

## An Oral Health Survey of the Lumbee Tribe in Southeastern North Carolina

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### Introduction

The Lumbee Indian tribe, located in Robeson County, a rural area of southeastern North Carolina, is the largest of North Carolina's eight American Indian tribes. It is the largest American Indian tribe east of the Mississippi River and the ninth largest tribal band in the United States.<sup>1,2</sup> In Robeson County, American Indians make up 37.2% of the population compared to 36.4% Caucasian and 24.6% Black.<sup>2</sup> The Lumbee tribe does not receive funding from the United States Bureau of Indian Affairs that would give them access to the Indian Health Service (IHS).<sup>3</sup> The IHS provides medical and dental care to federally recognized American Indian tribes.<sup>4,5</sup> Although there is a significant amount of data on the oral health needs of American Indians receiving dental services from the IHS, no data are available which report the needs of American Indians like the Lumbee tribe, who do not receive federally funded medical and dental services.<sup>5-8</sup>

### Review of the Literature

Oral diseases are common among American Indian tribes monitored by the IHS,<sup>5-9</sup> with dental decay and periodontal disease among the most common.<sup>9</sup> A study reporting data collected by the IHS in 1991 found that American Indian adults had a higher prevalence of dental decay compared to the general population of the United States. They also found that, al-

### Abstract

**Purpose:** The Lumbee tribe, North Carolina's largest American Indian tribe, is located in Robeson County, where there is an access to dental care crisis. There is a high incidence of systemic diseases, including coronary heart disease (CHD) and diabetes. The tribe also has a higher rate of adverse pregnancy outcomes compared to Caucasian populations. There is little information available regarding the oral health of this population. The aim of this study was to evaluate access to dental care issues, oral health knowledge and oral health-related quality of life of the Lumbee tribe.

**Methods:** A self-administered survey was developed to assess factors influencing access to dental care, oral health knowledge and oral health-related quality of life. The survey was administered to a convenience sample of 118 Lumbee Indians at the Lumbee Homecoming Festival in Pembroke, NC.

**Results:** Barriers to accessing dental care included being unable to leave work to find a dentist and cost of dental services. Many believed that it is natural to lose teeth as one ages. There was low oral health knowledge regarding oral and systemic health. Oral Health-related quality of life was affected. There was an association between poor access to dental care and poor oral health-related quality of life.

**Conclusion:** Lumbee Indians reported barriers to accessing dental care. There was a significant relationship between difficulty accessing dental care and poor oral health-related quality of life.

**Key Words:** access to dental care, Lumbee Indians, oral health-related quality of life, oral health knowledge

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though there had been a decline in decay among American Indian children, American Indian adults did not show the same trend. Compared to data collected in 1984 by the IHS, American Indian children had a 47% reduction in caries experience. However, American Indian adults aged 35 to 44 showed a 3% increase in caries experience in the same time period.<sup>7</sup> Further data

reported by the IHS showed that American Indians have a high rate of periodontal disease compared to Caucasian populations in the United States. In all age groups, American Indians with diabetes had significantly higher rates of severe periodontal disease compared to those without diabetes.<sup>9</sup> Recent research has found that there is an association between periodontal

disease and systemic diseases like diabetes and coronary heart disease (CHD).<sup>10–15</sup> Researchers have also found a possible relationship between periodontal disease and preterm, low birth-weight babies.<sup>16–19</sup> American Indians in North Carolina have higher rates of CHD and diabetes compared to North Carolina's Caucasian population. American Indians in North Carolina also have a higher infant mortality rate and nearly twice the incidence of low-birth weight babies compared to Caucasian populations.<sup>1,20</sup>

One of the goals of The National Call to Action to Promote Oral Health by the United States Department of Health and Human Services (USDHHS) is to increase the awareness of all Americans regarding the seriousness of oral disease and other systemic conditions like diabetes, CHD and adverse pregnancy outcomes. According to the USDHHS, it is important to educate the public about their oral health and how it relates to their overall well-being.<sup>21</sup>

When assessing CHD and diabetes, as well as oral disease, it is necessary to consider how these conditions affect the quality of life for people who are afflicted by them. Health care policy includes both the prevalence of disease and how those diseases affect quality of life.<sup>22</sup> Various data, including the presence and severity of oral diseases and oral health-related quality of life measures, have been collected to assess how much a population suffers from oral related disease.<sup>23,24</sup> In a study performed in the early 1990s by Slade et al, data which included decayed, missing or filled scores and clinical attachment level, along with the Oral Health Impact Profile-14 (OHIP-14), a quality of life survey, were taken from adults 65 years or older in Canada, Australia and North Carolina. The data were compared among the 3 populations. Researchers found that older adult minorities from the Piedmont area of North Carolina had a great-

er prevalence of oral disease and that they suffered from those diseases more than other study populations.<sup>25</sup>

