Racial and Ethnic Disparity in Oral Cancer Awareness and Examination: 2003 New York State BRFSS

Junhie Oh, DDS, MPH; Jayanth Kumar, DDS, MPH; Gustavo Cruz, DDS, MPH

Abstract

Objectives: *This study documents the level of oral cancer awareness and examination among New York State adults and evaluates the determinants of disparities in oral cancer detection.* ***Methods:*** *The 2003 New York State Behavioral Risk Factor Surveillance System gathered information on current awareness of oral cancer and receipt of oral cancer examination from 5,544 adults. To assess whether the racial/ethnic factor remains important for the awareness, receipt, and source of oral cancer examination after controlling for other socioeconomic and health care access variables, bivariate and multiple logistic regression analyses were conducted using SAS and SUDAAN.* ***Results:*** *Even though a majority of State adults (80.4 percent) had heard about oral cancer, about three-quarters of these adults (74.3 percent) had never heard about an oral cancer test or examination. Only 35 percent of the adults reportedly received an oral cancer examination in their lifetime. Adults with Hispanic origin were less likely to have heard about and received an oral cancer examination. Regarding the source of the examination, some 72 percent of the examinations were conducted by a dental professional; the remaining 28 percent were performed by a physician, nurse, or nurse practitioner. Non-Hispanic Blacks were more likely to have received an oral cancer examination from health care providers other than a dentist or dental hygienist.* ***Conclusions:*** *These data suggest the need to improve the oral cancer awareness and examination rate in New York State. Routine examination of the mouth by primary care providers as part of a physical examination would provide the best opportunity for improving the low oral cancer examination rates in minority populations.*

Key Words: Behavioral Risk Factor Surveillance System, oral cancer, health knowledge/attitudes, racial disparity

Introduction

The American Cancer Society estimated that in 2006, there were 30,990 new cases of oral and pharyngeal cancers and 7,430 deaths from these in the United States (1). Both nationally and in New York State, the incidence of oral and pharyngeal cancers in Blacks or African-Americans is higher than in Whites, and their mortality rate is nearly twice as high as that of Whites (2-4).

The early detection of oral and pharyngeal cancers through visual and tactile examination has been emphasized as a key element in the efforts to reduce the high mortality from oral cancer (3-6). Based on recent national estimates, the survival rate for localized cancers exceeded 80 percent, but dropped to about 50 percent for moderately advanced (regional) diseases and less than 30 percent for those with distant metastases (1). For the period of 1995-2000, nationally, only 20 percent of oral and pharyngeal cancers in Blacks were diagnosed in the localized stage. Meanwhile, 37 percent of the cancers were detected at the comparable stage among Whites (7). *Healthy People 2010* has therefore set, as an objective, to increase the proportion of oral and pharyngeal cancers detected at an early stage from a baseline of 35 to 50 percent (8).

As part of New York State's efforts to address oral and pharyngeal cancers, a statewide survey was conducted in 2003 using the Behavioral Risk Factor Surveillance System (BRFSS) to gather baseline information on the current knowledge about oral cancer and receipt of an oral cancer examination. The BRFSS was selected as a result of its proven reliability and validity, ease of administration, timeliness of obtaining results, and, most importantly, ability to monitor trends by the periodic inclusion of the oral cancer-related questions (9,10). In addition, the core questions in the BRFSS cover a variety of behavioral risks and preventive health practices that are linked to common chronic diseases.

This study was designed to accomplish the following objectives: a) identify the level of public awareness of and knowledge about oral cancer; b) document the percentage of New York State adults' receipt of an oral cancer examination; and c) assess the determinants of racial and ethnic disparities that may exist in the awareness of oral cancer and receipt of an oral cancer examination.

Methods

Data Source. The data used for this analysis were obtained from the 2003 New York State BRFSS. The BRFSS is an ongoing, random digit-dialed telephone health survey of US noninstitutionalized civilian adults

Send correspondence and reprint requests to Jayanth Kumar, Bureau of Dental Health, New York State Department of Health, ESP, Corning Tower, Room 542, Albany, NY 12237. Tel.: 518-474-1961; Fax: 518-474-8985; e-mail: jvk01@health.state.ny.us. Junhie Oh was with the Bureau of Dental Health, New York State Department of Health. Jayanth Kumar is with the Bureau of Dental Health, New York State Department of Health. Gustavo Cruz is with the New York University College of Dentistry. **Source of support:** NIDCR 5R21DE 01442503. **Poster presentation:** This paper was presented as a poster at the 2006 National Oral Health Conference, Little Rock, AR, May 1, 2006. Manuscript received: 10/9/06; accepted for publication: 8/26/07.

