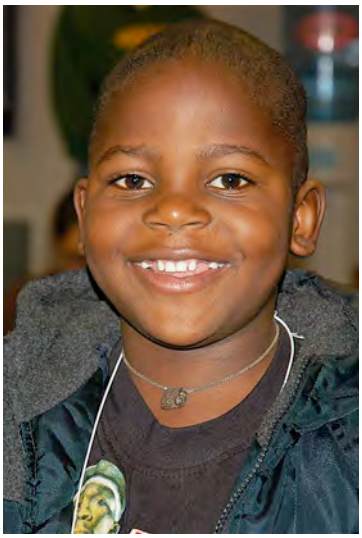

Burden of Oral Disease

in Vermont

Sept. 3, 2013

VERMONT
DEPARTMENT OF HEALTH

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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 and is much more than just healthy teeth. Oral refers to the whole mouth, including 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, but it also means being free of chronic oral pain conditions, 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 on the most basic human functions such as chewing, swallowing, speaking, smiling, kissing, 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.

This report summarizes the most current information available on the oral disease burden of people in Vermont. 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. Comparisons are made with national data whenever possible and to the *Healthy People 2020* objectives when appropriate. For some conditions, national data, but not state data, are available at this time. It is hoped that this information will help raise awareness of the need for monitoring the oral health burden in Vermont and guide efforts to prevent and treat oral diseases and enhance the quality of life of Vermont's residents.

BACKGROUND

Vermont is a small and rural state in New England. It is located east of New York, west of New Hampshire, north of Massachusetts, and south of Quebec, Canada.

In 2011 the estimated population of Vermont was 626,431, a 2.8 percent increase from 2000. The majority of the population in Vermont is Caucasian (95.5%), followed by Asian (1.4%) and Black (1.1%). Ninety-one percent of Vermonters were high school graduates or higher, as compared to the 85.4 percent in the U.S. Vermont also had a higher percentage of adults with a Bachelor's degree or higher (33.8%) than the U.S. population (28.2%) [U.S. Census Bureau, quickfacts.census.gov].

Vermont had a median household income of $53,422, slightly higher than the median U.S. household income of $52,762, according to 2007-2011 American Community Survey 5-year estimates. Similarly, the percentage of people living below the poverty level was three percentage points below the U.S. average [U.S. Census Bureau, quickfacts.census.gov].

Vermont has a lower rate people without health insurance than the U.S. average (9% vs. 16%, respectively). Twenty-four percent of Vermonters receive Medicaid benefits, compared to 16 percent nationally. The percent covered by employer-based insurance plans (49%) and Medicare (13%) are the same as the U.S. [The Kaiser Family Foundation, statehealthfacts.org].

EXECUTIVE SUMMARY

The Burden of Oral Disease in Vermont is a comprehensive summary of oral health data available in the state, with comparisons to national data and *Healthy People 2020* targets whenever possible. It highlights the importance of good oral health, Vermont's progress in improving oral health, and remaining oral health barriers and disparities for Vermonters.

The Burden of Oral Diseases

The 2009-2010 Basic Screening Survey indicated that Vermont children in grades 1-3 met the *Healthy People 2020* goals for caries experience (cavities) and untreated decay. The likelihood of caries experience and/or untreated decay, however, is significantly higher among children with certain demographic characteristics, such as low socioeconomic status. Most children without a dental visit in the past year were enrolled in Medicaid and four percent of third graders with Medicaid had urgent unmet dental needs.

Vermont has reached some of the *Healthy People 2020* goals for adults, including tooth loss among adults aged 45-64 and the percentage of edentulous adults aged 65-74. While the percent of adults 65 and older who have lost all their teeth has decreased over the past decade, there are significant disparities by education and income.

The oral cancer death rate in Vermont is higher than the national average, even though Vermont has a higher early detection rate of oral cancer than the national average. There has been no improvement in either the incidence or the mortality rate for oral cancer in the past decade.

One in three women who needed to see a dentist for a problem during their pregnancy did not receive dental care. Those who did not receive care tended to be younger, have less than a high school education, have a low income, be unmarried, and a WIC or Medicaid recipient.

Special populations, such as children and adults with disabilities, need more attention to minimize the gaps that exist in oral health care utilization. Disabled children and adults are less likely to visit a dentist. Parents of children with special health care needs were twice as likely to report that their child had two or more oral health problems in the past six months. Adults with disabilities report more tooth loss compared to non-disabled adults. Moreover, 11 percent of disabled adults reported all their teeth had been removed, compared to three percent of non-disabled adults.

