States, and had no regular source of dental care were more likely to need dental care (restorative services).

For the Dominican group, the overall mean DMFS was 28.78 (SE = 1.55), the mean DFS was 13.23 (SE = 0.77), and the mean %D/DFS was 10%. The mean number of missing teeth was 2.95 (SE = 0.26). Table 4 presents the bivariate analysis for this group. The DMFS values ranged from 15.28 in the younger age group to 48.47 in the 50+ age group. As expected, there was a significant difference in DMFS between age groups (P < 0.0001). Interestingly, besides age, the results showed a significant difference only between those born in or outside of the United States (P < 0.05), and income level

Variable	n	DMFS	DFS	%DS/DFS
Age				
P value		< 0.0001	< 0.0001	
18–34	106	15.28 (11.67)	9.64 (8.68)	10%
35–49	83	37.48 (23.67)	16.38 (11.91)	8%
50+ years	36	48.47 (24.65)	16.50 (14.52)	13%
Gender				
P value			< 0.05	
Female	150	30.19 (22.46)	14.70 (11.96)	8%
Male	75	25.96 (24.66)	10.27 (10.50)	13%
Born in US				
P value		< 0.05		< 0.05
No	201	29.89 (23.72)	13.12 (11.33)	10%
Yes	23	19.26 (16.84)	13.60 (12.92)	4%
Income				
P value		< 0.05		
0–9999	131	31.99 (25.38)	12.84 (12.07)	11%
10,000-19,999	52	26.38 (22.19)	12.94 (10.55)	6%
20,000+	42	21.74 (14.41)	14.76 (10.80)	9%
Education				
P value			< 0.05	
0-11 years	98	30.28 (24.37)	11.69 (10.80)	12%
12 years	52	26.13 (23.07)	11.92 (10.73)	7%
12+ years	73	29.09 (22.02)	16.23 (12.37)	8%
Dental insurance				
No	149	28.35 (22.88)	12.25 (11.67)	11%
Yes	71	29.59 (24.35)	15.74 (10.97)	6%
Source of dental car	e			
No (0)	166	27.44 (22.43)	12.48 (11.44)	11%
Yes (1)	56	29.59 (24.35)	15.74 (10.97)	6%

 Table 4

 Bivariate analysis for the Dominican subgroup

Values represent means and standard errors (in parentheses), unless otherwise indicated. *Abbreviations:* DMFS, decayed, missing, filled surfaces; DFS, decayed and filled surfaces; %DS/DFS, percentage of decayed surfaces over the total number of decayed and filled surfaces.

groups (P < 0.05). Those who were older, were born outside of the mainland United States, and did not have a regular source of dental care exhibited higher DMFS. The DFS ranged from 9.64 in the 18 to 34 age group to 16.50 in the 50 to 64 age group. There was a significant difference in the DFS index between age groups (P < 0.0001), gender (P < 0.05), and educational levels (P < 0.05). The %DS/DFS values, indicating restorative treatment needs and access to care, were significantly higher in those who were born outside of the United States as compared with those who were born in the United States (P < 0.05).

The results of the multivariate analyses of %DS/DFS using binomial logistic regression, controlling for age, gender, income, place of birth dental insurance, and regular source of dental care, showed that gender, income, place of birth, and having dental insurance were predictors of unmet need for this group (see Table 3). Those participants who were male, had an income lower than \$10,000, were not born in the United States, and did not have dental insurance were more likely to need dental care (restorative services).

For the Central American group, the overall mean DMFS was 29.12 (SE = 1.78), the mean DFS was 12.18 (SE = 0.76), and the mean %D/DFS was 19%. The mean number of missing teeth was 3.21 (SE = 0.30). Table 5 presents the bivariate analysis for mean DMFS, DFS, and %DS/DFS for this group. The DMFS values ranged from 12.67 in the younger age group to 52.57 in the 50+ age group. Results showed significance only between age groups (P < 0.0001) and those who were born in or outside of the United States (P < 0.001) and those who were older and born outside of the United States exhibited higher DMFS levels. The DFS ranged from 7.50 in the 18 to 34 age group to 18.15 in the 50 to 64 age group. There was a significant difference in the DFS index between age groups (P < 0.0001), and educational levels, and regular source of dental care (P < 0.05). The %DS/DFS values, indicating restorative treatment needs and access to care, were only significantly higher in those participants without a regular source of dental care (P < 0.05).

The results of the multivariate analyses of %DS/DFS, controlling for age, gender, income, place of birth, dental insurance, and regular source of dental care, showed that age, education level, income, having dental insurance, and having a regular source of dental care were predictors of unmet need for this group (see Table 3). Those participants who were younger, female, had an annual income of less than \$10,000, had dental insurance, and had no regular source of dental care were more likely to need dental restorative services.