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aged 18 years or older. Details of the BRFSS are described elsewhere (9).

A module of seven questions related to oral cancer was added to the 2003 BRFSS to identify the level of public awareness of oral cancer among New York State residents and the receipt of an oral cancer examination. Survey respondents who had heard about oral cancer were asked to name at least one early sign of oral cancer and respond to a list of risk factors as to whether or not each factor was associated with oral cancer. Respondents were also asked whether they had ever heard about a test for oral cancer and whether they had ever had an oral cancer test. Based on their responses, respondents were asked either the reason why they had never had an oral cancer examination or by whom they had been examined. The oral cancer questionnaire used in the 2003 BRFSS is available from the authors.

Variables Analyzed. The outcome variables examined in this study were: a) awareness of an oral cancer test or examination; b) receipt of an oral cancer test or examination; and c) source of the oral cancer examination (i.e., dentists, dental hygienists, physicians, nurses, or nurse practitioners).

Information on the racial/ethnic and sociodemographic status, reported general health status, access to health care (i.e., having a personal doctor and having their cholesterol checked in the past 5 years), access to dental care (i.e., visiting a dentist, dental hygienist, or dental clinic in the past year), and health and dental insurance coverage of the respondents were available from their responses to standard core, optional, and state-added questions in the 2003 BRFSS. For purposes of this analysis, general health status was recategorized as "excellent, very good, or good" or "fair or poor." Cholesterol-check history was used as a proxy indicator of recent access to medical care, as the State's 2003 BRFSS did not contain questions on medical visits within the past 12 months.

Because tobacco use in any form and regular alcohol drinking are known to be associated with an increased risk of oral and pharyngeal cancers, data were also obtained on the smoking and drinking risk behaviors of the respondents. Respondents who reported having smoked at least 100 cigarettes in their lifetime and who currently smoked were classified as "at risk for smoking." Male respondents who reported having more than two drinks per day and female respondents who reported having more than one drink per day were designated as "at risk for heavy drinking."

Statistical Analyses. Data were weighted to the probability of selection and adjusted to reflect the age, gender, racial/ethnic, and regional distribution of the civilian, noninstitutionalized New York State adult population.

Bivariate analyses using the chi-square test were done to identify any significant differences between the various groups, with respect to not having heard about an oral cancer examination, not having received an examination in their lifetime, and source of the examination. To identify the important predictors of the outcome variables, multiple logistic regression analyses were conducted. All independent variables significant at $P < 0.20$ in each bivariate analysis were included in the regression model; all other outcome variables were excluded from the analyses. The statistical significance of the regression coefficients was tested using the Wald statistic at $P < 0.05$.

SAS (11) and SUDAAN™ (12) softwares were used for all the analyses in the study to account for the complex sampling design.

Results

Characteristics of the Study Population. The characteristics of the survey population are summarized in Table 1. A total of 5,544 New York State adults aged 18 and older completed the survey. More than one in five adults [21.6 percent; 95 percent confidence interval (CI) = 20.3 to 22.9] were currently considered at risk for smoking, while slightly less than 6 percent (5.9 percent; 95 percent CI = 5.1 to 6.7) engaged in heavy drinking.

Not Having Heard about Oral Cancer and Oral Cancer Test or Examination. Overall, about 20 percent (19.6 percent; 95 percent CI = 18.2 to 21.0) of the State adults had never heard about oral cancer, while nearly three-quarters (74.3 percent; 95 percent CI = 72.9 to 75.7) had never heard about an oral cancer test or examination (Table 1). Among the adults who had heard about oral cancer, nearly 70 percent (69.1 percent; 95 percent CI = 67.5 to 70.7) had never heard about an oral cancer test or examination (Table 2). Besides, of those who had received an oral cancer examination, more than half (58.2 percent; 95 percent CI = 55.6 to 60.8) reported never hearing about an oral cancer examination (Table 2).