Large out-of-pocket expenses for dental care are a barrier to care. The 2010 Vermont Health Care Expenditure Report found that while 14 percent of all health care expenditures are paid out-of pocket, it is 60 percent for dental services.

Oral health and general health are integral to each other. Among adults who did not visit a dentist in the past year, 47 percent reported their general health as being fair or poor, 46 percent were smokers, and 47 percent reported having cardiovascular disease.

Disparities in oral health exist among many Vermonters by gender, geographic location, and socioeconomic status. The burden of oral disease among certain populations is unknown and should be addressed. This includes the elderly, preschool children, and adolescents.

Risk and Protective Factors Affecting Oral Diseases

Community water fluoridation is effective in preventing dental caries. The cost of providing fluoridated water is estimated at slightly over one dollar per person annually. For every dollar spent on community water fluoridation, as much as $38 is saved in costs associated with dental care. Vermont has not reached the *Healthy People 2020* goal of 79.6 percent of the population with community water systems receiving optimally fluoridated water. In Vermont 57 percent of the population falls into this category.

Beginning in June 2010, primary care providers have been able to bill for fluoride varnish procedures for Medicaid-eligible children ages 0-5. Although this is a new program, the number of claims filed by non-dentist practitioners has been increasing.

The 2009-2010 BSS determined that 53 percent of children in Grades 1-3 had dental sealants, exceeding the *Healthy People 2020* target. For 3rd graders the percentage of children with sealants increases to 64 percent.

In 2010, three-quarters of Vermont adults had their teeth cleaned in the previous 12 months, a rate slightly above the U.S. national rate of 69 percent. Adults with more education and higher annual household incomes are more likely to regularly have their teeth cleaned than those with less education and income.

According to the 2009-2010 Vermont Pregnancy Risk Assessment Monitoring System (PRAMS) survey, 65 percent of mothers reported having their teeth cleaned by a dentist or hygienist in the year prior to their pregnancies. The lowest prevalence of pre-pregnancy teeth cleaning occurred among mothers younger than 25, with less than a high school education, who are low income, smoked prior to pregnancy, and those with six or more stressors.

The Office of Oral Health collaborates with the Office of Local Health to place a public health dental hygienist in Women, Infant, and Child (WIC) clinics in each of the twelve district offices in order to provide oral health education, oral health risk assessments, fluoride varnish, and referrals for treatment. Currently three district offices employ public health dental hygienists.

Tooth Tutors, who are dental hygienists and dental assistants, also provide important linkages between families and dentists. They identify students who have not accessed oral health care in the past year and connect them to a local dental home. They provide oral health educational programs to school-aged children as part of the Tooth Tutor Program (TTP) by visiting each classroom in participating schools at least once a year to deliver educational programming. About half the elementary schools in Vermont participated in TTP in the 2009-2010 school year.

Provision of Dental Services

In 2011, 368 dentists actively practiced in Vermont, corresponding to 281.2 full time equivalents (FTEs). Despite aggressive recruiting efforts, there has been little increase in number of dentists or FTEs between 1999 and 2011.

The primary care dentist FTE to population ratio was 36.6 per 100,000 population in 2011 and has not changed significantly since 1999 (37.8). There are also wide variations in the ratio by county ranging from 9.8 in Grand Isle County to 44.8 in Rutland County. Of additional concern is the aging of Vermont dentists. The percent of dentists 60 years of age and older has increased from 11 percent in 1999 to 34 percent in 2011. As these dentists leave the workforce it will create a shortage of quality services to all Vermonters and limited access to care.

Eighty-four percent of Vermont's dentists participate at some level in the Medicaid program, however far fewer dentists accept new Medicaid patients than accept new non-Medicaid patients. Utilization of dental care among Medicaid adults is generally low in Vermont despite the high percentage of dentists participating in the Medicaid program. In CY 2011, 29.2 percent of Medicaid eligible adults 21 years and older and 55.5 percent of Medicaid eligible children utilized dental service. The utilization rate of dental care among adults has not changed significantly since 2003, while the rate among children has been rising slowly as preventive care has increased. The rate of restorative care has not declined for children however.

NATIONAL AND STATE OBJECTIVES ON ORAL HEALTH

Oral Health in America: A Report of the Surgeon General 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]. The *Healthy People 2020* is designed to serve as a roadmap for improving the health of all people in the United States during the second 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 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 2020*:

- 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 2020* 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 2020* oral health objectives for the nation and the current status of each indicator for the United States and for Vermont are summarized in Table 1.