Another research study performed in China assessed the severity of periodontal disease and its effects on quality of life.<sup>26</sup> Periodontal status was determined by clinical attachment level. Subjects aged 25 to 64 were divided into 2 groups that depended on the average amount of attachment loss for each individual. The OHIP-14 was used to assess how quality of life was affected by periodontal disease. Results showed that 22% of subjects reported that "their oral health status impacted on their quality of life in one or more ways," and that "the OHIP-14 score was significantly associated with occurrences of swollen gums, sore gums, receding gums, loose teeth, bad breath and tooth ache."<sup>26</sup> All of the studies that utilized the OHIP-14 provided researchers with a better understanding of the negative effects that oral disease has on quality of life.<sup>25–27</sup>

In North Carolina, it is often difficult for low income and poor people to access dental care, especially in rural Robeson County, where the Lumbee tribe is located.<sup>28–30</sup> North Carolina ranks 47th out of 50 states in its dentist to patient ratio. Robeson County has 1.1 to 2 dentists per 10,000 people. This places Robeson County well below the national (6.0 dentists per 10,000) and state (4.1 dentists per 10,000) averages.<sup>28,30</sup> One objective of the Healthy People 2010 report by the Surgeon General is to increase the use of dental services by all Americans.<sup>31</sup> To meet this objective, the state's public university system is working to increase the enrollment in its dental schools. Emphasis is also being placed on recruiting dentists into rural areas of North Carolina.<sup>28,30</sup> The American Dental Hygienists' Association (ADHA) revised its National Dental Hygiene Research Agenda in 2007 to identify how the

dental hygiene profession can help meet the Healthy People 2010 objective to increase access to dental care.<sup>32</sup> North Carolina has doubled its dental safety net programs from 43 in 1998, to 115 in 2004.<sup>28</sup> Dental safety net programs provide dental care for low-income patients in North Carolina.<sup>33</sup> However, concerns by the North Carolina Office of Research, Demonstrations and Rural Health Development regarding accessibility of the program by those who need it most have arisen. "Many of the patients most in need of safety net services do not have employment that allows them to leave work (with or without pay) for dental appointments."<sup>30</sup> This has prompted the Office of Research, Demonstration and Rural Health Development to consider creating dental safety net programs with more flexible hours to meet the dental needs of low-income working individuals.<sup>30,33</sup> Increasing the number of people who seek dental care is also a matter of creating value for oral health through education by culturally competent oral health care professionals.<sup>21,30,34,35</sup>

The aim of this study was to evaluate access to dental care issues, oral health knowledge and oral health-related quality of life, as well as determining if access to dental care was associated with oral health knowledge and oral health-related quality of life.

## Methodology

A self-administered survey was created to assess access to dental care issues, self-reported oral health status, oral health knowledge and demographic information. The OHIP-14 survey was chosen to assess oral health-related quality of life in this study due to its high validity. It was also used so that comparisons could be made to other North Carolina populations whose oral health-related quality of life was evaluated using the same survey instrument.<sup>23–25</sup> Approval for the survey was obtained from the

University of North Carolina Institutional Review Board. The survey was pilot tested at Mt. Elim Baptist Church, which has a predominantly Lumbee Indian congregation, prior to the Lumbee Homecoming Festival. With a population of approximately 22,500 Lumbee Indians attending the event within the ages of 18 years or older, a sample size of at least 109 completed surveys was determined using a prevalence estimate of 20% +/- 7.5% of the Lumbee population having their quality of life affected due to low oral health knowledge and poor access to dental care. The sample size was calculated using EpiInfo version 3.3.2 software.

The survey was administered to a consecutive convenience sample of 118 American Indians during the Lumbee Homecoming Festival in Pembroke, NC on July 7, 2007. A covered tent with tables and chairs was set up at the festival where the surveys were completed. A flyer describing the survey and participation requirements was distributed by a volunteer from the Lumbee community to recruit participants for the survey. The principal investigator was present during administration of the survey to aid in completing the survey for participants who could not read. Cold beverages were offered and dental hygiene supplies were distributed once the survey was completed.

