

# SOUTH CAROLINA TAKES ACTION

---

## The Burden of Oral Disease



D H E C



PROMOTE PROTECT PROSPER  
South Carolina Department of Health  
and Environmental Control

BOARD:  
Elizabeth M. Hagood  
Chairman

Edwin H. Cooper, III  
Vice Chairman

Steven G. Kisner  
Secretary



C. Earl Hunter, Commissioner

*Promoting and protecting the health of the public and the environment.*

BOARD:  
Henry C. Scott

Paul C. Aughtry, III

Glenn A. McCall

Coleman F. Buckhouse, MD

January 24, 2007

Dear Colleague:

The mission of DHEC is to promote and protect the health of the public and the environment. In order to increase the quality and years of healthy life, it is vital to understand the burden of oral diseases, access to dental care and other factors influencing health behaviors. This comprehensive report developed by South Carolina Department of Health and Environmental Control's Division of Oral Health in collaboration with the Centers for Disease Control and Prevention's Division of Oral Health provides an overview of the status of oral health in South Carolina.

South Carolina has made great strides in improving the oral health of its residents; however, this report also documents groups at risk for poor oral health outcomes. This first comprehensive report on the oral health of South Carolina will provide a foundation of knowledge and information for the promotion of oral health and the prevention of oral diseases in the future.

I hope that this document will catalyze the action process to significantly improve the general health of our residents by reducing the burden of oral diseases.

Sincerely,

Lisa F. Waddell, M.D., M.P.H.  
Deputy Commissioner for Health Services

# **Acknowledgments from the Centers for Disease Control and Prevention (CDC)**

## **Authors**

Scott L. Tomar, DMD, MPH, DrPH

Beth Hines, MPH, RDH

Lisa R. Levy, MPH

## **CDC Division of Oral Health Advisors**

Jessamyn Ressler-Maerlender, MPH

Laurie K. Barker, MSPH

Linda S. Orgain, MPH

Scott M. Presson, DDS, MPH

Special thanks to our partners in state oral health programs who reviewed the content of this document.

# **Acknowledgments from DHEC**

## **Authors**

Valeria Carlson, B.S., Division of Oral Health

Christine Veschucio, R.D.H., M.A., Director, Division of Oral Health

## **Advisors**

Lakshman Abeyagunawardene, M.D., M.P.H., Division of Oral Health

Nathan Hale, M.P.H., Bureau of Maternal and Child Health

Mary Kenyon Jones, M.Ed., Division of Oral Health

Susan Reed, D.D.S., M.P.H., Dr.P.H., Medical University of South Carolina Department of Periodontology

## **Other Contributors**

Amy Martin, Dr.P.H., University of South Carolina Arnold School of Public Health

## **Suggested citation:**

Carlson, V. and Veschucio, C. (2006). The Burden of Oral Disease in South Carolina. South Carolina Department of Health and Environmental Control, Columbia, SC, USA.

## I. Table of Contents

<b>I.</b>	<b>Table of Contents</b>	
a.	List of figures .....	3
b.	List of tables .....	3
<b>II.</b>	<b>Executive Summary</b> .....	4
<b>III.</b>	<b>Introduction</b> .....	6
<b>IV.</b>	<b>Theoretical Framework of this Document</b> .....	7
<b>V.</b>	<b>National and State Objectives on Oral Health</b> .....	9
a.	<i>Healthy People 2010</i> objectives and interim progress .....	10
b.	State Oral Health Plan .....	11
<b>VI.</b>	<b>Special Populations</b> .....	12
a.	Racial and ethnic groups .....	12
b.	Women .....	12
c.	Low income families .....	13
d.	Children in poverty .....	14
e.	Adults in poverty .....	14
f.	Rural and urban populations .....	15
g.	People with disabilities .....	16
<b>VII.</b>	<b>The Burden of Oral Diseases</b> .....	16
a.	Societal impact of oral disease .....	16
b.	Economic impact of oral disease .....	16
c.	Oral disease and other health conditions .....	17
d.	Prevalence of disease and unmet needs in children .....	17
e.	Oral disease in adults .....	19
f.	Periodontal disease .....	21
<b>VIII.</b>	<b>Protective Factors Affecting Oral Disease</b> .....	21
a.	Community water fluoridation .....	21
b.	Dental sealants .....	22
c.	Preventive visits .....	23
<b>IX.</b>	<b>Oral Health and Systemic Health</b> .....	24
a.	Cardiovascular disease and stroke .....	24
b.	Diabetes .....	26
c.	Oral health of pregnant women .....	26
<b>X.</b>	<b>Oral Cancer</b> .....	27
a.	Examination for oral cancer .....	29
b.	Tobacco and alcohol use and their impact on oral cancer .....	30
c.	Tobacco control .....	30
<b>XI.</b>	<b>Oral Health Education</b> .....	33
a.	Oral health education in schools .....	33
b.	Oral health education in the community .....	34
<b>XII.</b>	<b>Provision of Dental Services</b> .....	36
a.	Dental workforce and capacity .....	36
b.	Education of the dental workforce .....	37
c.	Dental workforce diversity .....	37
d.	Use of dental services .....	38
<b>XIII.</b>	<b>Conclusions</b> .....	39
<b>XIV.</b>	<b>References</b> .....	42

## **Appendix:**

Tables with national statistics not included previously

### **Figures:**

1. The PRECEDE/PROCEED Model
2. An Example of the PRECEDE/PROCEED Model Showing the Factors Contributing to Early Childhood Decay
3. Rurality of South Carolina
4. Decay Experience and Untreated Decay among Third Grade Children
5. Racial Disparities in Oral Health among Third Graders in South Carolina
6. Ethnic Disparities in Oral Health among Third Graders in South Carolina
7. Access to Fluoridated Water in South Carolina
8. Cardiovascular Disease in South Carolina and in the United States, per 100,000 Population
9. Oral Cancer Incidence Rates, by Race, per 100,000 Population
10. Oral Cancer Death Rates, by Race, per 100,000 Population
11. Prevalence of Cigarette Smoking, by Gender
12. Prevalence of Cigarette Smoking, by Race
13. School Districts with Active Dental Program, 2005
14. Dental Professional Shortage Areas in South Carolina

### **Tables:**

- I. *Healthy People 2010* Oral Health Indicators, Target Levels, and Current Status in the United States and South Carolina
- II. Educational Attainment of Adults, Nationally and in South Carolina
- III. Dental Characteristics among Third Graders
- IV. Tooth Loss of Adult Populations
- V. Percentage of Children with Dental Sealants
- VI. Percentage of Adults Aged 18 or Older who had their Teeth Cleaned Within the Past Year, 2004
- VII. Cardiovascular Disease Rates per 100,000 Population
- VIII. Diabetes
- IX. Proportion of Oral Cancer Cases Detected at the Earliest Stage
- X. Cigarette Smoking among Adults Aged 18 Years and Older
- XI. Percentage of Students in High School Who Used Tobacco in the Past Month
- XII. Proportion of Persons who Visited a Dentist in the Previous 12 Months

## II. EXECUTIVE SUMMARY

The two goals of the nation's guiding public health document, *Healthy People 2010*, are (1) to eliminate disparities in access to health care and health outcomes and (2) to increase quality of life. Oral health is a significant contributor to overall health. To increase quality of life, South Carolina must improve the oral health of its citizens. Most common oral diseases and conditions can be prevented. Although gains in oral health status have been achieved for the population as a whole, they have not been evenly distributed across subpopulations. Non-Hispanic Blacks, Hispanics, and American Indians and Alaska Natives generally have the poorest oral health of any of the racial and ethnic groups in the U.S. population. Women tend to have better oral health than men, but they are at higher risk for lack of access to care and for pregnancy-related oral health complications (USDHHS, 2004b).

Oral health and general health are integral to each other. Many systemic diseases and conditions, including diabetes, HIV, and nutritional deficiencies, have oral signs and symptoms. These manifestations may be the initial sign of clinical disease and may serve to inform health care providers and individuals of the need for further assessment. Recent research suggests that inflammation associated with periodontitis may increase the risk of heart disease and stroke, premature births, respiratory infection, and difficulty in controlling blood sugar in persons with diabetes, (Dasanayake, 1998; Offenbacher, Lieff, Boggess, Murtha, Maidanos, Champagne, et al., 2001; Davenport, Williams, Sterne, Sivapathasundram, Fearne, and Curtis, 1998; Beck, Offenbacher, Williams, Gibbs, and Garcia, 1998; Scannapieco, Bush, and Paju, 2003; Taylor, 2001).

Oral health is related to well-being and quality of life as measured along functional, psychosocial, and economic dimensions. Oral/facial pain, both as a symptom of untreated dental and oral problems and as a condition itself, is a major source of diminished quality of life. Diet, nutrition, sleep, psychological status, social interaction, school, and work are affected by impaired oral and craniofacial health. Oral and craniofacial conditions such as temporomandibular disorders, diminished salivary functions, and ill-fitting prosthetics can lead to a variety of poor health outcomes; these can include a compromised ability to eat which leads to limitations in food selection and to poor nutrition. Poor oral health is also associated with sleep deprivation, depression, and multiple adverse psychosocial outcomes (USDHHS, 2000a).

The S.C. Department of Health and Environmental Control (DHEC) Strategic Plan, published in 2005, contains a series of goals and objectives for improving the state's health status by the year 2010. All DHEC divisions are expected to include the agency goals as part of the divisional planning process. The goals are very similar to the national goals in *Healthy People 2010*.

A State Oral Health Plan was published by the Division of Oral Health in 2005 and is currently being updated. The State Oral Health Plan presents the reader with an understanding of the burden of oral disease in South Carolina, the collaborative process used in developing a comprehensive plan for action, a vision statement with an action plan, and methods to evaluate plan outcomes.

The South Carolina Oral Health Advisory Council was established in 2003 as a part of the State Oral Health Plan, to provide guidance for DHEC's Oral Health Division. The Advisory Council is active in establishing the goals and objectives of the Division of Oral Health, advocacy, and oral health education throughout the state.

The Oral Health Coalition was formed in 2003. Its mission is to assist in the development of oral health promotion and disease prevention activities at the state and community levels.

The Oral Health Advisory Council and Coalition have historically made demonstrable contributions to DHEC's Division of Oral Health. Given the utility of each group, there is tremendous value in using the strengths of each group in furthering public oral health in South Carolina. Therefore, effective September 2006, the Advisory Council and Coalition commenced quarterly advisory summits (QAS). The QAS meeting format allows for the groups to meet jointly and separately. The proposed advisory structure and process is intended to make the best use of the key stakeholders' time and talents and to improve communication and coordination among all the entities. The Coalition workgroups are undergoing reorganization based on the State Oral Health Plan.

## **Significant Findings of this Report:**

### **Oral Disease and Prevention**

Although the state needs assessment and BRFSS show some progress in improving the oral health of residents of South Carolina, a great deal of work remains to be done, especially among members of special populations. Women, minorities, and those living in low-income families have poorer outcomes than the norm. There has been no surveillance data gathered on teenagers, the elderly, or persons with disabilities.

South Carolina's third graders are more likely to have experienced tooth decay than other third graders in the United States. South Carolina third graders are less likely to have sealants on their molars than third graders in other states.

South Carolina has exceeded the goal of having 75 percent of those on public water systems receive fluoridated water; it ranks 11<sup>th</sup> in the nation, with 92 percent of public water systems dispensing fluoridated water.

### **Comorbid Conditions**

Due to the high prevalence of tobacco use in this state (more than twice the national rate in some populations), South Carolina has a disproportionately high rate of oral cancer incidence and mortality. South Carolina also has disproportionately high rates of cardiovascular disease and diabetes, which can exacerbate oral disease conditions.

### **Surveillance**

The Division of Oral Health is currently working with the Office of Research and Statistics to design and implement a statewide oral health monitoring system. A statewide needs assessment of third grade children is underway.

### **Ongoing Programs**

South Carolina's Comprehensive Health Education Act of 1988 (CHEA) includes dental health as a part of the kindergarten to grade five module. For middle and high school students, substance use (tobacco) also is a part of the curriculum.

The South Carolina School Dental Prevention Program enrolls public and private providers who agree to provide school-based oral health services in their local community and to operate within the *School-Based Dental Prevention Program Guidelines*. The program was active in 28 of

South Carolina's 46 counties in 2005. To educate the community, 37 percent of community health care centers have a dentist on staff, and an additional 21 percent include oral health activities in their budgets. There are 54 low-income dental clinics located in the state.

The recently completed oral health pilot project funded by The Robert Wood Johnson Foundation successfully increased use of oral health services by children receiving Medicaid and children with special health care needs.

### **III. INTRODUCTION**

The mouth is our primary connection to the world: it is how we take in water and nutrients to sustain life, our primary means of communication, the most visible sign of our mood, and a major part of how we appear to others. Oral health is an essential and integral component of overall health throughout life. It encompasses much more than just healthy teeth. "Oral" refers to the whole mouth: the teeth, gums, hard and soft palate, linings of the mouth and throat, tongue, lips, salivary glands, chewing muscles, and upper and lower jaws. Not only does good oral health mean being free of tooth decay and gum disease; it also means being free of chronic oral pain, oral cancer, birth defects such as cleft lip and palate, and other conditions that affect the mouth and throat. Good oral health also includes the ability to carry out the most basic human functions such as chewing, swallowing, smiling, kissing, speaking, and singing.

The mouth is an integral part of human anatomy and plays a major role in our overall physiology. Thus, oral health is intimately related to the health of the rest of the body. For example, mounting evidence suggests that infections in the mouth such as periodontal (gum) diseases may increase the risk of heart disease, may put pregnant women at greater risk of premature delivery, and may complicate control of blood sugar for people living with diabetes. Conversely, changes in the mouth often are the first signs of problems elsewhere in the body, such as infectious diseases, immune disorders, nutritional deficiencies, and cancer (USDHHS, 2000a).

This report summarizes the most current information available on the oral disease burden of South Carolina residents. It also highlights groups and regions in our state that are at highest risk of oral health problems and discusses strategies to prevent these conditions and provide access to dental care. Whenever possible, comparisons are made with national data and to national *Healthy People 2010* goals. For some conditions, national data, but not state data, are available at this time. For others, only state data are available. It is hoped that this information will help raise awareness of the need for monitoring the oral health burden in South Carolina and guide efforts to prevent and treat oral diseases and enhance the quality of life of South Carolina's residents.

## **IV. THEORETICAL FRAMEWORK OF THIS DOCUMENT**

The State Oral Health Plan for South Carolina is structured on the PRECEDE-PROCEED model of community assessment and program implementation (Green and Kreuter, 2005). The PRECEDE-PROCEED model was developed to provide a framework for developing, implementing, and evaluating health interventions. The model is divided into eight phases split into two parts: the PRECEDE (Predisposing, Reinforcing, and Enabling Constructs in Educational/Ecological Diagnosis and Evaluation) model, comprising phases one through four; and the PROCEED (Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development model), comprising phases five through eight.

This document is primarily concerned with the first half of the model, PRECEDE. Phase one begins by assessing the quality of life of the general population; phase two expands this assessment by including epidemiological data relating to the health outcome in question, including genetic and behavioral factors. In phase three, broader individual and community factors which contribute to the health outcome are explored. Phase four looks at policy implications on proposed health intervention programs, as well as covering the resources needed (human, fiscal, and spatial) for implementation of the program.

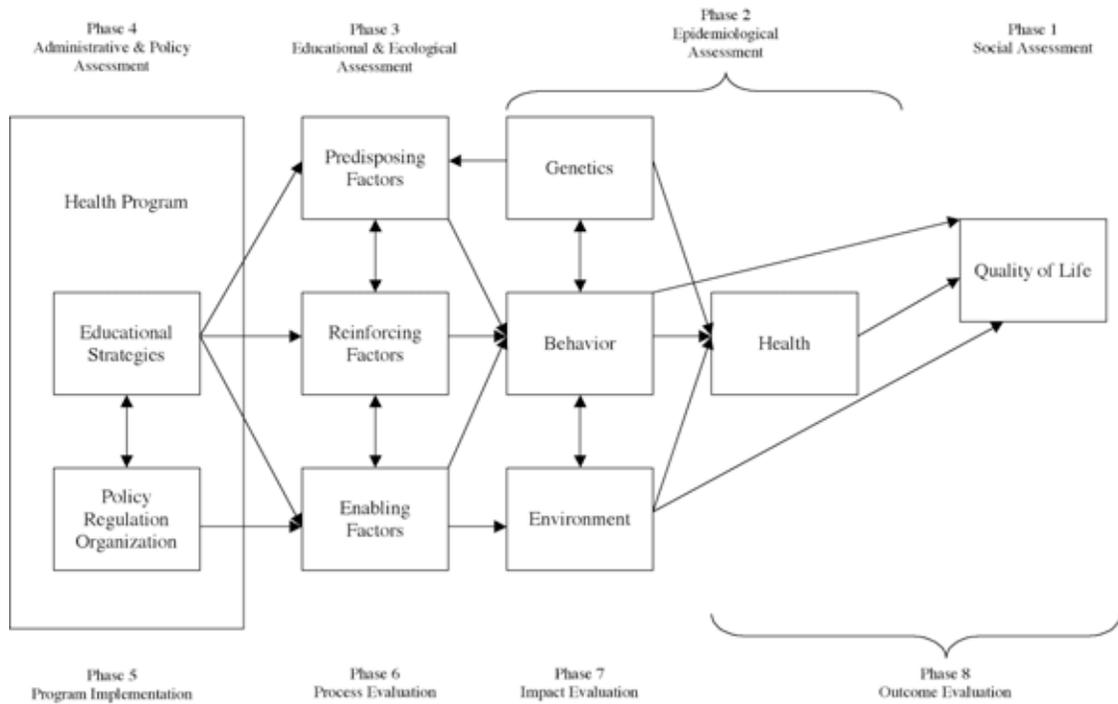
The second half of the model, PROCEED, covers the actual implementation of health intervention programs and evaluations of their outcomes. Each of the four phases in PROCEED corresponds with specific phases of PRECEDE. Phase five, the implementation of a health intervention program, is directly linked to phase four (the resources needed for implementation). Phases six, seven, and eight allow for evaluation of the program at the individual, program, and population levels.