Table 1. *Healthy People 2020* Oral Health Indicators, Target Levels, and Current Status in the U.S. and VT.

***Healthy People 2020* Objective**	**Target (percent)**	**National Status (percent) (1999-2004)**	**Vermont Status (percent) (2009-2010)**
OH-1: Dental caries experience			
Children aged 3 to 5 years	30.0	33.3	DNC
Children aged 6 to 9 years	30.0[a]	54.4	33.8
Adolescents aged 13 to 15 years	48.3	53.7	DNC
OH-2: Untreated caries (tooth decay)			
Children aged 3 to 5 years	21.4	23.8	DNC
Children aged 6 to 9 years	25.9	28.8	11.2
Adolescents aged 13 to 15 years	15.3	17.0	DNC
OH-3: Adults with untreated dental decay			
Adults aged 35 to 44 years	25.0	27.8	DNC
Adults aged 65 to 74 years	15.4	17.1	DNC
Adults aged 75 year and older	34.1	37.9	DNC
OH-4: Permanent tooth loss			
Adults aged 45 to 64 years (any)	45.0*	76.4	51.9[g]
Adults aged 65 to 74 years (lost all teeth)	21.6	24.0	14.7[g]
OH-5: Destructive periodontal disease Adults aged 45 to 74 years	11.4	12.7[b]	DNC
C-6: Oral and pharyngeal cancer death rates reduction (per 100,000 population)	2.3	2.5	2.8[f]
OH-6: Early detection of oral and pharyngeal cancers	35.8	32.5[c]	38[a]
TU-1: Reduction of cigarette smoking by adults	10.0*	20.6[e]	20.2[h]
OH-7: Use of oral health care system; all ages	49.0	44.5[c]	DNC
OH-8: Dental services for low-income children and adolescents	29.4	26.7[c]	DNA
OH-9: School-based centers with an oral health component			
Dental Sealants	26.5	24.1[d]	NA
Dental Care	11.1	10.1[d]	NA
Topical Fluoride	32.1	29.2[d]	NA
OH-10: Health Centers with oral health component			
Oral health care program at FQHCs	83	75[c]	87.5[i]
Oral health prevention or care programs at local health dept.	28.4	25.8[e]	25.0[j]
OH-11: Receipt of oral health services at health centers	33.3	17.5[c]	19.2[h]
OH-12: Dental sealants			
Children aged 3 to 5 years on one or more primary molar	1.5	1.4	DNC
Children aged 6 to 9 years on one or more permanent molar	28.1	25.5	53.2
Children aged 13 to 15 years	21.9	19.9	DNC
OH-13: Community water fluoridation	65.0*	72.4[e]	56.2[i]
OH-14: Preventive dental screening and counseling (Dev.)	n/a	n/a	DNC
OH-15: Systems that record cleft lip/palate and referrals (Dev.)	n/a	n/a	Y
OH-16: Oral and craniofacial State-based health surveillance system	51 states and District of Columbia	32 states [f]	Y

OH-17: Health agencies with a dental professional directing dental program			
States and local health agencies	25.7	23.4[f]	Y
Indian health service areas and Tribal health programs	12 programs	11 programs [g]	NA

Sources:
DNC=Data not collected.
DNA=Data not available.
NA=Not applicable.
*reflects Healthy Vermonter 2020 goals which are different from the national goals.
[a] 2000-2009 combined.
[b] 2001-2008 data.
[c] 2007 data.
[d] 2007-2008 data.
[e] 2008 data.
[f] 2009 data.
[g] 2010 data.
[h] 2011 data.
[i] 2012 data.
[J] 2013 data.

Table 1 Sources:
U.S. Department of Health and Human Services. *Healthy People 2020.*Available at http://www.healthypeople.gov/2020/topicsobjectives2020/default.aspx

THE BURDEN OF ORAL DISEASES

Prevalence of Disease and Unmet Needs

Early Childhood

Nationally, dental caries (tooth decay) is four times more common than childhood asthma and seven times more common than hay fever. Dental caries 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, dental caries can result in loss of tooth structure, inadequate tooth function, unsightly appearance, pain, infection, and tooth loss.