Based on the adjusted odds ratios (OR), Hispanics were found to be more likely (OR = 1.76, 95 percent CI = 1.26 to 2.46) not to have heard about an oral cancer test or examination, regardless of their socioeconomic background and access to medical and dental care (Table 3).

Not Having Received an Oral Cancer Examination in Their Lifetime. Only 34.8 percent (95 percent CI = 33.3 to 36.3) of the adults ever had an oral cancer examination in their lifetime (Table 1). Among the remaining 65.2 percent (95 percent CI = 63.7 to 66.7) who never had an oral cancer examination, most (63.8 percent; 95 percent CI = 61.8 to 65.8) reported "no reason to get an oral cancer test or never having thought of getting the exam" in response to why they had not had an oral cancer examination. Nearly a quarter of those reporting never having had an oral cancer examination (24.3 percent; 95 percent CI = 22.6 to 26.0) reported that their "dentist or physician had not recommended an oral cancer test."

The result of the logistic regression analysis shows that education, age, race, and access to medical and dental service all independently affect the likelihood of not having received an oral cancer examination

Table 1
Number of Surveyed Adults and Estimated Percent Distribution of the State Adult Population by Independent and Dependent Variables (2003 Behavioral Risk Factor Surveillance System, New York State)

Variable Category	Sample size* (total = 5,544)	%†	(95% confidence interval)
Sex			
Male	2,172	47.4	(±1.6)
Female	3,372	52.6	(±1.6)
Education			
<High school	546	13.1	(±1.2)
High school graduate	1,558	29.7	(±1.5)
College (1-3 years)	1,338	23.6	(±1.3)
≥College graduate	2,084	33.5	(±1.5)
Annual household income ($)			
<15,000	579	13.1	(±1.2)
15,000-24,999	808	18.4	(±1.4)
25,000-34,999	632	13.1	(±1.1)
35,000-49,999	743	14.8	(±1.2)
≥50,000	2,064	40.7	(±1.6)
Age (years)			
18-39	1,779	40.2	(±1.6)
40-64	2,576	42.2	(±1.5)
≥65	1,117	17.6	(±1.1)
Race/ethnicity			
White, non-Hispanic	4,035	62.6	(±1.6)
Black, non-Hispanic	513	12.2	(±1.2)
Hispanic	578	16.6	(±1.4)
Other race, non-Hispanic	346	8.7	(±1.0)
Region			
Upstate	3,772	63.4	(±1.6)
New York City	1,772	36.6	(±1.6)
Reported general health			
Excellent, very good, good	4,631	82.8	(±1.3)
Fair, Poor	896	17.2	(±1.3)
Had a personal doctor			
Yes	4,745	82.3	(±1.4)
No	779	17.7	(±1.4)
Had cholesterol checked in the past 5 years			
Yes	4,364	76.5	(±1.5)
No	1,027	23.5	(±1.5)
Dental visit in the past year‡			
Yes	3,884	72.3	(±1.5)
No	1,332	27.7	(±1.5)
Any health insurance coverage			
Yes	4,870	84.3	(±1.3)
No	655	15.7	(±1.3)
Any dental insurance coverage			
Yes	3,128	60.3	(±1.6)
No	2,056	39.7	(±1.6)
Smoking			
0-99 cigarettes in their lifetime	4,355	78.4	(±1.3)
≥100 cigarettes in their lifetime/currently smoked	1,169	21.6	(±1.3)
Drinking			
0-2(1 for female) drinks/day	5,157	94.1	(±0.8)
>2(1 for female) drinks/day	324	5.9	(±0.8)
Heard about oral cancer			
Yes	4,388	80.4	(±1.4)
No	836	19.6	(±1.4)
Heard about oral cancer test or examination			
Yes	1,445	25.7	(±1.4)
No	3,696	74.3	(±1.4)
Had an oral cancer examination			
Yes	1,918	34.8	(±1.5)
No	3,196	65.2	(±1.5)

* Unweighted sample sizes for each category may not add up to 5,544 because of missing and excluded data (responses of "don't know," "not sure," or refused were excluded).
† Weighed proportion estimates adjusted to the 2000 census data.
‡ Included visit to a dentist, dental hygienist, or dental clinic.