This model provides a framework for the design and implementation of most health promotion interventions. It requires the program designer to examine the health issue not only from the standpoint of implementation, but also from “before” and “after” views: is this health program really essential, based on the health needs of the population? After implementation, did the health program have an effect on the health of the general population?

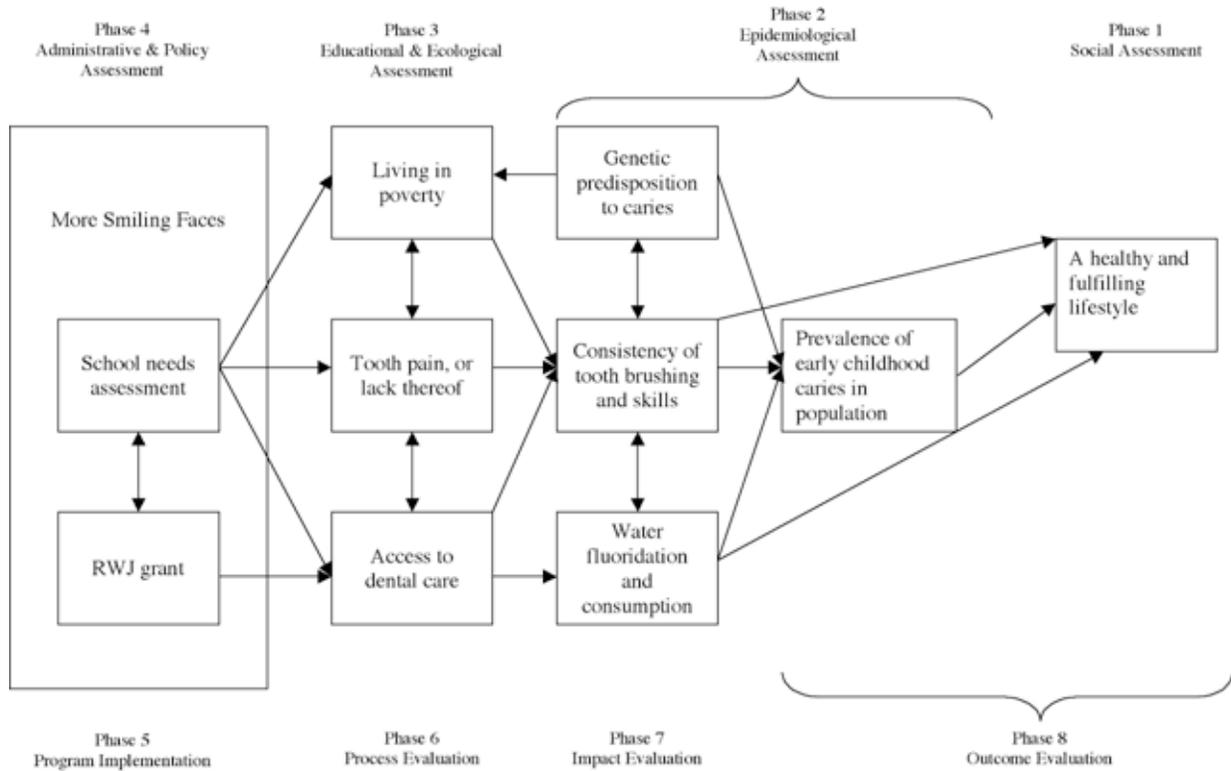
This document explores the quality of life of South Carolinians with respect to their oral health (phase one of PRECEDE), provides data on the local and national burden of oral disease (phase two), and looks briefly at some of the behavioral, environmental, and other factors which lead to poor oral health in South Carolina (phases three and four). This document concludes by offering the reader some resources for oral health education in our state.

This document provides a general overview of oral health education programs in South Carolina. No effort is made to provide details on the structure and implementation of existing or future programs; for this information, please see the State Oral Health Plan located on the DHEC Web site (<http://www.dhec.sc.gov/health/mch/oral/index.htm>) or contact the Division of Oral Health. This document also does not evaluate the effectiveness of past oral health programs.

**Figure 1:** The PRECEDE-PROCEED Model. This model should be read from the top right of the diagram (phase 1) around in a circle to the bottom right (phase 8). The phases of PRECEDE (top row) are aligned with the corresponding phases of PROCEED (bottom row).



**Figure 2:** An example of the PRECEDE-PROCEED Model, showing the factors contributing to early childhood decay.



## V. NATIONAL AND STATE OBJECTIVES ON ORAL HEALTH

*Oral Health in America: A Report of the Surgeon General* (the *Report*) alerted Americans to the importance of oral health in their daily lives (USDHHS, 2000a). Issued in May 2000, the *Report* further detailed how oral health is promoted, how oral diseases and conditions are prevented and managed, and what needs and opportunities exist to enhance oral health. The *Report's* message was that oral health is essential to general health and well-being and can be achieved. However, several barriers hinder the ability of some Americans to attain optimal oral health. The Surgeon General's *Report* concluded with a framework for action, calling for a national oral health plan to improve quality of life and eliminate oral health disparities.

One component of an oral health plan is a set of measurable and achievable objectives on key indicators of oral disease burden, oral health promotion, and oral disease prevention. One set of national indicators was developed in November 2000 as part of *Healthy People 2010*, a document that presents a comprehensive, nationwide health promotion and disease prevention agenda (USDHHS, 2000b). *Healthy People 2010* is designed to serve as a roadmap for improving the health of all people in the United States during the first decade of the 21st century. Included are objectives for key structures, processes, and outcomes related to improving oral health. These objectives represent the ideas and expertise of a diverse range of individuals and organizations concerned about the nation's oral health.

The Surgeon General's report on oral health (USDHHS, 2000a) was a wake-up call, spurring policy makers, community leaders, private industry, health professionals, the media, and the public to affirm that oral health is essential to general health and well-being and to take action. That call to action led a broad coalition of public and private organizations and individuals to generate *A National Call to Action to Promote Oral Health* (USDHHS, 2003). The vision of the *Call to Action* is "To advance the general health and well-being of all Americans by creating critical partnerships at all levels of society to engage in programs to promote oral health and prevent disease." The goals of the *Call to Action* reflect those of *Healthy People 2010*:

- To promote oral health
- To improve quality of life
- To eliminate oral health disparities

National objectives on oral health such as those in *Healthy People 2010* provide measurable targets for the nation, but most core public health functions of assessment, assurance, and policy development occur at the state level. The *National Call to Action to Promote Oral Health* calls for the development of plans at the state and community levels, with attention to planning, evaluation, and accountability (USDHHS, 2003). The *Healthy People 2010* oral health objectives for the nation and the current status of each indicator for the United States and for South Carolina are summarized in Table I.

**Table I. *Healthy People 2010* Oral Health Indicators, Target Levels, and Current Status in the United States and South Carolina**

<b><i>Healthy People 2010</i> Objective (Objective Number and Description)</b>	Target (%)	National* (%)	South Carolina Status* (%)
<b>21-1) Dental caries experience</b>			
Children, aged 6–8 years	42	51 <sup>b</sup>	51.6 <sup>f</sup>
<b>21-2) Untreated caries</b>			
Children, aged 6–8 years	21	27 <sup>b</sup>	32.5 <sup>f</sup>
<b>21-3) Adults with no tooth loss, aged 35–44 years</b>	42	38 <sup>b</sup>	54.6 <sup>k</sup>
<b>21-4) Edentulous (toothless) older adults, aged 65–74 years</b>	20	24 <sup>b</sup>	21.8 <sup>k</sup>
<b>3-6) Oral and pharyngeal cancer death rates reduction (%)</b>	10	0.8 <sup>h</sup>	6.8 <sup>h</sup>
<b>21-6) Oral and pharyngeal cancers detected at earliest stages, all</b>	50	35 <sup>b</sup>	37 <sup>c</sup>
<b>21-7) Oral and pharyngeal cancer exam within past 12 months</b>	20	13 <sup>a</sup>	14.6 <sup>d</sup>
<b>21-8) Dental sealants</b>			
Children, aged 8 years (first molars)	50	31 <sup>b</sup>	20.3 <sup>f</sup>

<b><i>Healthy People 2010</i> Objective (Objective Number and Description)</b>	Target (%)	National* (%)	South Carolina Status* (%)
<b>21-9) Water Fluoridation</b>			
Population receiving fluoridated water	75	65.8 <sup>e</sup>	81.9 <sup>e</sup>
Population served by public fluoridated water systems, all	75	67 <sup>e</sup>	93.2 <sup>e</sup>
<b>21-10) Dental visit within past 12 months, adults aged 18+</b>	56	70.3 <sup>k</sup>	66.3 <sup>k</sup>
<b>21-14) Community based health centers and local health departments with oral health components, all</b>	75	64 <sup>b</sup>	58 <sup>o</sup>

Age adjusted to the year 2000 standard population  
<sup>b</sup> CDC, 2004c  
<sup>c</sup> Oral Cancer State Report, 2000  
<sup>d</sup> BRFSS, 2002  
<sup>e</sup> CDC, 2002

<sup>f</sup> State Needs Assessment  
<sup>a</sup> NCHS, 1998, 2002  
<sup>h</sup> SEER, 2003  
<sup>k</sup> BRFSS, 2004  
<sup>o</sup> SC Primary Health Care Association, 2002

Following the release of the Surgeon General's report, *Oral Health in America*, DHEC established public and private partnerships to improve the oral health of South Carolinians. An oral health summit held in April 2001 brought together major stakeholders to finalize the priorities identified at the 2000 National Governors Association Oral Health Policy Academy (NGAOHPA). The NGAOHPA works to build linkages between providers and those in need, expand access to care, and develop policies related to oral health. The priorities addressed five areas: policy and advocacy, prevention and education, work force development, public health infrastructure, and improved access to dental services.

Subsequently, the Healthy Smiles for South Carolina Summit of November 2001 developed these policy recommendations to address the five priority areas. In addition, participants approved the *South Carolina School-Based Dental Prevention Program Guidelines*. These guidelines established a process for developing public/private partnerships to provide school-based oral health services to students. Twenty-eight of 46 counties in South Carolina currently have school based oral health programs.

An Oral Health Surveillance System is in the early stages of implementation. This new surveillance system is a joint project of DHEC, the Office of Public Health Statistics and Information Services (PHSIS), the State Office of Research and Statistics (ORS) and the South Carolina Oral Cancer Registry, South Carolina Birth Defects Registry. This system will allow the tracking of oral disease (i.e. dental caries/tooth decay and oral/pharyngeal cancer), oral health infrastructure (water fluoridation, workforce capacity), and use of the oral health system among subpopulations (elderly, children with special health care needs, Medicaid/Medicare populations, etc.).

## **State Oral Health Plan for South Carolina**

The State Oral Health Plan describes the burden of oral disease in South Carolina, the collaborative process used to develop a comprehensive plan for action, a vision statement with an action plan, and methods to evaluate desired plan outcomes. The heart of the document is the plan for action, which includes five priorities with specific strategies and action steps for each priority. Also included in the plan for action are national objectives from *Healthy People 2010*. The *Healthy People 2010* objectives will serve as additional benchmarks for success in evaluating the outcomes of the planned strategies and action steps.

The five major priority areas, which were approved by the South Carolina Oral Health Advisory Council in December 2003 and updated in December 2006, are:

- Priority 1 – Policy and Advocacy
- Priority 2 – School Based Oral Health Programs
- Priority 3 – Fluoridated Water Systems
- Priority 4 – Dental Workforce Development
- Priority 5 – Special Populations

The full text of the state plan for oral health is available at [http://www.dhec.sc.gov/health/mch/oral/docs/ORALHEALTHPLAN2004\\_2009.pdf](http://www.dhec.sc.gov/health/mch/oral/docs/ORALHEALTHPLAN2004_2009.pdf).

## VI. SPECIAL POPULATIONS

*Healthy People 2010* calls for the elimination of disparities in access to health care and health outcomes and increasing quality of life. These goals are reflected in the DHEC Strategic Plan and in the State Oral Health Plan published by the Division of Oral Health. Oral health is a significant contributor to overall health. To increase quality of life, South Carolina must improve the oral health of its citizens. Before the oral health of its citizens can be improved, South Carolina must reduce or eliminate the disparities in access to care and treatment that contribute to the increased burden of oral disease among minority populations.

### **Racial and Ethnic Groups**

Although gains in oral health status have been achieved for the population as a whole, they have not been evenly distributed across subpopulations. Non-Hispanic Blacks, Hispanics, and American Indians and Alaska Natives generally have the poorest oral health of any of the racial and ethnic groups in the U.S. population. These groups tend to be more likely than non-Hispanic Whites to experience tooth decay in some age groups, are less likely to have received dental treatment, and have more extensive tooth loss. African American adults in each age group are more likely than other racial/ethnic groups to have gum disease. Compared with White Americans, African Americans are more likely to develop oral or pharyngeal cancer, are less likely to have it diagnosed at early stages, and experience a worse five-year survival rate (Oral Cancer Foundation, 2006).

Among children in South Carolina, 63 percent of the state's Black children meet the definition of living in low-income families, although Blacks account for only 29 percent of the state's population. White children account for 67 percent of the state's population, but only 29 percent of the children living in poverty (Kids Count, 2006). Children living in low-income families are at a disproportionately high risk for oral disease and untreated tooth decay. The racial disparity among children living in poverty contributes to the racial disparity seen in the oral health of South Carolina's children.

A report released by the Centers for Disease Control and Prevention (CDC- August, 2005) showed that 55 percent of Mexican –American children ages 2-11 experienced cavities in their primary teeth compared to 43 percent of Black non-Hispanics and 38 percent of White non-Hispanic children. Thirty two percent of Mexican-American children ages 2-11 had *untreated* tooth decay in their primary teeth compared to 27 percent of Black non-Hispanic and 18 percent of White non-Hispanic children.

### **Women**

Most oral diseases and conditions are complex and are the product of interactions between genetic, socioeconomic, behavioral, environmental, and general health influences. Multiple factors may place some women at higher risk of oral disease. For example, the comparative longevity of women, compromised physical status over time, and the combined effects of multiple chronic conditions and side effects from multiple medications used to treat them, can result in increased risk of oral disease (Redford, 1993).

Many women live in poverty, are not insured, and are the sole head of their household. For these women, obtaining needed oral health care may be difficult. In addition, gender-role expectations

of women may not only affect their interaction with dental care providers, but could also affect treatment recommendations.

Many, but not all, statistical indicators show that women have better oral health than men (Redford, 1993; USDHHS, 2000a). Women are less likely than men, regardless of age, to have severe periodontal disease. Both African American and White women have a substantially lower incidence rate of oral and pharyngeal cancers than do African American and White men. However, a higher proportion of women than men have oral-facial pain, including pain from oral sores, jaw joints, face/cheek, and burning mouth syndrome (Redford, 1993).

## **Low-Income Families**

People living in low-income families bear a disproportionate burden from oral diseases and conditions. For example, despite progress in reducing tooth decay in the United States, children and adolescents in families living below the poverty level experience more dental decay than do children who are economically better off. Furthermore, the decay seen in individuals of all ages from poor families is more likely to be untreated than decay in those living above the poverty level (DHEC, 2005a).

Medicaid is the primary source of health care for low-income families, the elderly, and disabled persons in the United States. This program became law in 1965 and is jointly funded by the federal and state governments (including the District of Columbia and the Territories) to assist states in providing medical, dental, and long-term care assistance to people who meet certain eligibility criteria. People who are not U.S. citizens can receive Medicaid only to treat a life-threatening medical emergency; eligibility is determined on the basis of state and national criteria. Dental services are a required service for most Medicaid-eligible individuals younger than 21 years of age, as a component of the Early and Periodic Screening, Diagnosis and Treatment (EPSDT) benefit. Services must include, at a minimum, relief of pain and infections, restoration of teeth, and maintenance of dental health. Dental services may not be limited to emergency services for EPSDT recipients (CMS, 2004).