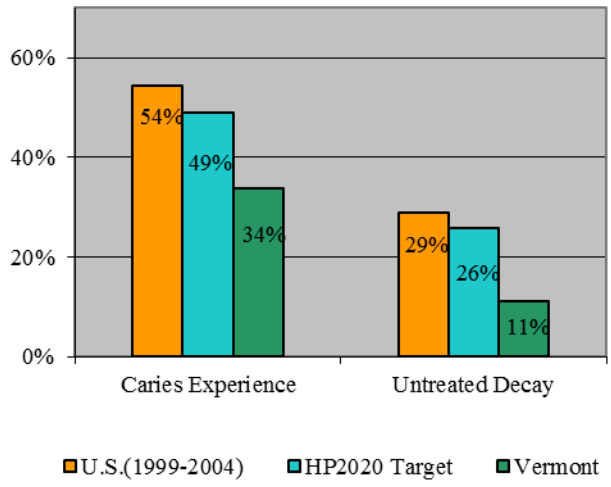
The prevalence of decay in children is measured by assessing caries experience (if they have ever had decay and now have fillings), untreated decay (active unfilled cavities), and urgent care (reported pain or a significant dental infection that requires immediate care).

An analysis of Medicaid claims for children aged 0-5 years in Vermont found that a total of 2,201 children underwent dental restoration, extractions or endodontic treatment (e.g., root canals) in 2009 [Vermont Department of Health 2012]. Of these children, 76 percent of the mothers were enrolled in WIC either prenatally or postpartum. In an effort to inform Vermonters about the importance of good oral health for both pregnant mothers and their babies, the Vermont Department of Health Office of Oral Health has been working closely with the Office of Local Health to place dental hygienists in WIC clinics where they can provide oral health education, oral health risk assessments, and apply fluoride varnish for children in participating families. Currently, three out of 12 local health district offices employ dental hygienists who work with WIC recipients.

Children

Caries experience and untreated decay are monitored in Vermont as consistent with the National Oral Health Surveillance System (NOHSS), which allows comparisons with other states and with the nation. According to the most recent Basic Screening Survey (BSS) conducted in the 2009-2010 school year, 34 percent of children surveyed in grades 1-3 had a history of caries, which was better than the *Healthy People 2020* target of 49.0 percent. Compared to the 2002-2003 BSS, this is a 6 percentage point decrease. Vermont also succeeded in reducing the percentage of children with untreated decay. Only 11.2 percent of children in grades 1-3 had active decay present in their mouth, which also surpassed the *Healthy People 2020* target of 25.9 percent. Again, compared to the 2002-2003 BSS, this was a 5 percentage point decrease. For comparisons of caries experience and untreated decay among the U.S., Vermont, and the *Healthy People 2020* target, see Figure 1.

Figure 1. Dental Caries Experience and Untreated Decay Among 1st-3rd grade children in Vermont, the U.S. and the *Healthy People 2020* Target.



VT Data Source: BSS 2009-2010.

Dental caries is not uniformly distributed in the United States or in Vermont. Some groups are more likely to experience the disease and are less likely to receive treatment. Caries experience and untreated decay, as well as the need for urgent dental care, are more prevalent among children whose mothers have a high school education or less. The most recent data for the 1st-3rd grade children in Vermont by mothers' education level are summarized in Table 2.

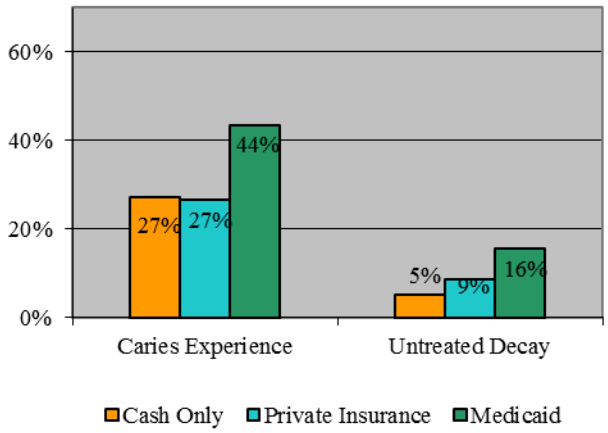
Table 2. Dental Caries Experience, Untreated Dental Decay, and Urgent Need for Dental Care Among 1st-3rd Grade Children in Vermont by Education Level of the Mothers.

	Caries Experience	**Untreated Decay**	**Urgent Need for Care**
Total	33.8 %	11.2 %	1.1 %
Mother's Educational Level			
High School or Less	51.9 %	20.2 %	3.0 %
At Least Some College	28.0 %	8.2 %	0.5 %

Data Source: 2009-2010 BSS.