Table 2
Bivariate Analyses by Outcome Variables "Not Having Heard about Oral Cancer Test or Examination" and "Not Having Received an Oral Cancer Examination in Their Lifetime" (2003 Behavioral Risk Factor Surveillance System, New York State)

Variable	Not having heard about oral cancer test or examination			Not having received an oral cancer examination		
Category	%*	(95% CI)	*P*-value	%*	(95% CI)	*P*-value
Sex						
Male	76.0	(±2.1)	<0.05	64.0	(±2.5)	n.s.
Female	72.8	(±1.8)		66.3	(±1.9)	
Education						
<High school	80.0	(±4.3)	<0.01	79.5	(±4.2)	<0.01
High school graduate	78.6	(±2.5)	<0.01	69.6	(±2.9)	<0.01
College (1-3 years)	74.5	(±2.8)	<0.01	63.6	(±3.2)	<0.01
≥College graduate	68.3	(±2.4)	Ref	57.4	(±2.6)	Ref
Annual household income ($)						
<15,000	78.5	(±4.3)	<0.01	77.7	(±4.4)	<0.01
15,000-24,999	79.0	(±3.4)	<0.01	75.5	(±3.9)	<0.01
25,000-34,999	75.8	(±4.1)	<0.10	66.7	(±4.5)	<0.01
35,000-49,999	74.1	(±3.8)	n.s.	60.1	(±4.3)	n.s.
≥50,000	71.6	(±2.2)	Ref	57.4	(±2.5)	Ref
Age (years)						
18-39	77.2	(±2.4)	<0.01	70.5	(±2.6)	<0.01
≥40	72.4	(±1.8)	Ref	61.8	(±2.0)	
Race/ethnicity						
White, non-Hispanic	71.6	(±1.6)	Ref	60.2	(±1.8)	Ref
Black, non-Hispanic	74.3	(±4.7)	n.s.	67.3	(±5.3)	<0.05
Hispanic	83.2	(±3.7)	<0.01	77.3	(±4.4)	<0.01
Other race, non-Hispanic	78.0	(±5.1)	<0.05	75.6	(±5.3)	<0.01
Region						
Upstate	74.2	(±1.7)	n.s.	60.9	(±1.9)	<0.01
New York City	74.5	(±2.5)		73.2	(±2.7)	
Reported general health						
Excellent, very good, good	73.7	(±1.5)	<0.10	63.7	(±1.7)	<0.01
Fair, Poor	77.2	(±3.4)		72.4	(±3.8)	
Had a personal doctor						
Yes	73.5	(±1.5)	<0.05	62.7	(±1.7)	<0.01
No	78.4	(±3.5)		76.6	(±3.8)	
Had cholesterol checked in the past 5 years						
Yes	72.3	(±1.6)	<0.01	61.5	(±1.8)	<0.01
No	80.1	(±3.0)		76.5	(±3.2)	
Dental visit in the past year†						
Yes	72.4	(±1.6)	<0.01	60.9	(±1.8)	<0.01
No	79.4	(±2.6)		76.2	(±2.9)	
Any health insurance coverage						
Yes	73.6	(±1.5)	<0.10	63.1	(±1.7)	<0.01
No	77.8	(±3.9)		76.1	(±4.1)	
Any dental insurance coverage						
Yes	73.6	(±1.8)	n.s.	63.0	(±2.0)	<0.01
No	75.0	(±2.2)		68.4	(±2.5)	
Smoking						
0-99 cigarettes in their lifetime	74.1	(±1.6)	n.s.	64.3	(±1.7)	<0.05
≥100 cigarettes in their lifetime/currently smoked	74.9	(±3.1)		68.4	(±3.3)	
Drinking						
0-2 (1 for female) drinks/day	74.6	(±1.4)	n.s.	65.1	(±1.6)	n.s.
>2 (1 for female) drinks/day	70.6	(±6.6)		62.7	(±6.8)	
Heard about oral cancer						
Yes	69.1	(±1.6)	<0.01	60.6	(±1.7)	<0.01
No	95.0	(±1.7)		83.4	(±3.0)	
Heard about oral cancer test or examination						
Yes				43.3	(±3.1)	<0.01
No				72.8	(±1.7)	
Had an oral cancer examination						
Yes	58.2	(±2.6)	<0.01			
No	83.0	(±1.5)				

* Weighted percent estimates adjusted to the 2000 census data.
† Included visit to a dentist, dental hygienist, or dental clinic.
CI, confidence interval; n.s., not significant at $P \geq 0.20$; Ref, reference.