For the South American group, the overall mean DMFS was 43.47 (SE = 2.75), the mean DFS was 20.86 (SE = 1.42), and the mean %DS/DFS was 6%. The mean number of missing teeth was 4.10 (SE = 0.50). Table 6 presents the bivariate analysis. For this group, the DMFS values were high. They ranged from 21.11 in the younger age group to 74.00 in the 50+ age group. As with all of the other groups, there was a significant difference in DMFS between age groups (P < 0.0001). Additionally, there was a

Variable	n	DMFS	DFS	%DS/DFS
Age				
P value		< 0.0001	< 0.0001	
18–34	118	12.67 (12.55)	7.5 (7.49)	22%
35–49	86	39.43 (27.66)	15.39 (12.56)	17%
50+ years	45	52.57 (32.31)	18.15 (15.66)	14%
Gender				
Female	154	29.93 (28.58)	12.85 (12.26)	19%
Male	95	27.82 (27.29)	11.10 (11.58)	17%
Born in US				
P value		< 0.05		
No	228	30.29 (28.52)	12.28 (11.90)	19%
Yes	20	16.15 (19.06)	10.50 (13.54)	12%
Income				
0–9999	130	30.13 (30.24)	11.45 (10.89)	20%
10,000-19,999	61	29.06 (25.97)	13.62 (13.16)	21%
20,000+	58	26.93 (25.28)	12.31 (13.17)	12%
Education				
P value			< 0.05	
0-11 years	126	27.09 (28.79)	9.76 (10.20)	24%
12 years	48	32.75 (28.28)	13.25 (12.40)	12%
12+ years	67	29.97 (26.18)	15.43 (13.77)	15%
Dental insurance				
No	210	28.38 (26.98)	12.15 (12.02)	18%
Yes	36	35.02 (34.01)	13.22 (12.18)	23%
Source of dental care				
P value		0.05	0.05	
No	205	28.93 (28.13)	11.57 (11.22)	21%
Yes	39	33.17 (28.20)	16.64 (15.14)	7%

 Table 5

 Bivariate analysis for the Central American subgroup

Values represent means and standard errors (in parentheses), unless otherwise indicated.

Abbreviations: DMFS, decayed, missing, filled surfaces; DFS, decayed and filled surfaces; %DS/DFS, percentage of decayed surfaces over the total number of decayed and filled surfaces.

significant difference in DMFS values only between educational levels (P < 0.05). The DFS index ranged from 12.80 in the 18 to 34 age group to 27.64 in the 50 to 64 age group; there were no significant differences between any of the groups. The %DS/DFS values, indicating restorative treatment needs and access to care, were significantly higher only for those participants who were older.

Multivariate analyses of %DS/DFS, controlling for the same variables as in the other groups (see Table 3), showed that those participants who were male, had an income between \$10,000 and \$19,000, were less educated, and had no dental insurance or regular source of dental care were more likely to need dental care (restorative services).

Variable	n	DMFS	DFS	%DS/DFS
Age				
P value		< 0.0001		
18–34	35	21.11 (15.88)	12.80 (9.69)	4%
35–49	52	40.32 (21.73)	22.25 (13.86)	3%
50+ years	31	74.00 (28.96)	27.64 (19.23)	12%
Gender				
Female	80	44.87 (28.97)	21.12 (14.71)	5%
Male	38	40.52 (32.02)	20.31 (17.08)	8%
Born in US				
No	112	44.25 (29.32)	20.97 (14.93)	6%
Yes	5	18.80 (34.78)	14.60 (25.39)	1%
Income				
0–9999	62	38.90 (27.70)	20.89 (16.83)	5%
10,000-19,999	30	44.13 (31.74)	18.26 (12.18)	9%
20,000+	26	53.61 (31.45)	23.80 (15.36)	4%
Education				
P value		< 0.05		
0-11 years	36	51.17 (32.26)	18.97 (15.90)	9%
12 years	27	48.28 (36.95)	20.62 (16.86)	8%
12+ years	53	35.28 (22.00)	21.83 (14.60)	3%
Dental insurance				
No	99	42.66 (30.00)	20.67 (15.42)	6%
Yes	15	46.13 (29.55)	21.73 (15.65)	2%
Source of dental care				
No	101	42.01 (29.79)	19.05 (13.85)	6%
Yes	14	43.14 (23.26)	26.21 (16.59)	4%

 Table 6

 Bivariate analysis for the South American subgroup

Values represent means and standard errors (in parentheses), unless otherwise indicated. *Abbreviations:* DMFS, decayed, missing, filled surfaces; DFS, decayed and filled surfaces; %DS/DFS, percentage of decayed surfaces over the total number of decayed and filled surfaces.

Fig. 1 shows the percentage of individuals per group who had at least one decayed tooth: 40% of the Puerto Ricans had at least one tooth that was decayed compared with 38% of the Central Americans, 31% of the South Americans, and 24% of the Dominicans.

Discussion

With the exception of the Hispanic Health and Nutrition Survey (HHANES), conducted from 1982 to 1984, no other study has included subgroups of Hispanics in the United States. Prior to the present study, individuals from the Dominican Republic, the number one source country of



Fig. 1. Percentages per subgroup of individuals with at least one decayed tooth.

immigration to NYC, had never been sampled; nor had individuals from Central or South America in NYC.