On January 1, 2000, South Carolina's EPSDT program implemented a number of reform measures to encourage more dental providers to participate in Medicaid. As part of the reform package, the state increased the rates for Medicaid dental health services from an average of 35 to 75 percent of South Carolina's dentists' average fees (based on 1998 fees).

The national expenditure on health care was \$1.9 trillion in 2004 (CMS, 2006). Of this, 81.5 billion dollars, or 4.34 percent, was spent on dental care. However, of the total Medicaid expenditure in 2004, approximately \$300 billion, only 1.64 percent was spent on dental services. Medicaid expenditures accounted for 16 percent of all national health care dollars in 2004, but only for 6 percent of national dental dollars (CMS, 2006). In South Carolina, Medicaid dental expenditures were 2.2 percent of total Medicaid expenditures in 2004 (Cynthia Higgins, DHEC, personal communication). These differences in expenditures between the private and public sector clearly delineate the disparities in dental services received by those receiving public medical assistance.

In the August 2005 edition of Health Services Research, Paul J. Nietert and others published their findings regarding the impact of the Medicaid reform package on use of dental health services. The researchers found that "...the percent of Medicaid enrollees receiving dental services was significantly greater in the year 2000 than what would have been expected had the

reform not occurred, given the trends observed in 1998-99” (Nietert, Bradford, and Kaste, 2005). For example, in 1998 and 1999, the number of oral health procedures billed was 839,849 and 828,731, respectively. In 2000, however, the number of procedures increased to 1,175,882 or 42 percent over the previous year. In a separate analysis, the researchers found that the number of dentists who provided at least 10 Medicaid services per quarter increased from 26 percent in 1999 to 34 percent in 2000. According to the researcher’s informant interview, while a number of factors influenced the reform package’s success, the increase in reimbursement was the main reason for increased participation and utilization.

## **Children in Poverty**

Oral health is a critical but overlooked component of overall health and well-being among our children. Dental caries (tooth decay) is the most common preventable chronic childhood disease (USDHHS, 2000a). Low-income children have the greatest odds of having tooth decay, have the most severe experience with tooth decay, and are most likely to have untreated cavities. Nationally, 50 percent of poor children aged 2 to 11 years have one or more untreated decayed primary teeth, compared with 31 percent of non-poor children (USDHHS, 2000a).

In August 2005 the CDC released a report stating that a 15.2 percent increase in tooth decay was seen in the nation’s youngest children (ages 2 through 5 years) between 1994 and 2002 (CDC, 2005). Among children aged 2 to 11 years, 41 percent had experienced cavities in their primary teeth, and more Mexican-American children experienced tooth decay (54.9 percent) than their Black (43.3 percent) or non-Hispanic White (37.9 percent) peers. Mexican-American children and adolescents aged 6 to 19 years were also more likely to have experienced tooth decay (48.8 percent) than their Black (38.8 percent) or non-Hispanic White (39.9 percent) peers.

The number of children living in poverty in a state can be estimated by the number of children receiving free or reduced lunch at school. In South Carolina, 64.21 percent of children receive free or reduced lunch (CDC, 2005). The National Center for Children in Poverty (NCCP) found that 43 percent of South Carolina’s under-18 population was living in a low-income situation in 2004: 19 percent in poverty (defined as an income of less than \$20,000 per year for a family of four) and 24 percent in low-income (defined as an income of less than \$40,000 per year for a family of four) situations. The Medicaid population of South Carolina has doubled since 1991 (CMS, 2006).

Approximately 430,000 children in South Carolina (42 percent of those younger than age 18) live below 200 percent of the federal poverty level and are at high risk for tooth decay (NCCP, 2006). This is higher than the national rate of 40 percent of children in poverty (Kids Count, 2006). In South Carolina, dental services for children are provided as part of the required EPSDT services through the S-CHIP program. The median percentage of children in poverty is 18 percent statewide (ranging from 11 percent to 48 percent across 46 counties), with just under 600,000 children eligible to receive EPSDT services (Kids Count, 2006).

## **Adults in Poverty**

Adults who have at least some college education or who have completed a bachelor’s, master’s, or professional degree (46 percent of the South Carolina population) have 2 to 2.5 times less destructive periodontal disease than do adults with high school (30 percent) or with less than high school (24 percent) levels of education (USDHHS, 2000b). Overall, a higher percentage of Americans living below the poverty level are edentulous (have lost all their natural teeth) than

are those living above the poverty level (USDHHS, 2000a). Among persons aged 65 years and older, 39 percent of persons with less than a high school education were edentulous in 1997, compared with 13 percent of persons with at least some college (USDHHS, 2000b). People living in rural areas also have a higher disease burden because of difficulties in accessing preventive and treatment services.

Educational attainment has an impact on general health of the body, including oral health. People with higher levels of education are more likely to visit physicians and dentists for prophylactic visits or for treatment and are more likely to be able to afford necessary treatment. South Carolina falls far short of the national average on most educational attainments, as can be seen in the following table:

**TABLE II: Educational Attainment of Adults, Nationally and in South Carolina**

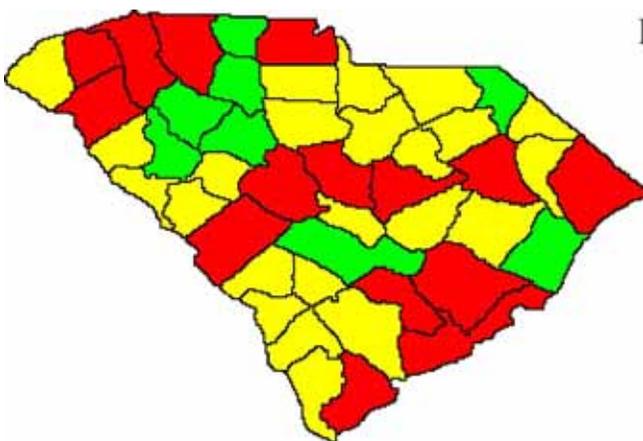
Level Of Attainment	< High School (%)	High School or GED (%)	Some College (%)	Bachelor’s Degree (%)	Master’s Degree or Higher (%)
United States	19.6	28.6	27.4	15.5	8.9
South Carolina	23.7	29.9	26	13.5	6.9

*(U.S. Census, 2005)*

### Rural and Urban Populations

The South Carolina Office of Research and Statistics defines a county as “urban” if its largest city has a population greater than 25,000, as “rural” if the population of the largest city is between 10,000 and 25,000, and as “very rural” if the largest city has a population of less than 10,000. Of the 46 counties in South Carolina, only 15 meet the definition of being an urban county.

Residents of rural and very rural counties are at high risk of having poor oral health outcomes for several reasons. They are likely to be of lower socioeconomic status than those living in more urban areas, which can make it very difficult to access care. Residents of rural counties are also more likely to be less educated and to have more behavioral risk factors.



**Figure 3: Rurality of South Carolina**

- Urban counties
- Rural counties
- Very rural counties

## **People with Disabilities**

The oral health problems of individuals with disabilities are complex. These problems may be due to underlying congenital anomalies as well as to the inability to receive the personal and professional health care needed to maintain oral health. Nearly one in five Americans (19.3 percent) has some form of disability as defined by the Americans With Disabilities Act, including almost 1 million children under 5 years of age and 2.6 million children between 5 and 15 years of age (U.S. Census Bureau, 2005).

No national studies have been conducted to determine the prevalence of oral and craniofacial diseases among the various populations with disabilities. Several smaller-scale studies show that the population with intellectual disability or other developmental disabilities has significantly higher rates of poor oral hygiene and need for periodontal disease treatment than does the general population, due in part to limitations in individual understanding of and physical ability to perform personal prevention practices or to obtain needed services (USDHHS, 2000a). Rates of tooth decay among people with disabilities vary widely, but overall are higher than those of people without disabilities (USDHHS, 2000a).

## **VII. THE BURDEN OF ORAL DISEASES**

### **Societal Impact of Oral Disease**

Oral health is related to well-being and quality of life as measured along functional, psychosocial, and economic dimensions. Oral-facial pain, as a symptom of untreated dental and oral problems and as a condition in and of itself, is a major source of diminished quality of life. Diet, nutrition, sleep, psychological status, social interaction, school, and work are affected by impaired oral and craniofacial health. Oral and craniofacial conditions such as temporomandibular disorders, diminished salivary functions, and ill-fitting prosthetics can lead to a variety of poor health outcomes; these can include a compromised ability to eat which leads to limitations in food selection, and to poor nutrition. Poor oral health is also associated with sleep deprivation, depression, and multiple adverse psychosocial outcomes (Council of State Governments, 2006).

More than any other body part, the face bears the stamp of individual identity. Attractiveness has an important effect on psychological development and social relationships. Considering the importance of the mouth and teeth in verbal and nonverbal communication, diseases that disrupt their functions are likely to damage self-image and alter the ability to sustain and build social relationships. The social functions of individuals encompass a variety of roles, from intimate interpersonal contacts to participation in social or community activities, including employment. Dental diseases and disorders can interfere with these social roles at any or all levels. Perhaps due to social embarrassment or functional problems, people with oral conditions may avoid conversation or laughing, smiling, or other nonverbal expressions that show their mouth and teeth.

### **Economic Impact of Oral Disease**

A large proportion of dental care is paid for out-of-pocket by patients. Nationally in 2003, 44 percent of dental care was paid for by the patient, 49 percent was paid by private dental

insurance, and 7 percent was paid by federal or state government sources. In comparison, 10 percent of physician and clinical services were paid out-of-pocket, 50 percent were covered by private medical insurance, and 33 percent were paid by government sources (CMS, 2005). Expenditures for dental services in the United States in 2003 were \$74.3 billion, or 4.5 percent of the total spent on health care that year (CMS, 2004). In South Carolina, Medicaid dental expenditures were 2.2 percent of total Medicaid expenditures in 2004 (Cynthia Higgins, DHEC, personal communication).

Oral and craniofacial diseases and their treatment place a burden on society in the form of lost days and years of productive work. In 1996, the most recent year for which national data are available, U.S. school children missed a total of 1.6 million days of school as a result of acute dental conditions, which is more than three days for every 100 students (USDHHS, 2000a). For employed adults, acute dental conditions were responsible for more than 2.4 million days of work lost and contributed to a range of problems, including restricted activity and bed days. In addition, conditions such as oral and pharyngeal cancers contribute to premature death and can be measured by years of life lost (USDHHS, 2000a).

## **Oral Disease and Other Health Conditions**

Oral health and general health are integral to each other. The oral cavity is a portal of entry as well as the site of disease for bacterial and viral infections that affect general health status. Many systemic diseases and conditions, including diabetes, HIV, and nutritional deficiencies, have oral signs and symptoms. These manifestations may be the initial sign of clinical disease and therefore may serve to inform health care providers and individuals of the need for further assessment. Recent research suggests that inflammation associated with periodontitis may increase the risk of heart disease and stroke, premature births in some women, difficulty in controlling blood sugar in persons with diabetes, and respiratory infection in susceptible individuals (Dasanayake, 1998; Offenbacher, Lieff, Boggess, Murtha, Maidanos, Champagne, et al., 2001; Davenport, Williams, Sterne, Sivapathasundram, Fearne, and Curtis, 1998; Beck, Offenbacher, Williams, Gibbs, and Garcia, 1998; Scannapieco, Bush, and Paju, 2003; Taylor, 2001). More research is needed in these areas.

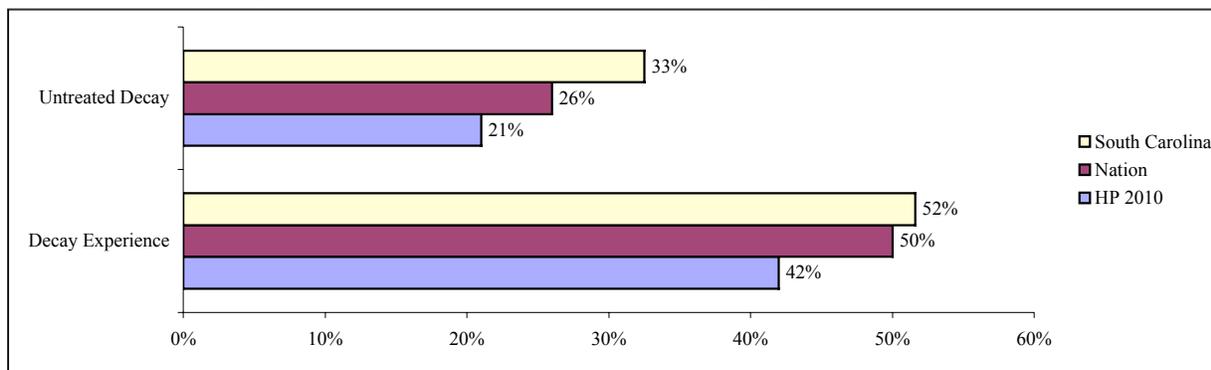
## **Prevalence of Disease and Unmet Needs in Children**

Nationally, tooth decay is four times more common than childhood asthma and seven times more common than hay fever. Tooth decay is a disease in which acids produced by bacteria on the teeth lead to loss of minerals from the enamel and dentin, the hard substances of teeth. Unchecked, tooth decay can result in loss of tooth structure, inadequate tooth function, unsightly appearance, pain, infection, and eventual tooth loss (USDHHS, 2000a).

The prevalence of decay in children is measured by assessing decay experience (if they have ever had decay, whether treated or not, and if they now have fillings), untreated decay (active unfilled cavities), and urgent care (reported pain or a significant dental infection that requires immediate care; DHEC, 2005a).

Decay experience and untreated decay are monitored by South Carolina in a manner consistent with the National Oral Health Surveillance System (NOHSS) requirements, which allows comparisons with other states and with the nation. For comparisons between South Carolina, the nation, and the *Healthy People 2010* targets, see Figure 4.

**Figure 4: Decay Experience and Untreated Decay among Third Grade Children**



Sources: *Healthy People 2010*, 2nd edition. U.S. Dept of Health and Human Services, November 2000. South Carolina Needs Assessment, 2001-2002.

Tooth decay is not uniformly distributed in the United States or in South Carolina. Some groups are more likely to experience the disease and are less likely to receive treatment. The most recent data for third grade children in South Carolina and the nation in selected demographic groups are summarized in Table III and Figures 5 and 6.

**Table III. Dental Characteristics among Kindergarten and Third Graders**

	Decay Experience		Untreated Decay		Urgent Need For Care
	United States <sup>a</sup> (%)	South Carolina <sup>b</sup> (%)	United States <sup>a</sup> (%)	South Carolina <sup>b</sup> (%)	South Carolina <sup>b</sup> (%)
<b>Total</b>	50	51.6	28	32.2	11.4
<b>Race or Ethnicity</b>					
Black or African American	50	56	36	37.7	13.5
White	51	46.4	26	25.7	9.1
Hispanic or Latino	64	58.6	47	41.1	14.7
Not Hispanic or Latino	49	46.2	26	25.7	9.1

Table III Sources:

*Healthy People 2010, Progress Review, 2000*. U.S. Department of Health and Human Services. Available at [www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls](http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls).

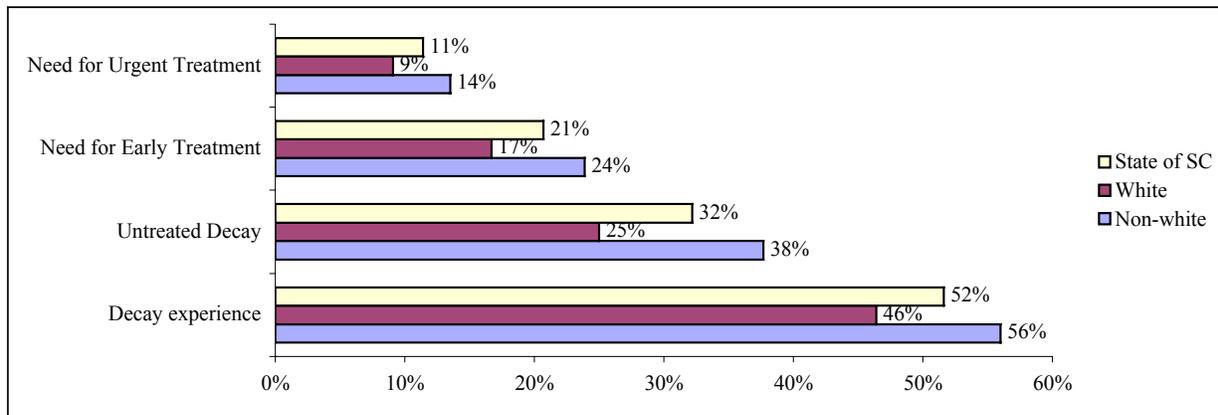
DSU = Data are statistically unreliable or do not meet criteria for confidentiality

All data are for children aged 6–8 years

<sup>a</sup> Data are from NHANES III, 1988–1994 (interim progress to HP 2010 goals has not been calculated).