Table 3
Percent and Adjusted Odds Ratios for Not Having Heard about Oral Cancer Test or Examination by Selected Variables (2003 Behavioral Risk Factor Surveillance System, New York State)*

Variable Category	Percent (%)†	Odds ratio (LCI, UCI)
Sex		
Male	76.0	1.21 (1.02, 1.42)
Female (reference)	72.8	–
Education		
<High school	80.0	1.56 (1.06, 2.29)
High school graduate	78.6	1.81 (1.45, 2.26)
College (1-3 years)	74.5	1.33 (1.08, 1.63)
≥College graduate (reference)	68.3	–
Race/ethnicity		
White, non-Hispanic (reference)	71.6	–
Black, non-Hispanic	74.3	1.14 (0.85, 1.52)
Hispanic	83.2	1.76 (1.26, 2.46)
Other race, non-Hispanic	78.0	1.44 (1.01, 2.06)
Had cholesterol checked in the past 5 years		
Yes (reference)	72.3	–
No	80.1	1.36 (1.08, 1.73)
Dental visit in the past year‡		
Yes (reference)	72.4	–
No	79.4	1.32 (1.09, 1.62)

* Adjusted for sex, education, annual household income, age, race/ethnicity, reported general health, and having a personal doctor, a cholesterol check history, a dental visit experience, and health insurance variables. Only selected variables whose regression coefficients are significant at level of <0.05 using the Wald *t*-test are presented.
† Weighted estimates in percent adjusted to the 2000 census data.
‡ Included visit to a dentist, dental hygienist, or dental clinic.
LCI, lower 95% limit; UCI, upper 95% limit.

(Table 4). Among these, an adult of Hispanic origin (OR = 1.64, 95 percent CI = 1.19 to 2.26) or from another racial minority group (OR = 1.78, 95 percent CI = 1.27 to 2.50) were more likely not to have gotten an oral cancer examination when controlled for other variables.

Oral Cancer Examination Performed by a Physician, Nurse, or Nurse Practitioner. Seven out of the 10 adults who had an oral cancer examination (71.6 percent; 95 percent CI = 69.0 to 74.2) reportedly received the examination from a dentist or dental hygienist; the remaining 28.4 percent (95 percent CI = 25.8 to 31.0) of adults reportedly received the examination from a physician, nurse, or nurse practitioner.

Bivariate and multiple logistic regression analyses were conducted to determine if there were significant differences in the characteristics of the adults, with respect to the provision of the oral cancer examination, i.e., those who got an oral cancer examination from a dentist or dental hygienist and those examined by a physician, nurse, or nurse practitioner (Tables 5 and 6). After controlling for other independent variables, non-Hispanic Blacks were more likely (OR = 3.41, 95 percent CI = 2.15 to 5.42) to have received an oral cancer examination from health care providers other than a dentist or dental hygienist.

Discussion

Despite an estimation of four out of five New York State adults having heard about oral cancer, awareness of the early signs of oral cancer, knowledge about the risk factors for oral and pharyngeal cancers, and information about oral cancer examination were low, indicating a lack of both general information about these cancers and accurate information about ways to reduce personal risk. Additionally, even among those knowing about oral cancer examinations, less than half had ever had an examination.

These results are consistent with national surveys and other state surveys conducted in Maryland, North Carolina, and Florida (13-18). The overall low level of awareness of oral cancer and the gaps or deficits in knowledge, particularly in information about oral cancer tests or examinations, were commonly found both at the national and state levels, including New York State, even given the differences among the surveys in the year conducted, methods, geographic areas, response rates, survey population characteristics, and health care environments. Summarizing the results of previous surveys, as well as data from the New York State 2003 survey, there is evidence to suggest the need to improve the level of knowledge among the general public about the signs and symptoms of oral cancer and precancerous lesions, the role of alcohol, and the availability of non-invasive techniques for the early detection of oral cancer. Tobacco smoking as a risk factor for oral cancer was the only area where the public is knowledgeable (data not shown).