This study presents the dental caries experience of four Hispanic subgroups that were residents of NYC during 1999-2000. The results showed differences between these subgroups in terms of dental caries experience and in the predictors of unmet need, as suggested by the DS/DFS measure and the percentage of individuals with at least one decayed tooth. South Americans showed higher DMFS values and lower DS/DFS than did the rest of the subgroups. DFS values were also highest in the South American group; the rest of the subgroups had rates similar among each other. Furthermore, 92% of the South Americans had at least one tooth that was filled. This is possibly the result of a higher access to dental care of this group in their country of origin. It may also be associated with the higher level of education of this group. Interestingly, South Americans also had a high number of missing teeth. Puerto Ricans reported the highest percentage of dental insurance, and had the second highest DMFS and DFS and the highest number of missing teeth. This may be due to the lack of a regular source of dental care. Having a regular source of medical care is one of the most important predictors of access to health services, particularly for the receipt of preventive services [14]. Following this line of reasoning, it makes sense that although Puerto Ricans reported high rates of dental insurance, their low rates of having a regular source of dental care, was likely the reason for their having the highest level of missing teeth and the highest percentage of persons with at least one decaved tooth.

The overall DMFS values for the Puerto Rican and the South American subgroups (38.63 and 43.47, respectively) seem to be much higher than the unadjusted scores reported for Mexican Americans in NHANES III (27.6). On the other hand, the rates for Central Americans and Dominicans (29.12 and 28.78, respectively) appear to be similar. Interestingly, the DFS scores

reported in this study for Central Americans (which includes Mexican Americans) approximate those reported in the NHANES III study for Mexican Americans (12.18 versus 12.8). All the other subgroups' DFS scores were higher. The %DS/DFS for all the subgroups were substantially lower than those reported for Mexican Americans in NHANES III [19].

The predictors of treatment needs and access to care as reflected in the %DS/DFS of these subgroups varied by subgroup. The only common predictor was the self-reported annual income levels of the participants. Age was a predictor for the Central Americans and the South Americans; education for the Central Americans, Puerto Ricans and South Americans; gender for the Dominicans and South Americans; place of birth for the Puerto Ricans and Dominicans; dental insurance for the Central Americans, the Dominicans, and the South Americans; and regular source of dental care for the Puerto Ricans, the Central Americans, and the South Americans.

These results may be reflective of differences in the sociopolitical conditions of the subgroups as well as cultural backgrounds, language variations, dental care experience in their country of origin, and other culturally influenced factors. Puerto Ricans, due to their status as United States citizens, are eligible for Medicaid, which covers dental care in New York. This accounts for their higher rates of dental insurance coverage. Interestingly, however, they reported a lack of a regular source of dental care as did the other subgroups.

The use of the health care system by Hispanics is affected by perceived need, insurance status, income, culture, language, and access to comprehensive care [5]. It also has been suggested that to really understand Hispanic access to medical care it is important to distinguish between the Hispanic subpopulations [15]. As implied by this study, the indicators for access to oral health care as well as oral health status within subgroups of the Hispanic population also merit further study. Furthermore, by studying the differences among subgroups, it may be possible to determine the impact of the different environmental, sociopolitical, behavioral, and possibly genetic influences on oral diseases of this population. Analyzing data combining several subgroups of larger racial/ethnic groups, as is commonly done in the United States, runs the risk of losing valuable information if the ethnic or cultural variations between the subgroups studied are not taken into consideration. Although this study is not representative of the larger Hispanic community in NYC due to its sampling strategy, it reinforces the need for further studies on oral health status and the predictors of oral health. access to care, and unmet needs among Hispanic subgroups.

Lack of proper access to care has been suggested as one of the most important factors for the disparities in oral health in the United States. National studies have shown that in addition to the expected indicators of poor utilization of dental services, such as education, low income, and gender, the non-white population is less likely to visit a dentist and have a smaller number of visits than do their white counterparts. This situation is compounded in the Hispanic population due to language and cultural barriers. Hispanics have the lowest utilization rates of dental care, are at highest risk of being uninsured, and lack proper access to employer plans [16,17]. In this study, all of the Hispanic subgroups reported a lack of a regular source of dental care and most had no dental insurance. It is no surprise that a high percentage of the individuals had untreated decay.

Health education and health promotion has been found to be efficacious for decreasing dental disease and promoting oral health [18]. Interventions should be culturally appropriate and tailored to peoples' specific needs. It is important that oral health care programs directed at Hispanics are offered in a community setting that is appropriate, comfortable, and in a culturally sensitive environment. The effect of financial barriers and other factors such as language, culture, dietary patterns, citizenship status, and acculturation on care-seeking behaviors and health outcomes must be considered. Oral health care professionals who understand the indigenous or local health beliefs, customs, characteristics, practices, and values of the community they are serving are better able to motivate patients and thereby encourage and empower them to access care and actively participate in oral health promotion and disease prevention activities.

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