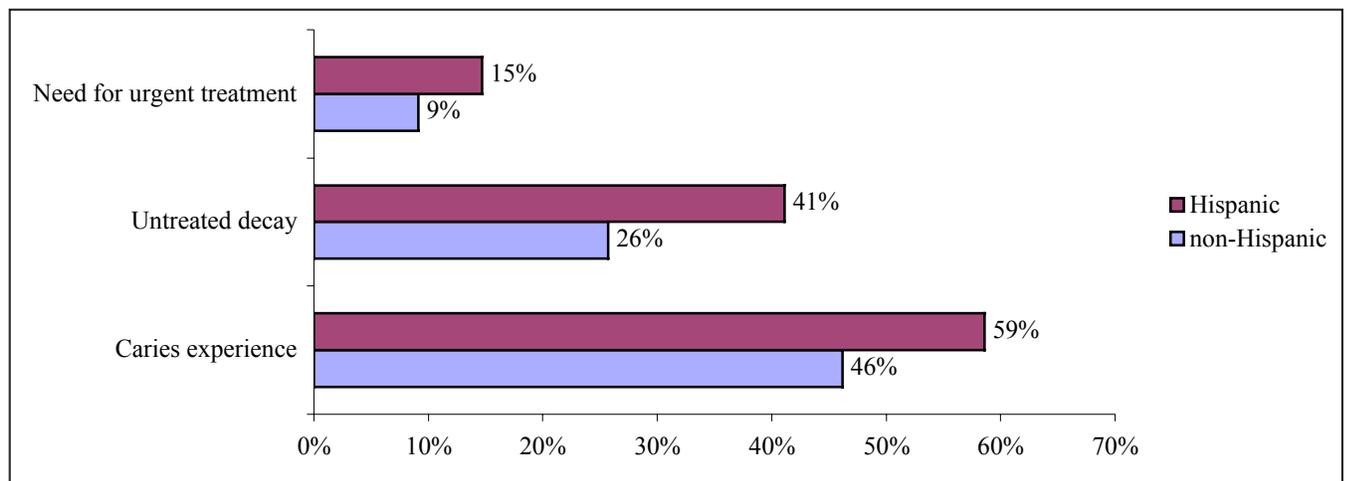
<sup>b</sup> South Carolina South Carolina State Oral Health Needs Assessment, 2002

**Figure 5: Racial Disparities in Oral Health among Kindergarten and Third Graders in South Carolina**



South Carolina State Oral Health Needs Assessment, 2002

**Figure 6: Ethnic Disparities in Oral Health among Kindergarten and Third Graders in South Carolina**



South Carolina State Oral Health Needs Assessment, 2002

## Dental Decay in Adults

People are susceptible to tooth decay throughout their lifetime. Like children and adolescents, adults can experience new decay on the crown (enamel covered) portion of the tooth. Adults can also develop decay on the root surfaces of teeth as those surfaces become exposed to bacteria and carbohydrates as a result of gum recession. In the most recent national examination survey, 85 percent of U.S. adults had at least one tooth with decay or a filling on the crown. Root surface decay affects 50 percent of adults aged 75 years or older (USDHHS, 2000a).

Not only do adults experience dental decay, but a substantial proportion of that disease is untreated at any point in time. Most persons can keep their teeth for life with adequate personal, professional, and population-based preventive practices. However, many adults lose teeth to untreated decay and do not have a full dentition (USDHHS, 2000a). A full dentition is defined as having 28 natural teeth, exclusive of the third molars (the wisdom teeth) and teeth removed for orthodontic treatment or as a result of trauma. As teeth are lost, a person's ability to chew and speak decreases, and this can interfere with social functioning. The most common reasons for tooth loss in adults are tooth decay and periodontal (gum) disease. Tooth loss also can result

from infection, unintentional injury, and head and neck cancer treatment. In addition, certain orthodontic and prosthetic services sometimes require the removal of teeth (USDHHS, 2000a).

Despite an overall trend toward a reduction in tooth loss in the U.S. population, not all groups have benefited to the same extent. Women tend to have more tooth loss than men of the same age group. African Americans are more likely than Whites to have tooth loss. The percentage of African Americans who have lost one or more permanent teeth is more than three times greater than for Whites. Among all predisposing and enabling factors, low educational level has been found to have the strongest and most consistent association with tooth loss (USDHHS, 2000a).

Data for South Carolina and the United States on the percentage of adults who have had no teeth extracted because of disease and the percentage who have lost all of their permanent teeth are presented in Table IV.

**Table IV: Tooth Loss of Adult Populations**

	Aged 35–44 Years No Tooth Extractions		Aged 65–74 Years Lost All Natural Teeth	
	United States <sup>a</sup> (%)	South Carolina <sup>c</sup> (%)	United States <sup>a</sup> (%)	South Carolina <sup>c</sup> (%)
<b>Healthy People 2010 Target</b>	<b>42</b>	<b>42</b>	<b>20</b>	<b>20</b>
<b>2004 evaluation</b>	<b>39</b>	<b>54.6</b>	<b>25</b>	<b>21.8</b>
<b>Race or Ethnicity</b>				
Black or African American	12 <sup>b</sup>	38.9	34 <sup>c</sup>	N/A
White	34 <sup>b</sup>	62.8	23 <sup>c</sup>	N/A
Hispanic or Latino	DSU	60.6	20 <sup>c</sup>	N/A
Not Hispanic or Latino	DNA	51.3	24	N/A
<b>Sex</b>				
Female	36	49.2	24	N/A
Male	42	53.6	24	N/A
<b>Education Level</b>				
Less than high school	15 <sup>b</sup>	29.4	43 <sup>c</sup>	N/A
High school graduate	21 <sup>b</sup>	41.5	23 <sup>c</sup>	N/A
At least some college	41 <sup>b</sup>	56	13 <sup>c</sup>	N/A

Table IV Sources:

\**Healthy People 2010, Progress Review, 2000*. U.S. Department of Health and Human Services.

Available at [www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls](http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls). Accessed July 26, 2006.

DNA = Data not analyzed

DSU = Data are statistically unreliable or do not meet criteria for confidentiality

<sup>a</sup> Data are from 2004 evaluation of HP 2010 objectives.

<sup>b</sup> Data are from NHANES III, 1988–1994 (baseline for HP 2010).

<sup>c</sup> Data are from 2002 evaluation of HP 2010 objectives.

<sup>e</sup> BRFSS, 2004.

## **Periodontal Disease**

Gingivitis is characterized by localized inflammation, swelling, and bleeding gums without a loss of the bone that supports the teeth. Gingivitis is usually reversible with good oral hygiene. Daily removal of dental plaque from the teeth is extremely important to prevent gingivitis, which can progress to destructive periodontal disease.

Periodontitis (destructive periodontal disease) is characterized by the loss of the tissue and bone that support the teeth. It places a person at risk of eventual tooth loss unless appropriate treatment is provided. Among adults, periodontitis is a leading cause of bleeding, pain, infection, loose teeth, and tooth loss (Burt and Eklund, 1999).

Nationally, the prevalence of gingivitis is highest among American Indians and Alaska Natives, Mexican Americans, and adults with less than a high school education (USDHHS, 2000a). Cases of gingivitis likely will remain a substantial problem and may increase as tooth loss from tooth decay declines or as a result of the use of some systemic medications. Although not all cases of gingivitis progress to periodontal disease, all periodontal disease starts as gingivitis. The major method available to prevent destructive periodontitis, therefore, is to prevent the precursor condition of gingivitis and its progression to periodontitis (USDHHS, 2000a). There is currently no data available on the prevalence of gingivitis or of periodontitis in South Carolina. This data may be available in the future through linked Medicaid and Medicare data sets.

## **VIII. PROTECTIVE FACTORS AFFECTING ORAL DISEASES**

### **Community Water Fluoridation**

Community water fluoridation is the process of adjusting the natural fluoride concentration of a community's water supply to a level that is best for the prevention of tooth decay. In the United States, community water fluoridation has been the basis for the primary prevention of tooth decay for 60 years and has been recognized as one of 10 great achievements in public health of the 20th century (CDC, 1999). It is an ideal public health method because it is effective, eminently safe, inexpensive, requires no behavior change by individuals, and does not depend on access to or availability of professional services. Water fluoridation is equally effective in preventing tooth decay among different socioeconomic, racial, and ethnic groups. Fluoridation helps to lower the cost of dental care and helps residents retain their teeth throughout life (USDHHS, 2000a).

Recognizing the importance of community water fluoridation, *Healthy People 2010* Objective 21-9 is to "Increase the proportion of the U.S. population served by community water systems with optimally fluoridated water to 75 percent." In the United States during 2002, approximately 170 million persons (67 percent of the population served by public water systems) received optimally fluoridated water (CDC, 2004).

Not only does community water fluoridation effectively prevent tooth decay, it is one of very few public health prevention measures that offers significant cost savings to almost all communities (Griffin, Jones, and Tomar, 2001). It has been estimated that every \$1 invested in community water fluoridation saves approximately \$38 in averted costs. The cost per person of

instituting and maintaining a water fluoridation program in a community decreases with increasing population size (CDC, 2002).

Because frequent exposure to small amounts of fluoride each day will best reduce the risk of tooth decay in all age groups, all people should drink water with an optimal fluoride concentration and brush their teeth twice daily with fluoride toothpaste (CDC, 2001). For communities that do not receive fluoridated water and persons at high risk of tooth decay, additional fluoride measures might be needed. Community measures include fluoride mouth rinse or tablet programs, which typically are conducted in schools. Individual measures include professionally applied topical fluoride gels or varnish for persons at high risk of decay.

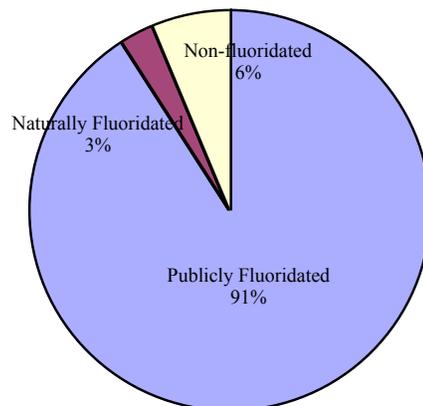
The South Carolina Drinking Water Fluoridation Grant Program provides grants to local public water systems to assist them in implementing drinking water fluoridation. About 91 percent of South Carolina’s public water systems are fluoridated (CDC, 2006). The overall percent of the state’s population with access to fluoridated water is 63 percent.

The 2003-2004 grantees of the South Carolina Drinking Water Grant Program were:

- City of Sumter (Plant 3): \$16,180 for replacement equipment.
- Bamberg Commission of Public Works: \$9,587 for replacement equipment.
- Town of Whitmire – replacement equipment - \$9,944.
- City of Darlington (N. Main St. Plant): \$4,046 for replacement equipment.
- High Hills Rural Water Company: \$4,200 for replacement equipment.

Proposals for grants in 2005-2006 have been received from the cities of Florence, Pickens, Greer, Pageland, Hartsville, and Bennettsville.

**Figure 7: Access to Fluoridated Water in South Carolina**



### **Dental Sealants**

Since the early 1970s, the incidence of childhood tooth decay on smooth tooth surfaces (those without pits and fissures) has declined markedly because of widespread exposure to fluorides. Most decay among school age children now occurs on tooth surfaces with pits and fissures, particularly the molar teeth (CDC, 2002).

Pit-and-fissure dental sealants—plastic coatings bonded to susceptible tooth surfaces—have been approved for use for many years and have been recommended by professional health associations and public health agencies. The first permanent molars erupt into the mouth at about age 6 years. Placing sealants on these teeth shortly after their eruption protects them from the development of decay in areas of

the teeth where food and bacteria are retained. If sealants were routinely applied to susceptible tooth surfaces in conjunction with the appropriate use of fluoride, most tooth decay in children could be prevented (USDHHS, 2000b).

The second permanent molars erupt into the mouth at about age 12 to 13 years. Pit-and-fissure surfaces of these teeth are as susceptible to decay as the first permanent molars of younger children. Therefore, young teenagers need to receive dental sealants shortly after the eruption of their second permanent molars.

The *Healthy People 2010* target for dental sealants is for 50 percent of the nation’s 8-year-olds and 14-year-olds to have sealants on at least one permanent molar. The most recent estimates of the proportion of children aged 8 years with dental sealants on one or more molars are presented in Table V. Within each age group, African Americans and Mexican Americans are less likely than non-Hispanic Whites to have sealants. The prevalence of sealants also varies by the education level of the head of household.

**Table V: Percentage of Third Grade Children with Dental Sealants**

	Dental Sealants on Molars in children aged 6 to 8 years	
	United States* (%)	South Carolina <sup>a</sup> (%)
<i>Healthy People 2010</i> Target	50	50
Current percentage(2003)	28	20.3
Race or ethnicity		
Black or African American	11	16.2
White	26	25

Table V Sources:

Healthy People 2010, Progress Review, 2000. U.S. Department of Health and Human Services.

Available at <http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls>.

\*National data are from NHANES 1999–2000 unless otherwise indicated.

<sup>a</sup> South Carolina State Oral Health Needs Assessment, 2002

## Preventive Visits

Maintaining good oral health takes repeated efforts on the part of the individual, caregivers, and health care providers. Daily oral hygiene routines and healthy lifestyle behaviors play an important role in preventing oral diseases. Regular preventive dental care can reduce the development of disease and facilitate early diagnosis and treatment. One measure of preventive care that is being tracked, as shown in Table VI, is the percentage of adults who had their teeth cleaned in the past year. Having one's teeth professionally cleaned by a dentist or dental hygienist is indicative of preventive behaviors.

**Table VI: Percentage of Adults Aged 18 or Older who had their Teeth Cleaned within the Past Year, 2004**

	Median% United States (%)	South Carolina <sup>a</sup> Status (%)
Total	69	66.7
Age		
18 – 24 years	70	63.2
25 – 34 years	66	62.8
35 – 44 years	69	66.8
45 – 54 years	71	67.7
55 – 64 years	73	69.9
65 + years	72	67.8
Race		
White	72	71.1
Black	62	54.5
Other	64	63.5
Sex		
Male	67	62.7
Female	72	69.6
Education Level		
Less than high school	47	37.3
High school or G.E.D.	65	61.4
Some post high school	72	66.9
College graduate	79	80.2
Income		
Less than \$15,000	49	40.4
\$15,000 – 24,999	56	51.1
\$25,000 – 34,999	65	62.9
\$35,000 – 49,999	72	71
\$50,000+	81	80

Table VI Sources:

Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System Online Prevalence Data, 1995–2004.

Available at <http://www.cdc.gov/brfss>.

<sup>a</sup> BRFSS, 2004

## **IX. ORAL HEALTH AND SYSTEMIC HEALTH**

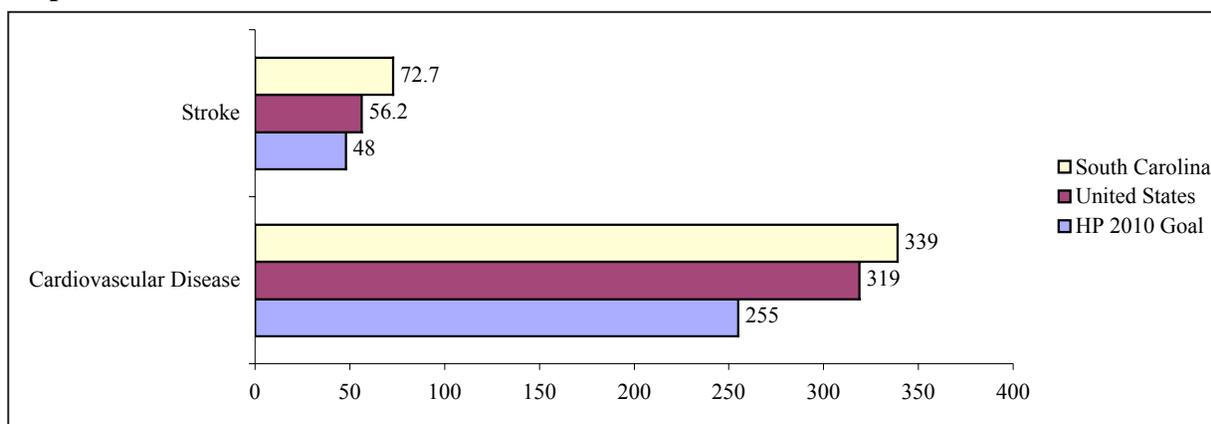
### **Cardiovascular Disease and Stroke**

Research has shown that there is a link between oral health and such systemic conditions as cardiovascular disease (CVD) and stroke (Renvert, Pettersson, Ohlsson, and Persson, 2006). The exact nature of the relationship is not known, nor is it known whether poor oral health can cause CVD. However, it is clear that poor oral health can be an indicator for poor overall health, and that the reverse is also true.