In reviewing the data on oral cancer examination, the percentage of adults who reported an oral cancer examination in their lifetime from other state surveys was less than about 30 percent (15,17,18). Nearly 35 percent of all New York State adults or 38 percent of older adults aged 40 and older reportedly had an oral cancer examination in their lifetime. Given the considerably low level of awareness of the oral cancer test or examination among all the adults (26 percent), one cannot eliminate the possibility of an underestimation or overestimation of their reporting. Even though the oral cancer examination question included a highly descriptive explanation of the examination to facilitate recall, survey respondents might not have related the procedures of the oral cancer examination described in

Table 4
Percent and Adjusted Odds Ratios for Not Having Received an Oral Cancer Examination in Their Lifetime by Selected Variables (2003 Behavioral Risk Factor Surveillance System, New York State)*

Variable Category	Percent (%)†	Odds ratio (LCI, UCI)
Education		
<High school	79.5	1.71 (1.18, 2.46)
High school graduate	69.6	1.43 (1.17, 1.75)
College (1-3 years)	63.6	1.19 (0.98, 1.45)
≥College graduate (reference)	57.4	–
Age (years)		
18-39	70.5	1.25 (1.05, 1.49)
≥40 (reference)	61.8	–
Race/ethnicity		
White, non-Hispanic (reference)	60.2	–
Black, non-Hispanic	67.3	1.35 (1.01, 1.81)
Hispanic	77.3	1.64 (1.19, 2.26)
Other race, non-Hispanic	75.6	1.78 (1.27, 2.50)
Had cholesterol checked in the past 5 years		
Yes (reference)	61.5	–
No	76.5	1.51 (1.20, 1.90)
Dental visit in the past year‡		
Yes (reference)	60.9	–
No	76.2	1.73 (1.41, 2.12)

* Adjusted for education, annual household income, age, race/ethnicity, reported general health, having a personal doctor, a cholesterol check history, a dental visit experience, medical and dental health insurance, and smoking risk variables. Only selected variables whose regression coefficients are significant at level of <0.05 using Wald *t*-test are presented.
† Weighted estimates in percent adjusted to the 2000 census data.
‡ Included visit to a dentist, dental hygienist, or dental clinic.
LCI, lower 95% limit; UCI, upper 95% limit.

the question with those of any actual examination they might have already experienced. Conversely, survey respondents might not have differentiated other dental procedures with those of the oral cancer examination. Additionally, the validity of the oral cancer-related questions in the New York State BRFSS is not known.

Even with the limitations of the current study, useful information was obtained to assess if disparities existed among New York State adults concerning awareness and receipt of an oral cancer examination. Consistent with the previous studies (13-18), low socioeconomic status (e.g., low level of education or limited income) or being non-White or Hispanic was found to be associated with the lower level of oral cancer knowledge or receiving an oral cancer examination. The analyses further demonstrated that limited access to dental and medical services (i.e., having a cholesterol check or visiting the dentist) were strong determinants for the receipt of an oral cancer examination. Part of these findings can be explained by the fact that an oral cancer examination is usually done in a dental or medical setting.

Results of this study, however, also suggest that improving access to dental care would not, in and of itself, necessarily lead to improvements in the percentage of adults having oral cancer examinations. As shown in this study, dental professionals provide the majority of oral cancer examinations. However, among the 72.3 percent of New York State adults who reported a dental visit in the past year, more than 7 out of 10 (72.4 percent) had never heard about an oral cancer examination, and 60.9 percent reported having no oral cancer examination experience (Tables 1 and 2). This shows a need on the part of dental professionals to better inform and educate their patients about oral cancer. Additionally, about 25 percent of the adults who had not received an oral cancer examination reported that it was not recommended by their dentist or physician. Of greater concern was the finding that even though older adults, smokers, and heavy drinkers are well known to health care providers as at a high risk for oral and pharyngeal cancer, 68 percent of adults aged 40 or older currently smoking and 51 percent of those heavily drinking alcohol reported never being examined for oral cancer (data not shown). These findings are consistent with the current practices of health care providers; not all health care providers routinely examine patients for oral cancer or recommend an oral cancer examination despite the cancer screening guidelines (19-25).