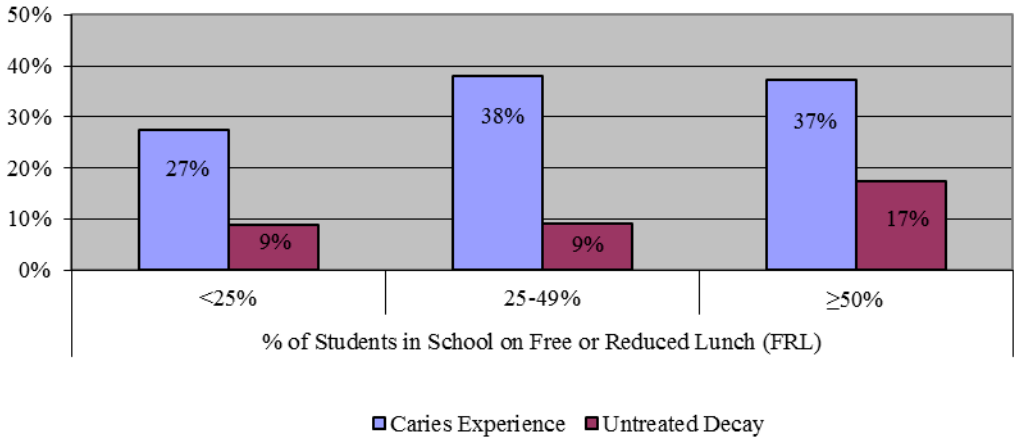
The 2009-2010 BSS also illustrates that type of insurance is associated with prevalence of caries experience and/or untreated decay. Figure 2 shows that Medicaid eligible children have a considerably higher percentage (44 percent) of caries experience and untreated decay (16 percent) than children with private insurance or private pay (27 percent and 9 percent; 27 percent and 5 percent, respectively). Among the children covered by private insurance or cash, fewer (13 percent) had three or more teeth with decay or fillings than children with Medicaid (25 percent). The oral health status of children screened by Free/Reduced Lunch (FRL) status of school is presented in Figure 3. Children who attend schools with a higher percentage of FRL participants generally have a higher percentage of caries experience and untreated decay.

Figure 2. Oral Health Status of Children in Vermont Screened by Insurance Coverage Type. 2009-2010.



Data Source: 2009-2010 BSS.

Figure 3. Oral Health Status of Children Screened by FRL Status of School. 2009-2010.



Data Source: BSS 2009-2010.

In the same survey parents reported about 95 percent of children had a dental visit at least annually. A closer examination, however, shows that children categorized as going to the dentist less than once a year or never having gone to the dentist were mostly Medicaid eligible children (50 percent) and/or children who attend school with more than 50 percent FRL participants (63.2 percent).

Although Vermont has reached the *Healthy People 2020* target for children with caries experience and untreated decay, disparities among certain populations clearly exist. Ninety-four percent of parents of Medicaid eligible children reported that their child had regular dental visits in the past year (2009-2010 BSS). Yet caries experience is 1.6 times more prevalent, and untreated decay is two times more likely among Medicaid children than non-Medicaid children. None of the non-Medicaid children were found to have an urgent need for dental care, while four percent of the 3rd graders on Medicaid had urgent dental needs. More focus and much effort are needed to eliminate this disparity.

Adults

Dental Caries

People are susceptible to dental caries throughout their lifetime. Like children and adolescents, adults can experience new decay on the crown (enamel covered) portion of the tooth. But adults can also develop caries 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 caries affects 50 percent of adults aged 75 years or older [USDHHS 2000a].

Tooth Loss

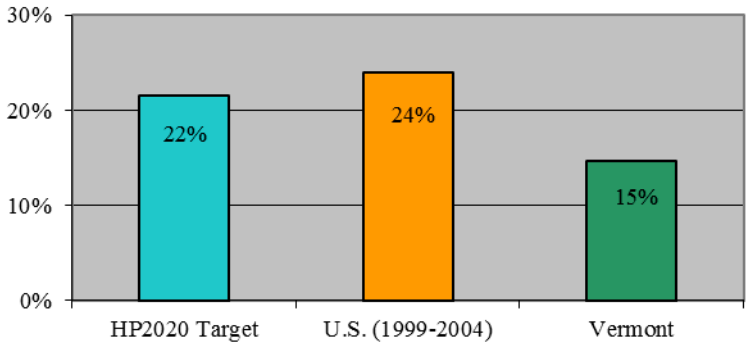
A full dentition is defined as having 28 natural teeth, exclusive of third molars (the wisdom teeth) and teeth removed for orthodontic treatment or as a result of trauma. Most persons can keep their teeth for life with adequate personal, professional, and population-based preventive practices. As teeth are lost, a person's ability to chew and speak decreases and interference with social functioning can occur. 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.