Survey sections which evaluated access to dental care issues and oral health knowledge contained Likert-type scale questions to measure the level of agreement with each statement. The responses included “strongly agree,” “somewhat agree,” “don’t know/not sure,” “somewhat disagree” and “strongly disagree.” Summary scores were calculated to identify subjects with poor access to dental care, low oral health knowledge and poor oral health-related quality of life. A value of 1 was assigned for responses of “somewhat agree” or “strongly agree” to statements regarding barriers to

**Table I. Demographic characteristics of Subjects (n=118)**

Demographic characteristics	% Subjects	% Robeson County
<b>Gender</b>		
Male	45	49
Female	55	51
<b>Age (years)</b>		
18–25	20	*
26–35	20	*
36–45	21	*
46–55	19	*
56 or older	21	*
<b>Marital status</b>		
Never married	26	*
Married	56	*
Separated/divorced/widowed	18	*
<b>Education</b>		
Less than high school graduate	7	*
High school graduate/GED	23	65
At least some college	43	*
Bachelor’s degree or higher	27	11.4
<b>Income</b>		
<\$19,999	20	*
\$20,000 to \$34,999	21	*
>\$35,000	60	*

accessing dental care. A summary score value of 1 was assigned for responses of “somewhat disagree” or “strongly disagree” to statements in the oral health knowledge section. The OHIP-14 is also rated on a Likert-type scale response of “never,” “hardly ever,” “occasionally,” “fairly often” or “very often,” respectively.<sup>23,24</sup> Summary scores from the OHIP-14 section were obtained by assigning a value of 1 for responses of “occasionally” or more often. Therefore, high summary scores represent more barriers to accessing dental care, low oral health knowledge and low oral health-related quality of life. “Missing” and “Don’t Know” responses were excluded from analysis.

The summary scores were used to assess the relationship between covariates and access to dental care issues, oral health knowledge

and oral health-related quality of life. The summary scores were also used to determine if poor access to dental care is associated with poor oral health-related quality of life and low oral health knowledge. The p-value was set at ≤0.05 to report significance within the sample population. Descriptive statistics were assessed using Pearson’s Chi-squared test for nominal and ordinal variables. T-test, Pearson’s Correlation and ANOVA were used for continuous variables. Statistical analyses were performed using JMP version 6.0 software.

## Results

Table I contains demographic information of the survey population. Of the 118 participants, most had at least some college education, and 55% were females. The majority of respondents had an income of at least \$35,000. Only

58% had any dental insurance coverage.

Table II describes the distribution of responses to the oral health knowledge and access to dental care sections of the survey. The majority of respondents had knowledge about fluoride use, daily flossing and dietary considerations for oral health. However, many did not know that oral disease may affect the heart, pregnancy and diabetes. Access to dental care was affected by cost, an inability to miss work and dental fear. Many also reported that it was too far to travel to visit a dentist or could not find a dentist to take care of them.

Table III describes the distribution of participants with poor oral health-related quality of life. Many participants had poor oral health-related quality of life due to oral pain and were self-conscious because of problems with their teeth/mouth. Some found it difficult to relax and had decreased taste.

Table IV describes the characteristics of those with problems accessing dental care, low oral health knowledge and low oral health-related quality of life. Those with an income of less than \$35,000 had more problems accessing dental care compared to those with an income greater than \$35,000 ( $p=0.0008$ ). Males had less oral health knowledge than females ( $p=0.0072$ ). Participants age 36 to 45 had the most trouble accessing dental care ( $p=0.043$ ). Having no dental insurance was also a deterrent to receiving dental care ( $p=0.048$ ). Those with less than a high school education had significantly less oral health knowledge than those with at least some college education ( $p=0.0072$ ). Current tobacco use was also associated with poor oral health-related quality of life ( $p=0.022$ ) (Figure 1). There was not a significant association between low oral health knowledge and poor access to dental care ( $r=0.11$ ,  $p=0.23$ ). However, there was a significant association between poor access to dental care

**Table II. Distribution of responses to oral health knowledge and access to care questions**

	Agree %	Don't Know %	Disagree %
<b>Oral Health Knowledge (n=115)</b>			
Problems with the teeth/mouth may cause problems with:			
the heart	52	39	9
pregnancy	50	45	5
diabetes	57	38	5
It is natural to loose your teeth as you age	39	25	36
Daily flossing makes your teeth /mouth healthier	89	10	<1
<b>Access to Dental Care (n=117)</b>			
I want to go to the dentist but cannot or do not because:			
it is too far to travel	20	10	70
I am afraid	27	4	69
it costs too much	50	1	49
I cannot miss work	34	<1	65
I cannot find a dentist	30	7	63
I do not want to go to the dentist	18	3	79