South Carolina has the 12<sup>th</sup> highest death rate in the nation from cardiovascular disease (AHA, 2006). The rate in South Carolina is 339 per 100,000, and the national average is 319 per 100,000. South Carolina has the second highest rate in the nation for death from stroke. The national rate of death from stroke is 56.2 per 100,000; South Carolina's rate (72.7 per 100,000 population) is only exceeded by Arkansas (74.5; AHA, 2006).

Cardiovascular disease actually is a comprehensive term which includes several conditions: coronary heart disease (CHD), heart attacks, chest pain, and stroke, among others. Because South Carolina statistics are computed for cardiovascular disease, but *Healthy People 2010* goals are computed for coronary heart disease (a subset of CVD), an estimated national goal for CVD was calculated for Figure 8 by summing the goals for each type of cardiovascular disorder.

**Figure 8: Cardiovascular Disease in South Carolina and in the United States, per 100,000 Population**



American Heart Association, 2006.  
*HP 2010* CDC review database, 2006.

**Table VII: Cardiovascular Disease rates per 100,000 Population**

<i>Healthy People 2010</i> goals	National baseline, 1998 <sup>a</sup>	interim progress (year)	National goal for 2010 <sup>a</sup>	South Carolina (2003) <sup>a</sup>
12-1) coronary heart disease mortality per 100,000 population	208	172 (2003) <sup>a</sup>	166	156
12-7) stroke death per 100,000 population	62	53 (2004) <sup>a</sup>	48	69
Prevalence of cardiovascular disease		34.2% <sup>b</sup>		
Prevalence of stroke		2.6% <sup>b</sup>		

<sup>a</sup> HP 2010, CDC review database, 2006.

<sup>b</sup> American Heart Association, 2006.

Because of the high prevalence of and mortality due to cardiovascular disease and stroke in South Carolina, the state's residents are at a higher risk for circulatory-related oral disease than residents of other states in the nation.

## Diabetes

Diabetes is a known risk factor for both the development of oral disease and the prevalence of oral disease (Mealey and Oates, 2006). This relationship holds true regardless of whether a person suffers from Type I diabetes (formerly known as juvenile diabetes, in which the body does not produce any insulin at all) or Type II diabetes (the more common form, related to obesity, in which the body does not produce enough insulin or produces it inefficiently; American Diabetes Association, 2006).

South Carolina ranks among the top 10 states in the nation for diabetes prevalence. The prevalence of diabetes among adults in South Carolinians was 9.3 percent in 2002 (BRFSS). Although the national prevalence of diabetes has increased by 30 percent since 1998, in South Carolina it has increased by 55 percent.

**Table VIII: Diabetes**

<i>HP 2010 goal</i>	National rate (1998) <sup>a</sup>	National rate <sup>a</sup> (2004)	National goal <sup>a</sup>	SC baseline <sup>a</sup>	SC rate <sup>a</sup> (year)
5-2: new cases of diabetes per 1000 population	5.5	6.9	3.8		
5-3: prevalence of diabetes per 1000 population	40	52	25	60	93 (2003) <sup>b</sup>
5-15: dental exam for diabetics within last 12 months	56%	55%	71%	66%	55% (2004)

<sup>a</sup>CDC *HP 2010* review database

<sup>b</sup>BRFSS

## Oral Health of Pregnant Women

Studies documenting the effects of hormones on the oral health of pregnant women suggest that 25 percent to 100 percent of these women experience gingivitis and up to 10 percent may develop more serious oral infections (Amar and Chung, 1994; Mealey, 1996). Recent evidence suggests that oral infections such as periodontitis during pregnancy may increase the risk of preterm or low birthweight deliveries (Offenbacher, Jared, O'Reilly, Wells, Salvi, Lawrence, et al., 2001). During pregnancy, a woman may be particularly amenable to disease prevention and health promotion interventions that could enhance her health or that of her fetus (Gaffield, Gilbert, Malvitz, and Romaguera, 2001).

It has been found that pregnant diabetics have more gingival inflammation and deeper pockets between their teeth and gums, which are symptoms of periodontal disease, than non-diabetic pregnant women. These findings are significant because periodontal disease is a bacterial infection that may also make diabetes more difficult to control. Consequently, treating the periodontal disease may benefit diabetic control as well as pregnancy outcomes (Guthmiller, Hassebroek-Johnson, Weenig, Johnson, Kirchner, Kohout, and Hunter, 2001).

Maternal oral health seems to contribute to the birth weight of an infant. One possible explanation is that bacteria from the mother's mouth may get into her bloodstream and travel to

the placenta, inducing premature labor. However, very little is known about the exact mechanism by which periodontal disease is linked to the birth outcome – and specifically, the birth weight – of an infant. Studies have shown that women with periodontal disease were between three and a half and seven times more likely than those who did not have periodontal disease to give birth to a preterm or low birth weight infant; periodontal treatment also significantly reduces the risk of having a preterm or low birth weight infant (Lopez, Smith, and Gutierrez, 2002; Lopez, Da Silva, Ipinza, and Gutierrez, 2005).

A low birth weight baby is an infant that is born weighing less than 5.5 pounds, and a very low birth weight baby is one that weighs less than 3.3 pounds at birth. The excess cost to the medical system of supporting a low or very low birth weight baby is staggering. While a normal birth with no complications might cost around \$2,100, a low birthweight baby incurs an average of \$16,500 in hospital costs and a very low birthweight baby an average of \$95,000. The total costs of low and very low birth weight babies in South Carolina is more than \$160 million per year (Kids Count, 2006).

South Carolina's rate of low birth weight is 10.1 percent. This is higher than the national average of 9 percent, and has been rising in the last few years. South Carolina ranks 47<sup>th</sup> out of 50 states for the rate of low birth weight. The problem is significantly greater among African Americans, whose low birth weight rate is 14.6 percent, compared with 7.6 percent of White or Hispanic babies. South Carolina's rate of low birth weight and of infant mortality is more than twice as high as the *Healthy People 2010* goals (March of Dimes, 2006).

South Carolina's Pregnancy Risk Assessment Monitoring System (PRAMS) has included questions on oral health since 2004, which allow researchers to gather data on the current practices of expectant mothers in South Carolina (PRAMS, 2006a). However, none of these results are available to the public yet, as tabulation has not been completed.

## **X. ORAL CANCER**

Cancer of the oral cavity or pharynx (oral cancer) is the fourth most common cancer in African American men and the seventh most common cancer in White men in the United States (Ries, Eisner, Kosary, Hankey, Miller, Clegg, et al., 2004). An estimated 28,000 new cases of oral cancer and 7,200 deaths from these cancers occurred in the United States in 2004. The 2001 age-adjusted (to the 2000 U.S. population) incidence rate of oral cancer in the United States was 10.4 per 100,000 persons. Nearly 90 percent of cases of oral cancer in the United States occur among persons aged 45 years and older. The age-adjusted incidence was more than twice as high among men (15.0 per 100,000) than among women (6.6 per 100,000), as was the mortality rate (4.1 per 100,000 in men versus 1.6 per 100,000 in women; American Cancer Society, 2006).

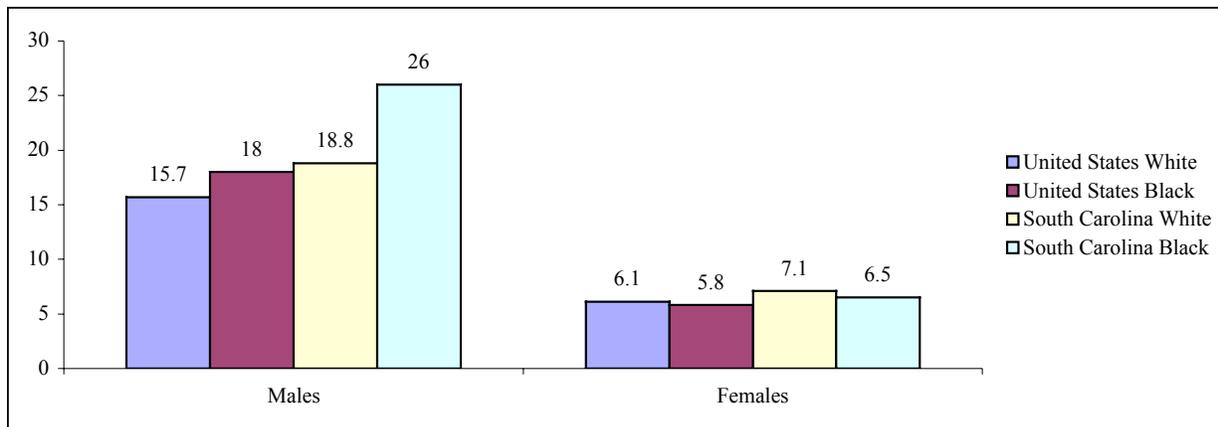
In South Carolina, the incidence of oral cancer among White women and Black women is about the same, seven per 100,000 population. South Carolina White men have an incidence rate of 19 per 100,000, and South Carolina Black men get oral cancer at a rate of 26 per 100,000 population. The oral cancer death rates show a similar racial stratification: White women have a death rate of two per 100,000 population; the rate among Black women is three per 100,000; the rate among White men is five per 100,000; and the rate among Black men is 13 per 100,000.

Survival rates for oral cancer have not improved substantially over the past 25 years. More than 40 percent of persons diagnosed with oral cancer die within five years of diagnosis (Ries, Eisner, Kosary, Hankey, Miller, Clegg, et al., 2004), although survival varies widely by stage of disease

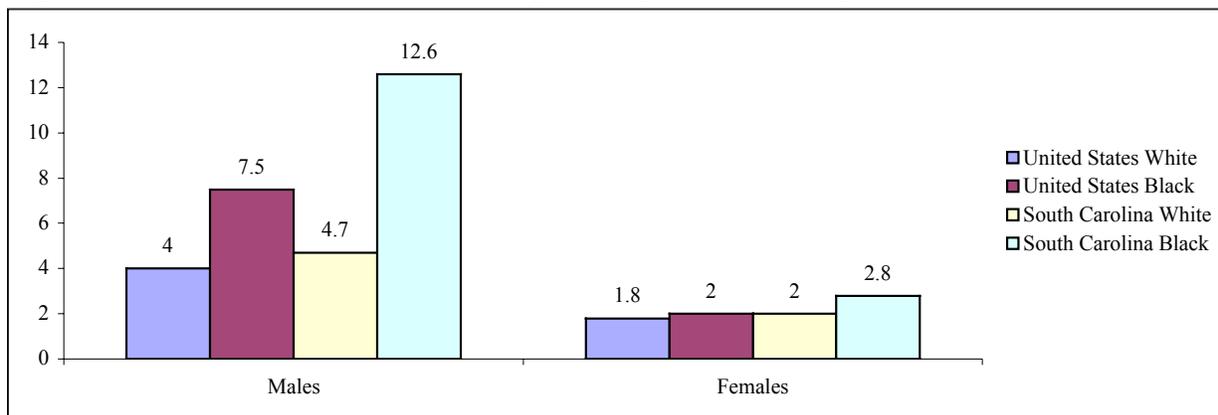
when diagnosed. The five-year relative survival rate for persons with oral cancer diagnosed at a localized stage is 81 percent. In contrast, the five-year survival rate is only 51 percent once the cancer has spread to regional lymph nodes at the time of diagnosis and is just 29 percent for persons with distant metastasis.

Some groups experience a disproportionate burden of oral cancer. In South Carolina and nationally, African Americans are more likely than Whites to develop oral cancer and much more likely to die from it. Cigarette smoking and alcohol are the major known risk factors for oral cancer in the United States, accounting for more than 75 percent of these cancers (Blot, McLaughlin, Winn, Austin, Greenberg, and Preston-Martin, 1988). The use of tobacco, including smokeless tobacco (USDHHS, 1986; IARC, 2005) and cigars (Shanks and Burns, 1998) also increases the risk of oral cancer. Dietary factors (particularly low consumption of fruit) and some types of viral infections (including HPV) also have been implicated as risk factors for oral cancer (McLaughlin, Grindley, and Block, 1998; Morse, Pendry, and Katz, 2000; Phelan, 2003; Herrero, 2003; Gillison, Koch, and Capone, 2000). Radiation from sun exposure is a risk factor for lip cancer (Silverman, 1998).

**Figure 9: Oral Cancer Incidence Rates, by Race, per 100,000 Population**



**Figure 10: Oral Cancer Death Rates, by Race, per 100,000 Population**



Sources for figures 9 and 10:

\* Age-adjusted to 2000 U.S. population

Source: National Cancer Institute, SEER

For more information on cancer profiles and for cancer data categorized by site, race, and sex, see: NCI state cancer profiles at <http://statecancerprofiles.cancer.gov/>.

State Report on Oral Cancer, available from <http://www.dhec.sc.gov>

## Examination for Oral Cancer

Oral cancer detection is accomplished by a thorough examination of the head and neck; an examination of the mouth including the tongue, the entire oral and pharyngeal mucosal tissues, and the lips; and palpation of the lymph nodes. Although the sensitivity (ability of a test to detect true positives) and specificity (ability of a test to detect true negatives) of the oral cancer examination have not been established in clinical studies, most experts consider early detection and treatment of precancerous lesions and diagnosis of oral cancer at localized stages to be the major approaches for secondary prevention of these cancers (Silverman, 1998; Johnson, 1999; CDC, 1998). If suspicious tissues are detected during an examination, definitive diagnostic tests, such as biopsies, are needed to make a firm diagnosis.

Oral cancer is more common after the age of 60 years. Known risk factors include use of tobacco products and alcohol. The risk of oral cancer is increased six to 28 times in current smokers. Alcohol consumption is an independent risk factor and, when combined with the use of tobacco products, accounts for most cases of oral cancer in the United States and elsewhere (USDHHS, 2004a). Use of lip sunscreen and hats is recommended to reduce the risk of lip cancer due to unprotected exposure to sunlight.

Recognizing the need for dental and medical providers to examine adults for oral and pharyngeal cancer, *Healthy People 2010* Objective 21-7 is to increase the proportion of adults who, in the past 12 months, report having had an examination to detect oral and pharyngeal cancers. Nationally, relatively few adults aged 40 years and older (13 percent) reported receiving an examination for oral and pharyngeal cancer, although the proportion varied by race and by ethnicity.

Based on available evidence that oral cancer diagnosed at an early stage has a better prognosis, several *Healthy People 2010* objectives specifically address early detection of oral cancer: Objective 21-6 is to “Increase the proportion of oral and pharyngeal cancers detected at the earliest stage,” and Objective 21-7 is to “Increase the proportion of adults who, in the past 12 months, report having had an examination to detect oral and pharyngeal cancer” (USDHHS, 2000b). Data for South Carolina and the United States on the proportion of oral cancer cases detected at the earliest stage (stage I, localized) are presented in Table IX.

**Table IX: Proportion of Oral Cancer Cases Detected at the Earliest Stage**

	United States (%)	South Carolina (%) <sup>a</sup>
Staged at time of detection	93 <sup>b</sup>	91
In Situ	DNC	2
Invasive	DNC	98
Late Stage	DNC	54
Early Stage	DNC	37

Table IV Sources:

*Healthy People 2010, Progress Review, 2000.* U.S. Department of Health and Human Services.

Available at <http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls>.

DNC = Data not collected

<sup>a</sup> State Report on Oral Cancer, available from <http://www.dhec.sc.gov>

<sup>b</sup> SEER, available at <http://www.seer.cancer.gov>

## **Tobacco and Alcohol Use and their Impact on Oral Cancer**

According to the Surgeon General's report on oral health (USDHHS, 2000a), tobacco and alcohol are major factors in causing both oral disease and oral cancer. Residents of South Carolina are more likely to smoke than residents of most other states (BRFSS, 2005). This high level of tobacco and alcohol use contributes to South Carolina's high oral disease burden and high oral cancer rate.

### **Tobacco Control**

Tobacco use has a devastating effect on the health and well being of the public. More than 400,000 Americans die each year as a direct result of cigarette smoking, making it the nation's leading preventable cause of premature mortality. In addition, smoking causes more than \$150 billion in annual health-related economic losses (CDC, 2002). The effects of tobacco use on the public's oral health are also alarming. The use of any form of tobacco — including cigarettes, cigars, pipes, and smokeless tobacco — has been established as a major cause of oral and pharyngeal cancer (USDHHS, 2004a). The evidence is sufficient to consider smoking a causal factor for adult periodontitis (USDHHS, 2004a); one-half of the cases of periodontal disease in this country may be attributable to cigarette smoking (Tomar and Asma 2000). Tobacco use substantially worsens the prognosis of periodontal therapy and dental implants, impairs oral wound healing, and increases the risk of a wide range of oral soft tissue changes (Christen, McDonald, and Christen, 1991; American Academy of Periodontology, 1999).