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 as great as for whites. Among all predisposing and enabling factors, low educational level often has been found to have the strongest and most consistent association with tooth loss.

In 2010, 44 percent of Vermont adults reported they have had at least one tooth extracted. Seventy-four percent of those who had less than high school education had at least one tooth extracted compared to 31 percent of college graduates. Similarly, 67 percent of those with a household income less than $15,000 per year had at least one tooth extracted compared to 34 percent of those with a household income greater than $50,000 per year.

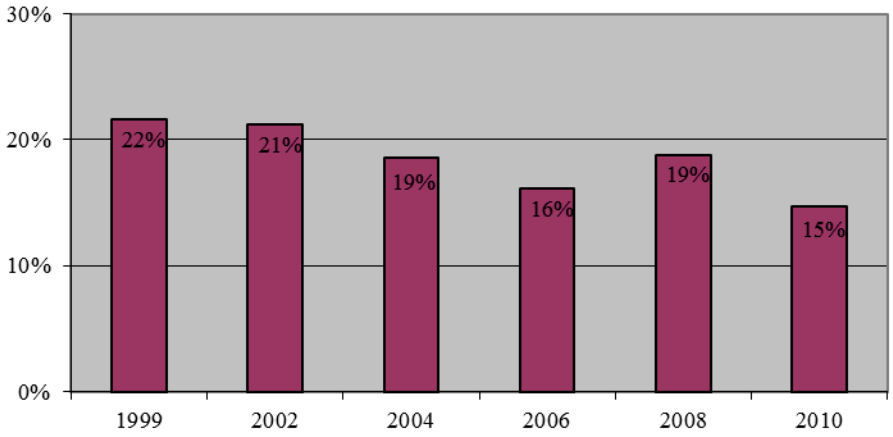
Among adults aged 65-74 in Vermont 14.7 percent have lost all their natural teeth compared to 24 percent nationally (1999-2004), and the proportion of edentulous adults has been decreasing consistently over an 11-year time span in Vermont (Figures 4 and 5).

Figure 4. Percentage of Adults aged 65-74 Who Lost All of Natural Teeth.



VT Data Source: BRFSS 2010.

Figure 5. Percentage of VT Adults aged 65-74 Who Lost All Natural Teeth. 2000-2010.

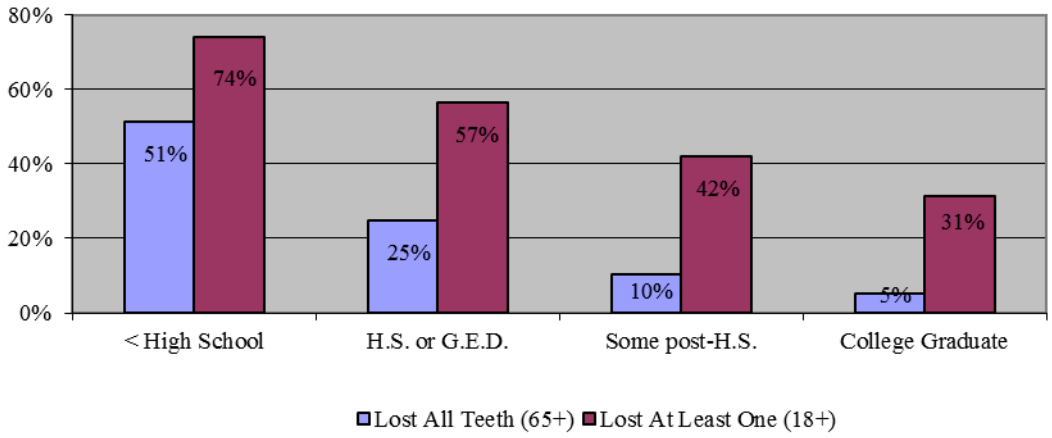


Data Source: BRFSS.

Low educational attainment and low income level continue to predict tooth loss (Figures 6 and 7).