**Table III. Distribution of responses to Oral Health Impact Profile-14 (OHIP-14) item responses (n=117)**

	Occasionally/fairly/very often %
<b>Functional limitation</b>	
Trouble pronouncing words	13
Taste worsened	21
<b>Physical pain</b>	
Painful aching	30
Uncomfortable to eat	31
<b>Psychological discomfort</b>	
Self-conscious	33
Tense	25
<b>Physical disability</b>	
Diet unsatisfactory	15
Interrupt meals	19
<b>Psychological disability</b>	
Difficult to relax	21
Been embarrassed	22
<b>Social disability</b>	
Irritable with others	13
Difficulty doing jobs	9
<b>Handicap</b>	
Life unsatisfying	16
Unable to function	8

**Table IV. Characteristics of subjects' summary scores in oral health knowledge, access to dental care and poor oral health–related quality of life**

	Oral health knowledge Mean (SE)	P Value	Access to dental care issues Mean (SE)	P Value	oral health–related quality of life Mean (SE)	P Value
<b>Gender</b>						
Male	2.69 (0.22)	0.0072*	2.21 (0.31)	>0.05	2.91 (0.55)	>0.05
Female	1.90 (0.19)		1.92 (0.26)		2.73 (0.45)	
<b>Age (years)</b>						
18–25	2.36 (0.34)	>0.05	1.22 (0.44)	0.043*	1.43 (0.76)	>0.05
26–35	2.22 (0.33)		1.91 (0.44)		3.09 (0.76)	
36–45	2.67 (0.32)		2.96 (0.43)		4.21 (0.91)	
46–55	2.18 (0.34)		2.50 (0.45)		2.68 (0.78)	
56 or older	1.91 (0.33)		1.63 (0.43)		2.21 (0.75)	
<b>Income</b>						
<\$19,999	2.68 (0.32)	>0.05	3.00 (0.43)	0.0008*	4.00 (0.85)	0.02*
\$20,000 to \$34,999	2.13 (0.31)		3.00 (0.42)		4.35 (1.02)	
>\$35,000	2.14 (0.19)		1.46 (0.25)		2.09 (0.39)	
<b>Education</b>						
Less than high school graduate/GED	4.14 (0.83)	0.0072*	2.88 (0.97)	>0.05	2.38 (1.33)	>0.05
High school graduate/GED	2.52 (0.26)		2.33 (0.39)		4.07 (0.73)	
At least some college	2.02 (0.16)		1.89 (0.24)		2.47 (0.42)	
<b>Dental insurance</b>						
No dental insurance	2.60 (0.26)	>0.05	2.64 (0.56)	0.048*	3.67 (0.56)	0.031*
Dental insurance	2.08 (0.26)		1.68 (0.31)		2.15 (0.38)	
<b>Tobacco use</b>						
Current tobacco use	2.41 (0.24)	>0.05	2.86 (0.45)	>0.05	3.96 (0.76)	0.022*
Past tobacco use	2.76 (0.30)		1.91 (0.36)		3.17 (0.74)	
Never user	1.90 (0.21)		1.66 (0.27)		1.72 (0.38)	

\*=Statistically significant p value of  $\leq 0.05$

and poor oral health–related quality of life ( $r=0.46$ ,  $p=0.0001$ ).

## Discussion

The purpose of this study was to assess oral health knowledge, barriers to accessing dental care and oral health–related quality of life of the Lumbee tribe. There was evidence of low oral health knowledge regarding the link between oral and systemic disease among those surveyed at the Lumbee homecoming Festival in Pembroke, NC. Although subjects had a high level of knowledge about oral health topics, such as daily flossing and fluoridated toothpaste and its positive effect on oral

health, many had low knowledge about oral health and its relationship with systemic diseases like CHD and diabetes. Even though recent research shows a significant relationship between periodontal disease and adverse pregnancy outcomes, many of the female participants in this study did not know that oral health may affect pregnancy outcomes.<sup>16,17</sup> The results of the OHIP–14 survey suggest that the Lumbee population surveyed at the Lumbee Homecoming Festival have low oral health–related quality of life. Slade et al reported a mean OHIP–14 score of 1.64 in South Australian populations aged 60 and older.<sup>24</sup> The present study