Comprehensive tobacco control would have a large impact on oral health status. The goal of comprehensive tobacco control programs is to reduce disease, disability, and death related to tobacco use by:

- Preventing the initiation of tobacco use among young people;
- Promoting quitting among young people and adults;
- Eliminating nonsmokers' exposure to secondhand tobacco smoke; and
- Identifying and eliminating the disparities related to tobacco use and its effects among different population groups.

According to both the Federation of Tax Administrators (2006) and Tobacco Free Kids (2006), South Carolina has the lowest cigarette tax in the nation at 7 cents per pack. Rhode Island has the highest at \$2.46. The U.S. median is 80 cents. Higher taxes on cigarettes discourages use, especially by young people, because they make cigarettes less affordable. (Leverett, Ashe, Gerard, Jenson, and Wollery, 2002).

Additional information on tobacco use and abuse can be found at:

- National and state data on Behavioral Risk Factor Surveillance System: <http://apps.nccd.cdc.gov/brfss/page.asp?cat=TU&yr=2004&state=US#TU>
- National data on National Youth Tobacco Survey: [http://www.cdc.gov/tobacco/research\\_data/youth/mmwr\\_5412\\_intro.htm](http://www.cdc.gov/tobacco/research_data/youth/mmwr_5412_intro.htm)
- National and state data on Youth Risk Behavioral Surveillance System: <http://apps.nccd.cdc.gov/yrbss/>
- National Health Interview Survey (NHIS): <http://www.cdc.gov/nchs/nhis.htm>
- National Health and Nutrition Examination Survey (NHANES): <http://www.cdc.gov/nchs/nhanes.htm>.

The dental office provides an excellent setting for providing tobacco intervention services. More than one-half of adult smokers see a dentist each year (Tomar, Husten, and Manley, 1996). Dental patients are particularly receptive to health messages at periodic check-up visits, and oral effects of tobacco use provide visible evidence and a strong motivation for tobacco users to quit. Because dentists and dental hygienists can be effective in treating tobacco use and dependence, the identification, documentation, and treatment of every tobacco user they see needs to become a routine practice in every dental office and clinic (Fiore, Bailey, and Cohen, 2000). However, national data from the early 1990s indicated that just 24 percent of smokers who had seen a dentist in the past year reported that their dentist advised them to quit, and only 18 percent of smokeless tobacco users reported that their dentist ever advised them to quit.

Cigarette smoking among adults 18 years and older is described in Table X. Data from the Youth Risk Behavior Surveillance System on students who smoked or used other tobacco products are shown in Table XI, and presented graphically in figures 11 and 12.

**Table X. Current Cigarette Smoking among Adults Aged 18 Years and Older**

<i>Healthy People 2010</i> Target: 12%	United States <sup>a</sup> (%)	South Carolina Status <sup>b</sup> (%)
Total	24	38.9
Race or Ethnicity		
Black or African American	25	39.9
White	25	38.1
Hispanic or Latino	19	61.3
Not Hispanic or Latino	25	38.5
Sex		
Female	22	40.9
Male	26	37.4

Table X Sources:

*Healthy People 2010*, 2<sup>nd</sup> Ed. U.S. Department of Health and Human Services, November 2000.

<sup>a</sup> Age-adjusted to the Year 2000 standard population.

<sup>b</sup> BRFSS 2004, people who reported smoking every day.

**Table XI: Percentage of Students in High School Who Used Tobacco in the Past Month**

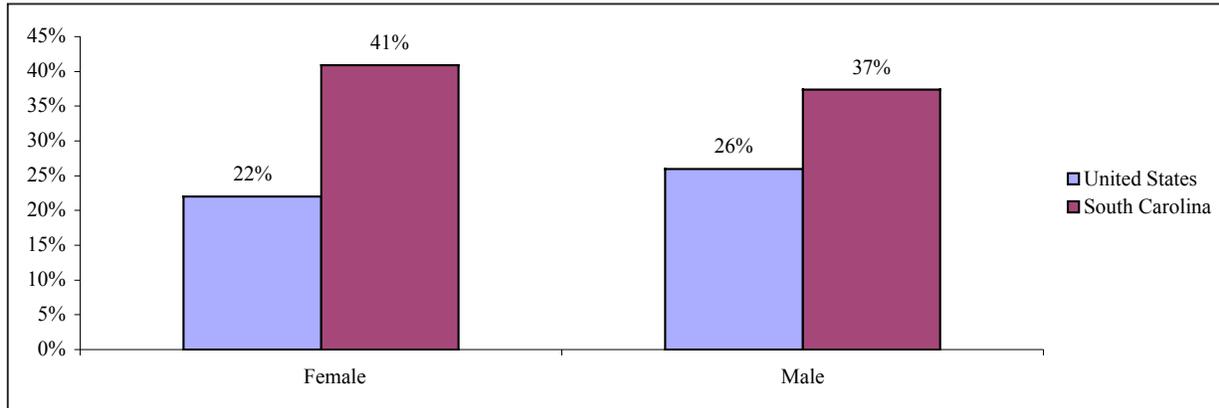
	Cigarettes (%)		Chew (%)	
	United States, 2004	South Carolina, 2005	United States, 2004	South Carolina, 2005 <sup>a</sup>
Total	22	24.4	7	8.6
Boys	22	26.9	11	15.1
Girls	22	21.7	2	2.3
Race				
White	25	31.2	8	12.9
Black or African American	15	14.4	3	2.7
Hispanic	18	17.8	5	6
Other	18	DNC	10	DNC

Table IX Sources:

Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, [Youth Risk Behavior Surveillance System Online](http://apps.nccd.cdc.gov/yrbss/SelQuestyear.asp?cat=2&desc=Tobacco%20Use&loc=XX), Available at <http://apps.nccd.cdc.gov/yrbss/SelQuestyear.asp?cat=2&desc=Tobacco%20Use&loc=XX>

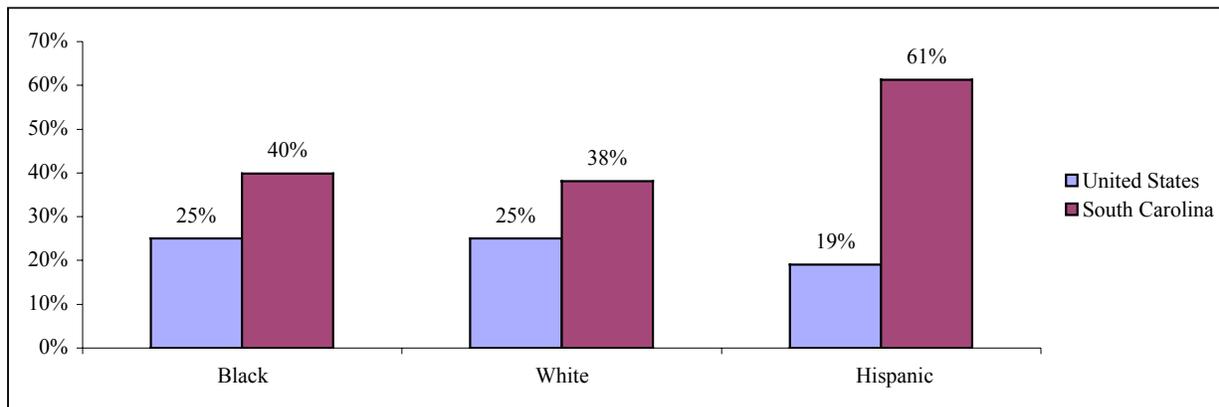
<sup>a</sup>Youth Tobacco Survey, 2005 (DHEC Division of Tobacco Control)

**Figure 11: Prevalence of Cigarette Smoking, by Gender**



YRBS, 2006

**Figure 12: Prevalence of Cigarette Smoking, by Race**



BRFSS, 2004

## XI. ORAL HEALTH EDUCATION

Oral health education for the community is a process that informs, motivates, and helps people to adopt and maintain beneficial health practices and lifestyles; advocates for environmental changes as needed to achieve this goal; and conducts professional training and research to the same end (Kressin and DeSouza, 2003). Although health information or knowledge alone does not necessarily lead to desirable health behaviors, knowledge may help empower people and communities to take action to protect their health.

*Healthy People 2010* includes several objectives for community health education in general and for oral health education specifically. These are:

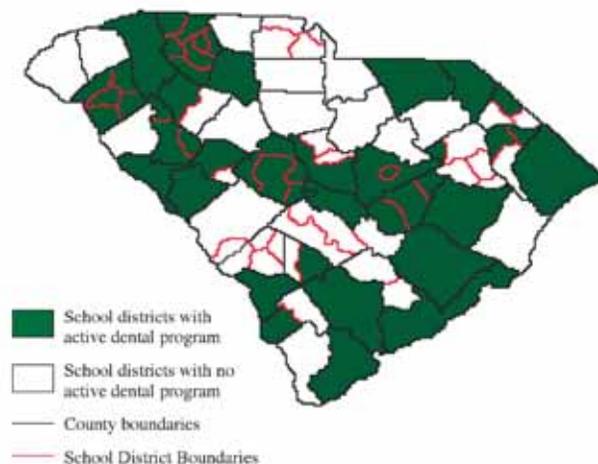
- Objective 7-2: Increase the proportion of middle, junior high, and senior high schools that provide school health education to prevent health problems.
- Objective 7-7: Increase the proportion of health care organizations that provide patient and family education.
- Objective 7-11: Increase the proportion of local public health departments that have established culturally appropriate and linguistically competent community health promotion and disease prevention programs.
  - Objective 7-11u: Increase the proportion of local public health departments that have established culturally appropriate and linguistically competent oral health promotion and oral disease prevention programs. At baseline in 1998, 25 percent of health clinics had reached this objective; the target is 50 percent.

### Oral Health Education In Schools

South Carolina's Comprehensive Health Education Act of 1988 (CHEA) includes dental health as a part of the kindergarten to grade five module. For middle and high school students, substance use (tobacco) also is a part of the curriculum.

The South Carolina School Dental Prevention Program enrolls public and private providers who agree to provide school-based oral health services in their local community and to operate within the *School-Based Dental Prevention Program Guidelines*. The program was active in 28 of South Carolina's 46 counties in 2005.

**Figure 13: School Districts With Active Dental Program, 2005**



## Educational Resources for Teaching Oral Health

The South Carolina Healthy Schools program, in the South Carolina Healthy Schools program, under the guidance of the Office of Adult and Community, developed several oral health curriculum resource guides and activity guides in 2003. In addition to being valuable resources for the citizens of our state, the development of these materials has solidified community partnerships with groups such as Head Start and EdVenture Children's Museum. These collaborative efforts provide DHEC with a way to distribute materials, train providers and educate parents, children and community leaders.

The guides contain lessons that teach students oral health concepts and encourage them to take care of their teeth. Each of the student activities in the *Oral Health Supplemental Resource Guides* includes a list of needed materials, background information, step-by-step instructions and suggested extension and evaluation activities. These guides are primarily designed for classroom use and for parental education:

- **The Oral Health Supplemental Curriculum Resource Guides.** The lessons and activities for Kindergarten, second and seventh grade students were designed to reinforce the health and safety learning standards at these grade levels. The Oral Health Supplemental Curriculum Resource Guides were funded through CDC DASH Cooperative Agreement U58/CCU417047-03-02 and South Carolina Healthy Schools at the State Department of Education.
- For the school-age child there is an **Oral Health Activity Guide for Afterschoolers** as well as a standards-based oral health curriculum for preschool, kindergarten, second and seventh grade students.
- **The Oral Health Supplemental Curriculum Resource Guide for Preschool,** developed in 2005, draws from and was designed to be part of the original oral health curriculum resource series. The Preschool Guide, part of the *More Smiling Faces in Beautiful Places* project, was funded by a grant from the Robert Wood Johnson Foundation.
- The final resource to be added to the collection of oral health materials is **Oral Health for Families with Special Health Care Needs.** This information is designed for families dealing with a special health care issue that may directly impact their child's oral health.

These materials are based on the *Stepping Stones for Caring for Our Children* and the *Bright Futures Guidelines for Oral Health* and were developed as part of the More Smiling Faces program:

- An **Oral Health Activity Booklet** for infants to 4-year-olds is filled with developmentally appropriate activities that can be done within the child care setting. As a companion to the Activity Booklet, the **Oral Health Parent Information Booklet** provides parents and caregivers with valuable information about caring for teeth, eating healthy foods, preventing injuries and visiting the dentist.
- The **Oral 101 Training** and **Dental Emergency Training**, approved Center for Child Care Career Development courses, provide child care providers and community outreach program coordinators with valuable training and information that is in line with the information in the Activity and Parent Information Booklets.

## The More Smiling Faces in Beautiful Places Program

The More Smiling Faces in Beautiful Places program was funded by a grant from the Robert Wood Johnson Foundation and was implemented in six counties from 2002 to 2005. The

program goal was to improve oral health for children from birth to age six and children with special health care needs. The program objectives were achieved. A 28 percent improvement was seen in the number of Medicaid-eligible children under age six who received dental services, and a 17 percent improvement was seen in the number of children with special health care needs under age 20 who received dental services. Other program activities included:

- Continuing education in pediatric oral health for medical and dental professionals
- Initiation of a “first birthday card” program to notify WIC enrollees, Medical Homes program participants, and students in the pilot counties of the need for their child’s first dental visit
- Oral health education to parents, early childhood programs (i.e. Healthy Start and First Steps), and faith communities
- A patient navigator system to link medium or high risk children from a medical home to a dental home

More Smiling Faces in Beautiful Places has concluded. However, the impact of the project will be felt for years to come. Education and community outreach efforts continue to be successful. For full information on the More Smiling Faces project, contact DHEC’s Division of Oral Health for a copy of the project report.

## **Oral Health Education in the Community**

The Division of Oral Health and its partners provide assistance to South Carolina communities in designing and establishing activities to prevent oral disease. Community meetings are held to identify particular needs of the community and to make plans for appropriate actions. DHEC’s Division of Oral Health and its partners conduct promotional campaigns, particularly targeting those South Carolina counties with the greatest burden of oral disease. The campaigns are designed to raise public awareness on the importance of improving oral health.

Community Health Centers (CHCs) provide family-oriented primary and preventive health care services for people living in rural and urban medically underserved communities. CHCs exist in areas where economic, geographic, or cultural barriers limit access to primary health care. The Migrant Health Program (MHP) supports the delivery of migrant health services, serving more than 650,000 migrant and seasonal farm workers. Among other services provided, many CHCs and Migrant Health Centers provide dental care services.

*Healthy People 2010* objective 21-14 is to “Increase the proportion of local public health departments and community-based health centers, including community, migrant, and homeless health centers, that have an oral health component” (USDHHS, 2000b). In 2002, 61 percent of health centers in the United States had an oral health component (USDHHS, 2004b); the *Healthy People 2010* target is 75 percent. In South Carolina, 37 percent of community health care centers have a dentist on staff and a further 21 percent include oral health activities in their budgets. There are 54 low-income dental clinics located in the state, and five counties have a dental coordinator.

In partnership with the Special Olympics, the College of Dental Medicine at the Medical University of South Carolina is active in the Special Smiles Program. Faculty and students from the College of Dental Medicine, as well as some private providers, offer oral health screenings and lessons in oral hygiene during Special Olympics events. Each athlete is given a report card, a listing of local dentists who accept patients with special health care needs, and a gift bag

containing oral hygiene products. More information on the program is available from the Special Olympics Web site:  
[http://www.specialolympics.org/Special+Olympics+Public+Website/English/Initiatives/Healthy\\_Athletes/Special\\_Smiles/default.htm](http://www.specialolympics.org/Special+Olympics+Public+Website/English/Initiatives/Healthy_Athletes/Special_Smiles/default.htm).

Each year in Spartanburg, the Carol Drum Project at the Spartanburg Public Health Department conducts about 10,000 dental screenings and referrals for needed dental care. In addition, for students and their families that may not be able to afford dental care, there is a scholarship program that will compensate the dentists for the dental treatment.

## XII. PROVISION OF DENTAL SERVICES

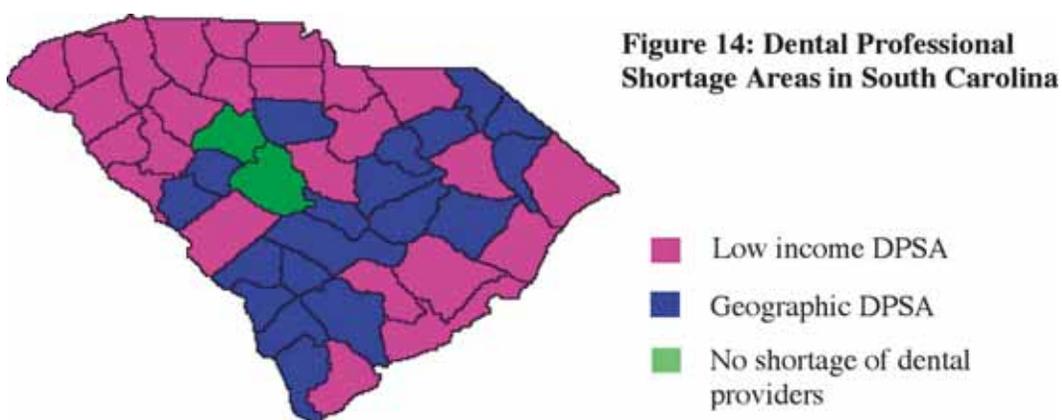
### Dental Workforce and Capacity

The oral health care workforce is critical to society's ability to deliver high quality dental care in the United States. Effective health policies intended to expand access, improve quality, or constrain costs must take into consideration the supply, distribution, preparation, and utilization of the health workforce (see <http://bhpr.hrsa.gov/healthworkforce/reports/profiles/>).