The results of this study clearly demonstrate the need to expand oral cancer prevention education efforts and increase the rate of oral examination, particularly for high-risk populations, i.e., individuals at risk for smoking and heavy drinking, elderly, racial/ethnic minorities, and adults from lower socioeconomic groups. Coming up with an effective intervention model that reaches more high-risk populations and that actively encourages and helps larger proportions of them to receive an oral examination requires evaluating the characteristics of these populations regarding their access to health care. It has already been pointed out that oral cancer-related high-risk populations are more likely to seek out doctors or medical health care settings than dentists or dental clinics for needed care (5,26). Through the authors' separate analyses of the data used in this report, high-risk groups (i.e., current smokers, less-educated, and low-income adults) were less likely to visit dentists or dental hygienists (data not shown). Consistent with the recommendations of several experts, it should be more effective to focus on medical care settings and medical providers, where these populations are more likely to be examined and advised, in

Table 5
Oral Cancer Examination Provided by Nondental Providers According to Population Characteristics (2003 Behavioral Risk Factor Surveillance System, New York State)

Variable Category	Sample size* (total = 1,918)	Oral cancer examination by physician, nurse, or nurse practitioner %†	(95% confidence interval)	*P*-value
Sex				
Male	728	34.4	(±4.2)	<0.01
Female	1,152	22.7	(±3.2)	
Education				
<High school	98	49.7	(±11.8)	<0.01
High school graduate	437	33.9	(±5.7)	<0.01
College (1-3 years)	470	26.3	(±4.8)	n.s.
≥College graduate	870	22.6	(±3.6)	Ref
Annual income ($)				
<15,000	127	32.4	(±9.8)	<0.05
15,000-24,999	198	37.3	(±9.3)	<0.01
25,000-34,999	200	33.8	(±8.1)	<0.05
35,000-49,999	286	27.7	(±6.6)	<0.20
≥50,000	851	21.8	(±3.4)	Ref
Age (years)				
18-39	482	33.4	(±5.1)	<0.05
≥40	1,378	26.0	(±2.9)	
Race/ethnicity				
White, non-Hispanic	1,556	22.4	(±2.5)	Ref
Black, non-Hispanic	124	47.9	(±10.7)	<0.01
Hispanic	106	46.5	(±11.3)	<0.01
Other race, non-Hispanic	83	38.6	(±12.1)	<0.05
Region				
Upstate	1,447	25.0	(±2.7)	<0.01
New York City	433	37.8	(±6.1)	
Reported general health				
Excellent, very good, good	1,641	26.5	(±2.7)	<0.01
Fair, Poor	238	40.8	(±8.5)	
Had a personal doctor				
Yes	1,708	27.2	(±2.7)	<0.10
No	169	36.3	(±9.7)	
Had cholesterol checked in the past 5 years				
Yes	1,620	27.8	(±2.8)	n.s.
No	225	32.2	(±7.7)	
Dental visit in the past year‡				
Yes	1,590	22.9	(±2.6)	<0.01
No	289	52.2	(±7.1)	
Any health insurance coverage				
Yes	1,729	26.5	(±2.7)	<0.01
No	149	44.3	(±9.7)	
Any dental insurance coverage				
Yes	1,181	27.4	(±3.2)	n.s.
No	686	29.4	(±4.6)	
Smoking				
0-99 cigarettes in their lifetime	1,525	27.1	(±2.9)	<0.10
≥100 cigarettes in their lifetime/currently smoked	350	33.3	(±6.1)	
Drinking				
0-2 (1 for female) drinks/day	1,750	28.1	(±2.7)	n.s.
>2 (1 for female) drinks/day	121	33.0	(±12.1)	

* Unweighted sample sizes for each category may not add up to 1,918 because of missing and excluded data (responses of "don't know," "not sure," or refused were excluded).
† Weighted estimates in percent adjusted to the 2000 census data.
‡ Included visit to a dentist, dental hygienist, or dental clinic.
n.s., not significant at $P \geq 0.20$; Ref, reference.