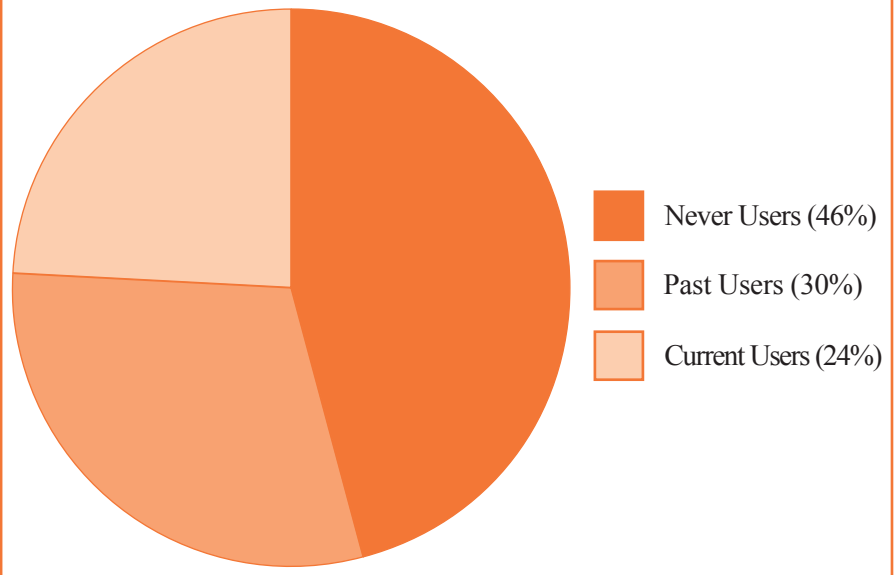
found a mean OHIP–14 score of 2.74 for the population surveyed. Those age 36 to 45 years had the lowest oral health–related quality of life. Those aged 56 or older had better oral health–related quality of life than those aged 36 to 45. This suggests that the Lumbee population surveyed may experience poor oral health–related quality of life at a younger age than some populations. Data from the IHS revealed that American Indians had an increase in caries in those aged 35 to 44.<sup>7</sup> The current study found a lower oral health–related quality of life in a similar age group. This suggests that future research efforts may need to focus on those aged 30

and older.

One observation of interest was that, although recruitment was performed in the same manner by all of those involved, subjects were more willing to participate when recruited by the Lumbee community volunteer than when recruited by the principal investigator or student volunteer who were not American Indian. Without the efforts of the Lumbee volunteer, it is unlikely that there would have been enough subjects recruited into the study. This finding supports recommendations from the USDHHS and the United States Surgeon General that oral health professionals need to be culturally competent in order to have effective communication and increase access to dental services.<sup>21,30,31,35</sup> To address this and other findings from this study, North Carolina's public universities may need to focus on recruiting students from the Lumbee tribe. It is also important that future oral health research with the Lumbee community be conducted by a research team that includes qualified members of the Lumbee tribe.

There were some limitations to this study. There may have been some bias in the survey instrument because the data were self-reported. Since the population surveyed tended to be well-educated and had a high household income compared to the general population of Robeson County, the results may not be generalized to the entire Lumbee population of Robeson County. However, since the sample population had a higher socioeconomic status than Robeson County's general population, there may be greater difficulty accessing dental care and lower oral health-related quality of life than the current study found. Many of the Lumbee community were unintentionally excluded from the study because they did not have financial or trans-

Figure 1: Distribution of Tobacco Use by Participants



portation resources to attend the Lumbee Homecoming Festival. Therefore, it is only representative of a portion of the Lumbee population. Further investigation of the oral health needs of the entire Lumbee community is needed.

### Conclusion

This study found that there is an association between low oral health-related quality of life and barriers to accessing dental care. This may be related to the access to dental care crisis in North Carolina. Because of the rural location of the Lumbee tribe, dental offices may be a long distance away for many of Robeson County's population.<sup>1,20</sup> This is especially true for those with low socioeconomic status. Because of the recent economic decline in the United States, traveling far distances to receive dental care may use up monetary resources needed for traveling to work. Therefore, driving a far distance to receive dental care may become an unaffordable expense, even for those who carry dental insurance. For many respondents, the cost of receiving dental services was also a deterrent to accessing care. Many were unable to find a dentist to take

care of them. This is due in part to the low dentist to population ratio in Robeson County.<sup>28,29</sup> Many reported that although they wanted to go to the dentist, they were unable to take time off from work. This finding is in agreement with concerns raised over accessibility of dental safety net programs by working individuals.<sup>30</sup> The current study provides preliminary data for further research by organizations like the ADHA. Future research efforts need to focus on how dental hygiene services might improve oral health outcomes of this underserved population.<sup>32</sup>

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