There were 1,839 dentists, 1,883 dental hygienists, and 2,970 dental assistants practicing in South Carolina in 2005. In 2000, there were 43.2 dentists per 100,000 population in South Carolina, which is well below the national rate of 63.6. The per capita ratio of dental hygienists was also substantially lower than the national rate, at 44.2 per 100,000 population.

Between 1991 and 2000, the number of dentists in South Carolina increased by 71 percent while the state's population grew by 13 percent. The result was a 52 percent increase in dentists per capita compared to a 16 percent increase nationwide. However, this was offset by the 25 percent decrease in the number of dentists between 2000 and 2005, despite the state's continued population growth.

Only two counties, Lexington and Newberry, are not designated as Dental Professional Shortage Areas (DPSA). Of the other counties, 19 are designated as geographic DPSA, and 25 are designated as income DPSA.



## **Education of the Oral Health Workforce**

The only four-year school of dentistry in South Carolina is at the Medical University of South Carolina, which offers a joint D.M.D./Ph.D. program in addition to the standard curriculum. Post-doctoral training is available in general dentistry, oral and maxillofacial surgery, pediatric dentistry, and periodontics.

Palmetto Richland Hospital in Columbia has a general practice dental residency program. It is a one year certificate program, and also includes rotations in anesthesia and in family medicine. Nearly all of the resident's time is spent providing dental care at Palmetto Richland clinic sites.

There are seven technical colleges across the state that train dental hygienists. A dental hygiene associate program takes two years and provides academic study in basic and dental sciences as well as clinical experience, which renders the student eligible to take the national and state licensing exams. Some colleges also offer a one-year dental assisting program. Continuing education for dental hygienists, dental assistants, and dental office professionals is also available either on campus or online.

## **Dental Workforce Diversity**

One cause of oral health disparities is a lack of access to oral health services among under-represented minorities. Increasing the number of dental professionals from under-represented racial and ethnic groups is viewed as an integral part of the solution to improving access to care for these populations (USDHHS, 2000b) because individuals in minority communities are more likely to seek treatment from people of their own racial or ethnic background (Edmunds, 2006). Research also shows that increasing the diversity of our schools enhances the educational experience and increases the likelihood that dental school graduates will practice in ways that extend oral care services to all segments of society (Edmunds, 2006).

Data on the race and ethnicity of dental care providers were derived from surveys of professionally active dentists conducted by the American Dental Association (ADA, 1999). In 1997, 1.9 percent of active dentists in the United States identified themselves as being Black or African American, although that group constituted 12.1 percent of the U.S. population. Hispanic/Latino dentists made up 2.7 percent of U.S. dentists, compared with 10.9 percent of the U.S. population that was Hispanic/Latino.

In South Carolina, 80 percent of 1,722 licensed dentists in 2003 were White males. Just over 6 percent of all dentists were African American, and 2 percent were Hispanic (ORS, 2005). Of 1,698 registered dental hygienists in the state, 96.5 percent were White females (ORS, 2005). The Office of Primary Care at DHEC promotes the National Health Service Corps as a way for communities to work to increase the number of minority providers available to residents.

Further resources for information on the dental and oral health workforce in South Carolina include:

- State Health Workforce Profiles from the National Center for Health Workforce Analysis: <http://bhpr.hrsa.gov/healthworkforce/reports/profiles/>
- American Dental Education Association: Dental Education at a Glance [http://www.adea.org/DEPR/2004\\_Dental\\_Ed\\_At\\_A\\_Glance.pdf](http://www.adea.org/DEPR/2004_Dental_Ed_At_A_Glance.pdf)

- American Dental Education Association: Allied Dental Education At A Glance [http://www.adea.org/CEPRWeb/DEPR/Documents/2004\\_Allied\\_Dental\\_Education\\_At-A-Glance.pdf](http://www.adea.org/CEPRWeb/DEPR/Documents/2004_Allied_Dental_Education_At-A-Glance.pdf)
- American Dental Education Association: Annual ADEA Survey of Dental School Seniors, 2005 [http://www.adea.org/CEPRWeb/DEPR/Documents/2005\\_Senior\\_Survey.pdf](http://www.adea.org/CEPRWeb/DEPR/Documents/2005_Senior_Survey.pdf)

## Use of Dental Services

Although appropriate home oral health care and population-based prevention are essential, professional care is also necessary to maintain optimal dental health. Regular dental visits provide an opportunity for the early diagnosis, prevention, and treatment of oral diseases and conditions for people of all ages and for the assessment of self-care practices.

Adults who do not receive regular professional care can develop oral diseases that eventually require complex treatment and may lead to tooth loss and health problems. People who have lost all their natural teeth are less likely to seek periodic dental care than those with teeth, which, in turn, decreases the likelihood of early detection of oral cancer or soft tissue lesions from medications, medical conditions, and tobacco use, as well as from poor-fitting or poorly maintained dentures. Persons with visits to the dentist in the last 12 months are shown in Table XII.

**Table XII: Proportion of Persons Who Visited a Dentist in the Previous 12 Months<sup>a</sup>**

	Dental Visit in Previous Year	
	United States*	South Carolina <sup>d</sup>
	(%)	(%)
TOTAL	70.3	66.7
Race and ethnicity		
Black or African American		
DNA	56.6	
White	DNA	71
Sex		
Female	DNA	69.3
Male	DNA	63.9
Education Level		
Less than high school	24	38.2
High school graduate	41	61.9
At least some college	57	69.9

Table XII Sources:

*Healthy People 2010*, Progress Review, 2000. U.S. Department of Health and Human Services.

Available at <http://www.cdc.gov/nchs/ppt/hpdata2010/focusareas/fa21.xls>.

<These data are released annually. 2002 national data are available from the Medical Expenditure Panel Survey at <http://www.meps.ahrq.gov/>.>

DNA = Data not analyzed

\* National data are for 2000.

<sup>a</sup> Age-adjusted to 2000 U.S. standard population.

<sup>d</sup> BRFSS 2004

## **XIII. CONCLUSIONS**

South Carolina is doing very well at reducing some aspects of the burden of oral disease. Outreach programs funded by DHEC for water fluoridation, Medicaid enrollment (which requires dental screening as a part of well-child checkups), and dental health education of children and parents have been particularly effective. However, there are many aspects that could be improved. In some parts of the state, a method of surveillance is needed so that oral disease can better be tracked and understood in the future.

### **What South Carolina Is Doing Well**

#### **Fluoridated Water**

One of the highlights of oral disease prevention in the state of South Carolina has been the ongoing effort to supply all municipalities with fluoridated water systems. South Carolina has exceeded the national goal of having 75 percent of households receive fluoridated water; 82 percent of the total population (and 94 percent of the population dependant on public water systems) receives fluoridated water. With this high rate of fluoridation, South Carolina can look forward to a reduced rate of decay prevalence, especially among populations with low access to care, in the future.

#### **Increasing Dental Access among Medicaid Populations**

The More Smiling Faces program, funded by the Robert Wood Johnson Foundation, successfully met its project objectives of increasing access to dental care among Medicaid populations and among children with special healthcare needs. Along with the expanded outreach efforts by the supplemental Medicaid program (S-CHIP), more than 95 percent of children that are eligible for Medicaid, statewide, are enrolled in the program. Although not all of these children receive the services for which they are eligible, the access to care has improved over the last several years. The number of children receiving dental screenings as a part of their regular EPSDT services has increased by about 10 percent (Final report to the Robert Wood Johnson Foundation by the DHEC Division of Oral Health, 2006).

#### **School Dental Programs**

School dental programs that provide access to dental treatment have been developed in several communities where access to dental care is an issue for the students. The school dental prevention program has been very successful in increasing access to dental sealants. During the 2004-2005 school year, there were eight programs (MUSC, College of Dental Medicine, Big Smiles for Little Scholars, Health Promotion Specialists, Communicare, Communities Caring for Children, Meeks Dental Associates, Mobile Dental Care and Little River Medical Center) throughout South Carolina, providing dental preventive services to approximately 30,000 students.

#### **Tobacco Control**

Tobacco control is a health issue for all South Carolinians. Nearly 40 percent of South Carolina residents smoke every day, and an additional 13 percent smoke on at least some days (BRFSS, 2004). This is much higher than the national rates. DHEC has recently established the Tobacco Quitline, a toll-free phone number that state residents can call to receive individualized cessation counseling. The program includes an oral health component, where the “QuitCoach” discusses the impact of tobacco on teeth, gums, breath, and the risk of oral cancer with the client. The program is also available as a Web-based counseling program. Tobacco use is included in health

classes taught in South Carolina schools, and supplemental curricula are available to school districts that choose to use them.

## **Areas in which South Carolina Needs to Invest**

### **Access to Care**

Access to any medical care, but especially dental care, continues to plague poor, rural South Carolinians. Transportation issues and a lack of dental providers who accept Medicaid are problems many counties in South Carolina continue to face. Adult dental services (Medicaid beneficiaries over the age of 21) are limited to emergency dental services only. Comorbid conditions such as cardiovascular disease and HPV, which can contribute to periodontitis and oral cancer, respectively, are also cause for concern. Community education programs that focus on major health concerns such as obesity, diabetes, or tobacco use need to include an oral health component.

### **Tobacco Control**

Dental care professionals can play a valuable role in informing patients about the risks associated with tobacco use and refer them to tobacco cessation resources. Although dental teams usually ask their patients about their tobacco use, most do not provide tobacco cessation counseling. Havlicek *et al* demonstrated that training offered in a dental clinic setting can be an effective strategy for addressing tobacco dependence. This project documented increased prescriptions for nicotine replacement products and bupropion, increased referrals to and enrollment in telephone-based counseling courses, increased knowledge and behavior change, and increased use of the “five A’s” in response to a planned training program enhanced with ongoing support.

### **Diversifying the Dental Workforce**

Little progress had been made in diversifying the dental workforce of South Carolina. Although South Carolina does have more minority dental providers than the national average, they are still a very small proportion of the total workforce. Recruiting more minority dental providers could contribute to the elimination of oral health disparities in our state.

### **Early Childhood and Oral Health**

The Healthy People 2010 Objective for children ages 2 to 4 is to “reduce the proportion of young children with dental caries experience in their primary teeth” from the baseline of 18 percent to a target of 11 percent. CDC’s latest data show a trend in the wrong direction (CDC, 2005). The best opportunity for true primary prevention is in infants and toddlers because caries is established as an active disease process before age 2.

South Carolina needs to develop a Oral Health Plan of Action for the early childhood (0-5 years of age) population in South Carolina based on the outcomes and lessons learned from both the Robert Wood Johnson funded oral initiative, More Smiling Faces, and the HRSA Oral Health Integrated Systems Development Grant. This Oral Health Plan of Action must be consistent with the recommendations of the Surgeon General’s *National Call to Action to Promote Oral Health* and with the professional guidelines of the American Academy of Pediatric Dentistry. The plan will become a section of the South Carolina State Oral Health Plan (SCSOHP) and provide South Carolina with a road map to improve oral health as well as the overall health and well being of young children.

## **Areas in Which South Carolina Needs to Expand Surveillance Programs**

South Carolina is developing a strategy to collect oral health data for many populations that are widely regarded as being at a disadvantage for receiving good oral health care, e.g. senior citizens, adolescents, and children with special health care needs. The Office of Research and Statistics is partnering with the Division of Oral Health to create a surveillance module that will track all Medicaid and Medicare claims for oral health. It should provide some oral health data on disadvantaged groups, but it will not be available until at least spring of 2007.

Some standardization of surveillance methods needs to be created. For example, South Carolina uses a four-stage delineation of oral cancer spread at detection (in situ, invasive, late stage, and early stage), while *Healthy People 2010* and the American Cancer Society use a three-stage delineation (localized, distant, and invasive) with definitions that are very different. Similarly, the American Heart Association measures cardiovascular disease, while *Healthy People 2010* measures coronary heart disease, angina pectoris, and myocardial infarctions. It is difficult to compare state and national rates if they are measuring different conditions or defining terms and categories differently.

## **Future Directions for South Carolina**

DHEC's Division of Oral Health, is planning to conduct a statewide needs assessment among children in kindergarten and in third grade during the 2006-2007 school year. This needs assessment will build on the assessment performed during 2002-2003. It will show the impact that state education efforts had during the intervening five years.

The Division of Oral Health is also updating the State Plan for Oral Health. Some changes have been made in the priorities and objectives, but the overall intention is the same: to improve the oral health of all residents in South Carolina. The new State Plan should be released in the spring of 2007.

## XI. REFERENCES

- Amar, S. and Chung, K.M. (2000). Influence of Hormonal Variation on the Periodontium in Women. *Periodontology*, 6: 79–87.
- American Academy of Periodontology (1999). Position Paper: Tobacco Use and the Periodontal Patient. *Journal of Periodontology* 70: 1419–1427.
- American Cancer Society (2006). Current Oral Cancer Statistics. Available from <http://www.cancer.org> .
- American Dental Association (1999). *Distribution of dentists in the United States by Region and State*, 1997. Chicago, IL: American Dental Association Survey Center.
- American Diabetes Association (2006). Type I and Type II Diabetes. Available at <http://www.diabetes.org/type-1-diabetes.jsp> and <http://www.diabetes.org/type-2-diabetes.jsp> .
- American Heart Association (2006). Cardiovascular Disease Statistics. Available at <http://www.americanheart.org/presenter.jhtml?identifier=1200026> .
- Beck J.D., Offenbacher S., Williams R., Gibbs P., and Garcia R. (1998). Periodontics: A Risk Factor for Coronary Heart Disease? *Annals of Periodontology* 3 (1): 127–141.
- Behavioral Risk Factor and Surveillance System (2005). Available at <http://www.scdhec.gov/hs/epidata/brfss2004> .
- Blot, W.J., McLaughlin, J.K., Winn, D.M., Austin, D.F., Greenberg, R.S., and Preston-Martin, S. (1988). Smoking and Drinking in Relation to Oral and Pharyngeal Cancer. *Cancer Research* 48(11): 3282–3287.
- Centers for Disease Control (2005). *Surveillance for Dental Caries, Dental Sealants, Tooth Retention, Edentulism, and Enamel Fluorosis—United States, 1988-1994 and 1999-2002*). Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5403a1.htm> .
- Centers for Disease Control (2006). My Water's Fluoride. Available at <http://apps.nccd.cdc.gov/MWF/Index.asp> .
- Centers for Disease Control and Prevention (1998). Preventing and Controlling Oral and Pharyngeal Cancer. Recommendations from a National Strategic Planning Conference. *Morbidity and Mortality Weekly Report*, 47(No. RR-14): 1–12.
- Centers for Disease Control and Prevention (1999). Achievements in Public Health, 1900–1999: Fluoridation of Drinking Water to Prevent Dental Caries. *Morbidity and Mortality Weekly Report*, 48(41): 933–940.
- Centers for Disease Control and Prevention (2002). Populations Receiving Optimally Fluoridated Public Drinking Water — United States, 2000. *Morbidity and Mortality Weekly Report*, 51(7): 144–7.
- Centers for Disease Control and Prevention (2004). *Behavioral Risk Factor Surveillance System Survey Data*. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers