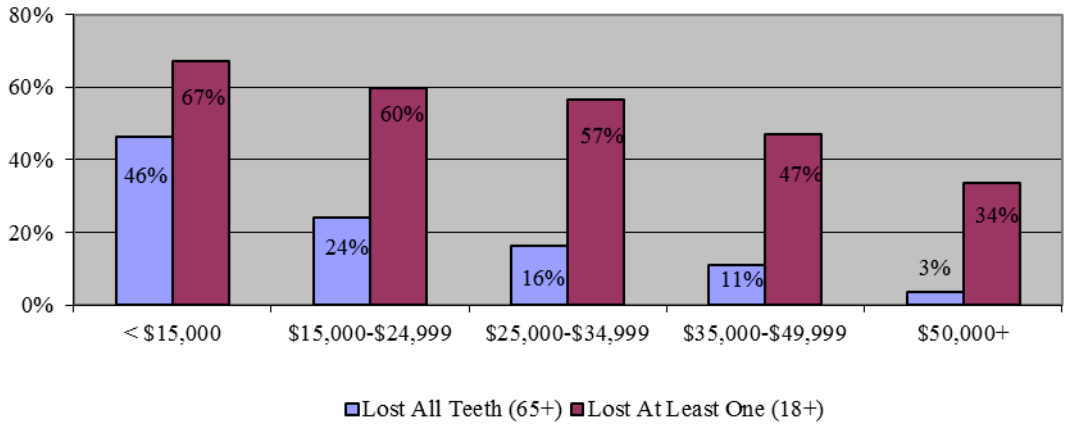
For those adults aged 65 and older, 51 percent of those with less than a high school education and 46 percent of those with incomes less than $15,000 per year were edentulous compared to 5 percent of college graduates and 3 percent of those with a household income greater than $50,000 per year.

Figure 6. Vermont Adults Tooth Loss, by Education Level. 2010.



Data Source: BRFSS 2010.

Figure 7. Vermont Adults Tooth Loss, by Income Level. 2010.



Data Source: BRFSS 2010.

Periodontal (Gum) Diseases

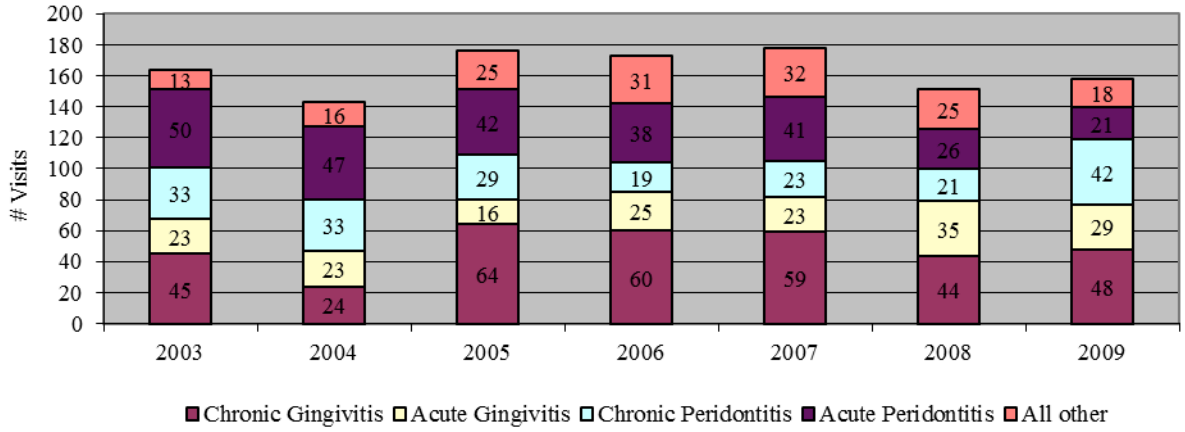
Gingivitis is characterized by localized inflammation, swelling, and bleeding gums without a loss of the bone that supports the teeth. Gingivitis is usually reversible with good oral hygiene. Daily removal of dental plaque from the teeth is extremely important to prevent gingivitis, which can progress 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 & 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. Cases of gingivitis likely will remain a substantial problem and may increase as tooth loss from dental caries 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.

The prevalence of gingival and periodontal disease is not available in Vermont; however the number of Emergency Department visits for gingival and periodontal disease is known and can serve as a marker for disease. Between 2003 and 2009, there was an average of 164 Emergency Department visits by Vermont residents to Vermont and New Hampshire hospitals. This constitutes about 2.7 percent of all the Emergency Department visits. The figure below (Figure 8) describes the Emergency Department visits between 2003 and 2009 by types of gingival and periodontal diseases. Emergency Department visits for gingival and periodontal diseases are most prevalent in the 25-34 age group (46 percent).

Figure 8. Gingival and Periodontal Diseases Emergency Dept. Visit for Vermonters at VT & NH Hospitals. 2003-2009.



Data Source: Vermont Uniform Hospital Discharge Data Set. 2003-2009.

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 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) than among women (6.6), as was the mortality rate (4.1 vs. 1.6).