Table 6
Percent and Adjusted Odds Ratios for Oral Cancer Examination by Nondental Providers (Physician, Nurse, or Nurse Practitioner) by Selected Variables (2003 Behavioral Risk Factor Surveillance System, New York State)*

Variable Category	Percent (%)†	Odds ratio (LCI, UCI)
Sex		
Male	34.4	1.72 (1.29, 2.30)
Female (reference)	22.7	–
Race/ethnicity		
White, non-Hispanic (reference)	22.4	–
Black, non-Hispanic	47.9	3.41 (2.15, 5.42)
Hispanic	46.5	1.96 (1.07, 3.58)
Other race, non-Hispanic	38.6	2.12 (1.13, 3.97)
Dental visit in the past year‡		
Yes (reference)	22.9	–
No	52.2	2.87 (2.02, 4.10)

* Adjusted for sex, education, annual household income, age, race/ethnicity, reported general health, having a personal doctor, a dental visit experience, health insurance, and smoking risk variables. Only selected variables whose regression coefficients are significant at level of <0.05 using Wald *t*-test are presented.
† Weighted estimates in percent adjusted to the 2000 census data.
‡ Included visit to a dentist, dental hygienist, or dental clinic.
LCI, lower 95% limit; UCI, upper 95% limit.

order to increase oral examinations for underserved, high-risk populations (26). Although the US *Guide to Clinical Preventive Services* found insufficient evidence to recommend routine screening for oral cancer in asymptomatic patients by primary care physicians, it suggested that clinicians may wish to include an examination for cancer and precancerous lesions of the oral cavity for high-risk individuals (27). Physicians and other medical health care providers seeing larger numbers of high-risk patients and more often assessing their risk factors for other conditions should be strongly encouraged to routinely include the examination of the mouth and throat. The survey finding clearly illustrates that Blacks, regardless of socioeconomic and general heath status, were more likely to receive an oral cancer examination from physicians or nurse practitioners, reflecting their easier access to nondental providers and ultimately leading to reduced gaps in oral cancer examination.

There are provider-related barriers, however, that may make the implementation of an oral examination by medical care professionals difficult to accomplish. Surveys of physicians, nurses, or nurse practitioners revealed that most primary care providers do not accept oral cancer examinations as part of their routine care, with low perceived benefits/beliefs and high perceived barriers (22-25). Modifying the practice of primary care providers to adopt new procedures or guidelines into their standard of care is a challenging task (28,29). Nonetheless, there have been encouraging reports that primary care physicians are well aware of the importance of their role in promoting oral health and are willing to participate in programs to achieve this goal (25).

The recent American Cancer Society's guidelines for early cancer detection also emphasized the opportunity of oral cancer detection through the inclusion of an oral cancer checkup in general periodic health examination rather than through a stand-alone oral cancer examination (6). Integrating oral cancer prevention education into existing tobacco and alcohol cessation programs may also be feasible (5). As this and other studies found that regular alcohol use was overlooked as a risk factor for oral cancer by both the public and health care providers, additional prevention education efforts should be targeted to reducing the gaps in knowledge among providers and the general public concerning the relationship between alcohol and oral cancer.

Finally, even with the limitations of this study and its reliance on self-reported oral cancer examination experience, the use of the BRFSS made it possible to identify the disparities in oral cancer awareness and examination among New York State adults. Taking advantage of the extensive pool of sociodemographic, health care access, and health behavior related data available from the BRFSS, a greater understanding of the determinants of disparities in oral cancer knowledge and oral cancer examination experience was possible. The addition of the oral cancer questions in a preestablished surveillance system such as the BRFSS resulted in considerable cost savings and preservation of resources. However, the history of cholesterol check as a proxy indicator for recent access to medical care could have introduced age-related bias. Therefore, it is important to consider other relevant health care access questions when including an oral cancer module. Nevertheless, the use of the BRFSS should prove to be a promising new tool for the monitoring of oral cancer-related behaviors and progress toward *Healthy People 2010* objectives.

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