- for Disease Control and Prevention. State data accessed 5/17/06 from <http://www.scdhec.gov/hs/epidata/brfss2004.htm#wh> .
- Centers for Disease Control and Prevention (2006). Youth Risk Behavior Surveillance System. Data on tobacco use available from <http://www.cdc.gov/yrbs> .
- Centers for Medicare and Medicaid Services (2006). Health Accounts. Available at <http://www.cms.hhs.gov/statistics/nhe/> .
- Centers for Medicare and Medicaid Services (CMS, 2004). National Health Expenditure (NHE) Amounts by Type of Expenditure and Source of Funds: Calendar Years 1965–2013. Available at <http://www.cms.hhs.gov/oralhealth/6.asp> .
- Christen, A.G., McDonald, J.L., and Christen J.A. (1991). The Impact of Tobacco Use and Cessation on Nonmalignant and Precancerous Oral and Dental Diseases and Conditions. Indianapolis, IN: Indiana University School of Dentistry.
- Council of State Governments (2006). Healthy States – Oral Health. Available at <http://www.healthystates.csg.org/Public+Health+Issues/Oral+Health/> .
- Dasanayake, A.P. (1998). Poor Periodontal Health of The Pregnant Woman as a Risk Factor for Low Birth Weight. *Annals of Periodontology* 3: 206–212.
- Davenport, E.S., Williams, C.E., Sterne, J.A., Sivapathasundram, V., Fearne, J.M., and Curtis, M.A. (1998). The East London Study of Maternal Chronic Periodontal Disease and Preterm Low Birth Weight Infants: Study Design and Prevalence Data. *Annals of Periodontology* 3: 213–221.
- De Stefani, E., Deneo-Pellegrini, H., Mendilaharsu, M., and Ronco, A. (1999). Diet and Risk of Cancer of the Upper Aerodigestive Tract – I. Foods. *Oral Oncology* 35(1) 17–21.
- Edmunds, R.K. (2006). Increasing Access to Care with Diversity. *Journal of Dental Education* 70 (9): 918-920.
- Federation of Tax Administrators (2006). State Tax Rates on Cigarettes. Available at <http://www.taxadmin.org/fta/rate/cigarette.html> .
- Fiore, M.C., Bailey, W.C., and Cohen, S.J. (2000). Treating Tobacco Use and Dependence: Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service. Available at: [http://www.surgeongeneral.gov/tobacco/treating\\_tobacco\\_use.pdf](http://www.surgeongeneral.gov/tobacco/treating_tobacco_use.pdf) .
- Gaffield, M.L., Gilbert, B.J., Malvitz, D.M., and Romaguera, R. (2001). Oral Health During Pregnancy: An Analysis of Information Collected by the Pregnancy Risk Assessment Monitoring System. *Journal of the American Dental Association*, 132(7): 1009–1016.
- Gillison, M.L., Koch W.M., and Capone, R.B. (2000). Evidence for a Causal Association Between Human Papillomavirus and a Subset of Head and Neck Cancers. *Journal of the National Cancer Institute* 92: 709-720.
- Green, L.W. and Kreuter, M. (2005). Health Program Planning: An Educational and Ecological Approach (4th Ed.). New York: McGraw-Hill

- Griffin, S.O., Jones, K., and Tomar, S.L. (2001). An Economic Evaluation of Community Water Fluoridation. *Journal of Public Health Dentistry*, 61(2): 78–86.
- Guthmiller, J.M., Hassebroek-Johnson, J.R., Weenig, D.R., Johnson, G.K., Kirchner, H.L., Kohout, F.J., and Hunter, S.K. (2001). Periodontal Disease in Pregnancy Complicated by Type 1 Diabetes Mellitus. *Journal of Periodontology* 72 (11): 1485-90.
- Havlicek D., Stafne E., and Pronk N.P. (2006). Tobacco Cessation Interventions in Dental Networks: A Practice-Based Evaluation of the Impact of Education on Provider Knowledge, Referrals, and Pharmacotherapy Use. Available at [http://www.cdc.gov/pcd/issues/2006/jul/05\\_0226.htm](http://www.cdc.gov/pcd/issues/2006/jul/05_0226.htm) .
- Herrero, R. (2003). Chapter 7: Human Papillomavirus and Cancer of the Upper Aerodigestive Tract. *Journal of National Cancer Institutes Monographs* (31): 47–51.
- International Agency for Research on Cancer (IARC, 2005). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 89, Smokeless Tobacco and Some Related Nitrosamines. Lyon, France: World Health Organization, International Agency For Research On Cancer.
- Johnson, N.W. (1999). *Oral Cancer*. London: FDI World Press. Kids Count (2006). 2006 Kids Count Databook. Accessed 7/1/06 from <http://www.sckidscount.org> .
- Kressin, N.R. and De Souza, M.B. (2003). Oral Health Education and Health Promotion. In: Gluck G.M. and Morganstein W.M. (eds). *Jong's Community Dental Health*, 5th ed. St. Louis, MO: Mosby, 277–328.
- Leverett, M., Ashe, M., Gerard, S., Jenson, J., and Woollery, T. (2002). Tobacco Use: the Impact of Prices. *Journal of Law, Medicine & Ethics* 30 (3): S88-100.
- Levi, F. (1999). Cancer Prevention: Epidemiology And Perspectives. *European Journal of Cancer* 35(14): 1912–24.
- Lopez, Da Silva, Ipinza, and Gutierrez (2005). Periodontal Therapy Reduces the Rate of Preterm Low Birth Weight in Women with Pregnancy-Associated Gingivitis. *Journal of Periodontology*, 76 (11 supplement): 2144-2215.
- Lopez, Smith, and Gutierrez (2002). Higher Risk of Preterm Birth and Low Birth Weight in Women with Periodontal Disease. *Journal of Dental Research*, 81(1): 58-63.
- March of Dimes (2006). Perinatal Statistics for South Carolina. Available at <http://www.marchofdimes.com> .
- McLaughlin, J.K., Gridley, G., and Block, G. (1988). Dietary Factors in Oral and Pharyngeal Cancer. *Journal of the National Cancer Institutes*, 80(15): 1237–1243.
- Mealey, B.L. (1996). Periodontal Implications: Medically Compromised Patients. *Annals of Periodontology* 1(1): 256–321.
- Mealey, B.L., and Oates, T.W. (2006). Diabetes Mellitus and Periodontal Diseases. *Journal of Periodontology* 77 (8): 1289-1303.

- Morse, D.E., Pendrys, D.G., and Katz, R.V. (2000). Food Group Intake and the Risk of Oral Epithelial Dysplasia in a United States Population. *Cancer Causes and Control* 11(8):713-720.
- National Cancer Institute State Cancer Profiles (2006). Profile for South Carolina (oral cancer) available at <http://statecancerprofiles.cancer.gov/cgi-bin/quickprofiles/profile.pl?45&003>
- National Center for Children in Poverty (2006). Available at <http://www.nccp.org/> .
- National Center for Health Statistics (NCHS) (2006). Data on Oral Health. Available from <http://www.cdc.gov/nchs> .
- Nietert, P.J., Bradford, W.D., and Kaste, L.M. (2005). “The Impact of an Innovative Reform to the South Carolina Dental Medicaid System.” *Health Services Research* 40(4):1080.
- Offenbacher, S., Jared, H.L., O’Reilly, P.G., Wells, S.R., Salvi, G.E., Lawrence, H.P., et al. (1998). Potential Pathogenic Mechanisms of Periodontitis Associated Pregnancy Complications. *Annals of Periodontology*, 3(1): 233–250.
- Offenbacher, S., Lieff, S., Boggess, K.A., Murtha, A.P., Madianos, P.N., Champagne, C.M., et al. (2001). Maternal Periodontitis and Prematurity. Part I: Obstetric Outcome Of Prematurity and Growth Restriction. *Annals of Periodontology*, 6(1): 164–174.
- Office of Research and Statistics (2005). Health and Demographics Information. Accessed 10/04/06 from <http://www.ors2.state.sc.us/manpower2.asp> .
- Oral Cancer Foundation (2006). Facts About Oral Cancer. Accessed 8/31/06 from <http://www.oralcancerfoundation.org/facts/index.htm> .
- Phelan, J.A. (2003). Viruses and Neoplastic Growth. *Dent Clin North Am* 47(3): 533–543.
- Redford, M. (1993). Beyond Pregnancy Gingivitis: Bringing a New Focus to Women’s Oral Health. *Journal of Dental Education* 57(10): 742–748.
- Renvert, S., Pettersson, T., Ohlsson, O., and Persson, G.R. (2006). Bacterial Profile and Burden of Periodontal Infection in Subjects with a Diagnosis of Acute Coronary Syndrome. *Journal of Periodontology* 77 (7): 1110-1119.
- Ries, L.A.G., Eisner, M.P., Kosary, C.L., Hankey, B.F., Miller, B.A., Clegg, L., et al. (eds) (2004). SEER Cancer Statistics Review, 1975-2001, National Cancer Institute: Bethesda, MD; National Cancer Institute. Available at [http://seer.cancer.gov/csr/1975\\_2001/](http://seer.cancer.gov/csr/1975_2001/) .
- Scannapieco, F.A., Bush, R.B., and Paju, S. (2003). Periodontal Disease as a Risk Factor for Adverse Pregnancy Outcomes: A Systematic Review. *Annals of Periodontology*, 8(1): 70–78.
- Shanks, T.G. and Burns, D.M. (1998). Disease Consequences of Cigar Smoking. In: National Cancer Institute. Cigars: Health Effects and Trends. Smoking and Tobacco Control Monographs, 9th Edition. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute.
- Silverman, S.J. Jr. (1998). *Oral Cancer*, 4th edition. Atlanta, GA: American Cancer Society.

- South Carolina Department of Health and Environmental Control (2003). State Plan for Oral Health. Available at [http://www.dhec.sc.gov/health/mch/oral/docs/ORALHEALTHPLAN2004\\_2009.pdf](http://www.dhec.sc.gov/health/mch/oral/docs/ORALHEALTHPLAN2004_2009.pdf) .
- South Carolina Department of Health and Environmental Control (2005a). South Carolina State Oral Health Needs Assessment. Available at <http://www.dhec.sc.gov/health/mch/oral/docs/burden.pdf> .**
- South Carolina Department of Health and Environmental Control (2005b). State Report on Oral Cancer, available from [http://www.dhec.sc.gov/health/mch/oral/docs/oral\\_cancer.pdf](http://www.dhec.sc.gov/health/mch/oral/docs/oral_cancer.pdf) .
- South Carolina Department of Health and Environmental Control (2005c). 2005 South Carolina Youth Tobacco Survey. Available at [http://www.dhec.sc.gov/health/chcdp/tobacco/docs/YTSbook\\_final406.pdf](http://www.dhec.sc.gov/health/chcdp/tobacco/docs/YTSbook_final406.pdf) .
- South Carolina Department of Health and Environmental Control (2006a). Pregnancy Risk Assessment and Monitoring System. Available at <http://www.sc.dhec.gov/scan/prams/prams.aspx> .
- South Carolina Department of Health and Environmental Control (2006b). Final Report to the Robert Wood Johnson Foundation. Special Smiles Program (2006). Information on Oral Health and Special Olympians. Available at [http://www.specialolympics.org/Special+Olympics+Public+Website/English/Initiatives/Healthy\\_Athletes/Special\\_Smiles/default.htm](http://www.specialolympics.org/Special+Olympics+Public+Website/English/Initiatives/Healthy_Athletes/Special_Smiles/default.htm) .
- Taylor, G.W. (2001). Bidirectional Interrelationships Between Diabetes and Periodontal Diseases: An Epidemiologic Perspective. *Annals of Periodontology* 6(1): 99–112.
- Tobacco Free Kids (2006). Top Combined State-Local Cigarette Tax Rates. Available at <http://tobaccofreekids.org/research/factsheets/pdf/0267.pdf> .
- Tomar, S.L., Asma, S. (2000). Smoking-Attributable Periodontitis in the United States: Findings From NHANES III. *Journal of Periodontology* 71:743–751.
- Tomar, S.L., Husten, C.G., Manley, M.W. (1996). Do Dentists and Physicians Advise Tobacco Users to Quit? *Journal of the American Dental Association* 127(2): 259–265.
- U.S. Department of Health and Human Services (2000b). *Healthy People 2010, 2nd edition: With Understanding and Improving Health and Objectives for Improving Health*. 2 vols. Washington, DC: U.S. Government Printing Office.
- U.S. Department of Health and Human Services (2003). *National Call to Action to Promote Oral Health*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research. NIH Publication No. 03-5303.
- U.S. Department of Health and Human Services (2004a). *The health consequences of smoking: A report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Available at: [http://www.cdc.gov/tobacco/sgr/sgr\\_2004/index.htm](http://www.cdc.gov/tobacco/sgr/sgr_2004/index.htm) .

- U.S. Department of Health and Human Services (2004b). *Healthy People 2010 progress review: Oral health*. Washington, DC: U.S. Department of Health and Human Services, Public Health Service. Available at: <http://www.healthypeople.gov/data/2010prog/focus21/> .
- U.S. Department of Health and Human Services (2004c). *Healthy People 2010 progress review: Oral health*. Washington, DC: U.S. Department of Health and Human Services, Public Health Service. Available at: <http://www.healthypeople.gov/data2010/focus.htm> .
- U.S. Department of Health and Human Services. (1986). *The Health Consequences of Using Smokeless Tobacco: A Report of the Advisory Committee to the Surgeon General*. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service. NIH Publication No. 86-2874.
- U.S. Department of Health and Human Services. (2000a). *Oral Health in America: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Dental and Craniofacial Research. NIH Publication No. 00-4713.
- U.S. Department of the Census (2005). *Americans Living with Disabilities – 2000 Census*. Available from <http://www.census.gov/prod/2003pubs/c2kbr-17.pdf> .
- U.S. Department of the Census (2006). *Current Population Estimates for 2005*. Accessed 8/14/06 from <http://www.census.gov>

### XIII. APPENDICES

All data in the following tables are from the CDC interim review of HP 2010 goals.

<b>Table A-I: National Goals: <i>Healthy People 2010</i> Objectives (Objective number and description)</b>	<b>Target</b>	<b>2004</b>
<b>21-1) Dental caries (tooth decay) experience</b>		
a) Young children aged 2-4 years	11	23
b) Adolescents aged 15 years	51	59
<b>21-2) Untreated caries (tooth decay)</b>		
a) Young children aged 2-4 years	9	20
b) Adolescents aged 15 years	15	16
c) Adults aged 35-44 years	15	26
<b>21-5) Periodontal (gum) diseases, adults aged 35-44 years</b>		
a) Gingivitis aged 35-44 years	41	48
b) Destructive periodontal (gum) diseases, aged 35-44 years	14	20
<b>21-8) dental sealants</b>		
a) Adolescents aged 14 years (first and second molars)	50	14
<b>21-11) Use of oral health care system by adult residents in long-term care facilities</b>	<b>25</b>	<b>19</b>
<b>21-12) Low-income children and adolescents receiving preventive dental care during past 12 months, aged 0-18 years</b>	<b>57</b>	<b>31</b>
<b>21-13) School-based health centers with oral health component, K-12</b>		
a) Dental sealants		DNC
b) Dental care		DNC
<b>21-15) System for recording and referring infants and children with cleft lip and cleft palate, all</b>	<b>51</b>	<b>23</b>
<b>21-16) Oral health surveillance system, all</b>	<b>51</b>	<b>0</b>
<b>21-17) Tribal, state, and local dental programs with a public health trained director, all</b>		
a) State and local		DNC
b) Tribal and Indian Health Service		DNC

<b>Table A-II: Americans Aged 35-44 Years, percentage with:</b>	<b>Gingivitis</b>	<b>Destructive Periodontal Disease</b>
<b><i>Healthy People 2010</i> Target</b>	41	14
Current Level	48	20
<b>Race</b>		
American Indian or Alaska Native	96	59
Black or African American	51	33
White	47	20
Mexican American	61	16

<b>Sex</b>		
Female	45	14
Male	52	26
<b>Education Level (head of household)</b>		
Less than high school	60	35
High school graduate	52	28
At least some college	42	15

<b>Table A-III: Proportion of Oral Cancer Cases Detected at Earliest Stage</b>	<b>United States (%)</b>
<b>Healthy People 2010 Target</b>	<b>50</b>
Current Level	35
<b>Race or Ethnicity</b>	
American Indian or Alaska Native	24
Asian or Pacific Islander	29
Black or African American	21
White	38
Hispanic or Latino	36
Not Hispanic or Latino	34
<b>Sex</b>	
Female	40
Male	33

<b>Table A-IV: Children With Dental Sealants on Molars</b>	<b>Age 8, U.S.%</b>	<b>Age 14, U.S.%</b>
<b>Healthy People 2010 Target</b>	<b>50</b>	<b>50</b>
Current Level	28	14
<b>Race or Ethnicity</b>		
American Indian or Alaska Native	63	46
Native Hawaiian or other Pacific Islander	20	
Black or African American	11	5
White	26	19
Mexican American	10	
Not Hispanic or Latino	25	
Black or African American, not Hispanic or Latino	23	14
White, not Hispanic or Latino	35	16
<b>Sex</b>		
Female	31	12
Male	25	17
<b>Education Level (head of household)</b>		
Less than high school	17	4
High school graduate	12	6
At least some college	35	28
<b>Select Populations</b>		
3 <sup>rd</sup> grade students	26	

<b>Table A-V: Adults aged 40+ who have had an oral cancer exam within 12 months</b>	<b>United States (% 1998)</b>
<b>Healthy People 2010 Target</b>	<b>20</b>
Current Level	13
<b>Race or Ethnicity</b>	
Asian or Pacific Islander	12
Asian	12
Black or African American	7
White	14
Hispanic or Latino	6
Not Hispanic or Latino	14
Black or African American, not Hispanic or Latino	6
White, not Hispanic or Latino	15
<b>Sex</b>	
Female	14
Male	12
<b>Education Level (head of household)</b>	
Less than high school	5
High school graduate	10
At least some college	19