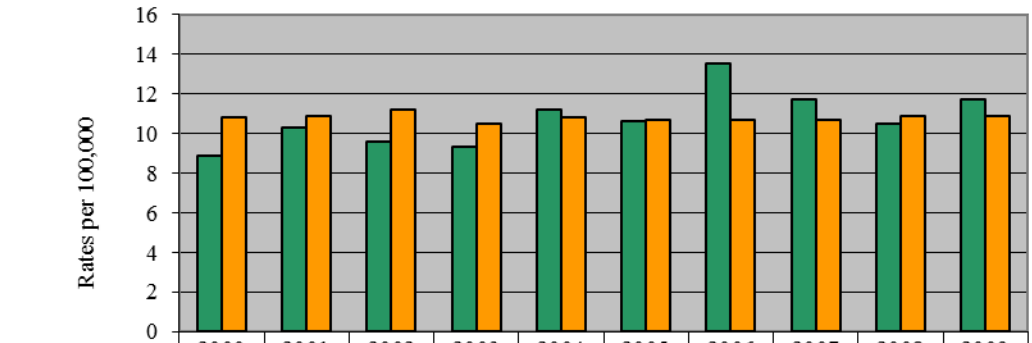
Survival rates for oral cancer have not improved substantially over the past 25 years. More than 40 percent of persons diagnosed with oral cancer die within five years of diagnosis [Ries et al. 2004], although survival varies widely by stage of disease when diagnosed. The 5-year relative survival

rate for persons with oral cancer diagnosed at a localized stage is 81 percent. In contrast, the 5-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. 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 et al. 1988]. The use of tobacco, including smokeless tobacco [USDHHS 1986; IARC 2007] and cigars [Shanks & Burns 1998] also increases the risk of oral cancer. Dietary factors, particularly low consumption of fruit, and some types of viral infections also have been implicated as risk factors for oral cancer [McLaughlin et al. 1998; De Stefani et al. 1999; Levi 1999; Morse et al. 2000; Phelan 2003; Herrero 2003]. Radiation from sun exposure is a risk factor for lip cancer [Silverman et al. 1998].

The incidence rates of cancers of the oral cavity and pharynx for Vermont and the United States between 2000 and 2009 are shown in Figure 9. Vermont follows a similar pattern as the national trends. Over a period of 10 years, there has been little improvement in the incidence rates. Similar to national data, the incidence is higher in males than in females, and neither males nor females in Vermont show any decreases in incidence rates between 2000 and 2009 (Figure 10).

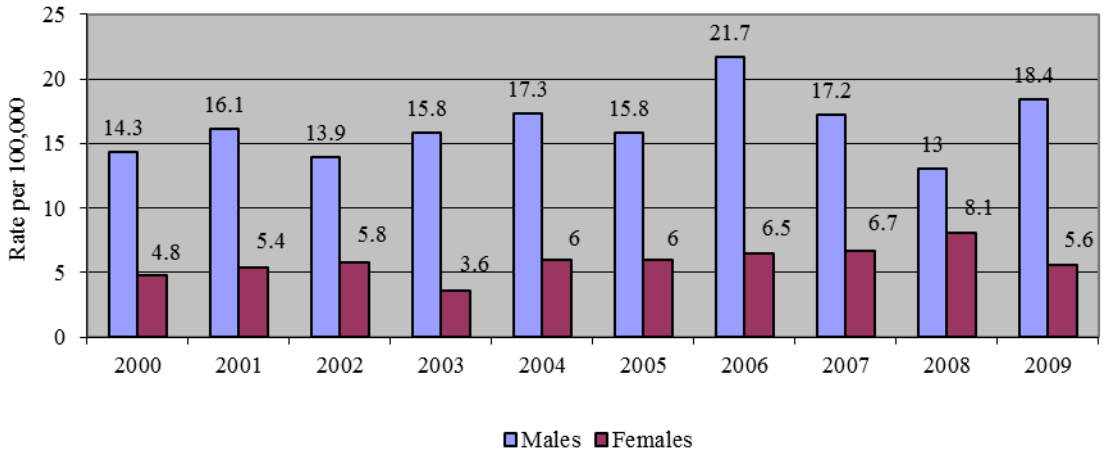
Figure 9. U.S. and Vermont Incidence Rates, Oral & Pharyngeal Cancer.



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Vermont	8.9	10.3	9.6	9.3	11.2	10.6	13.5	11.7	10.5	11.7
U.S. (SEER 9)	10.8	10.9	11.2	10.5	10.8	10.7	10.7	10.7	10.9	10.9

VT Data Source: Vermont Cancer Registry. 2000-2009.

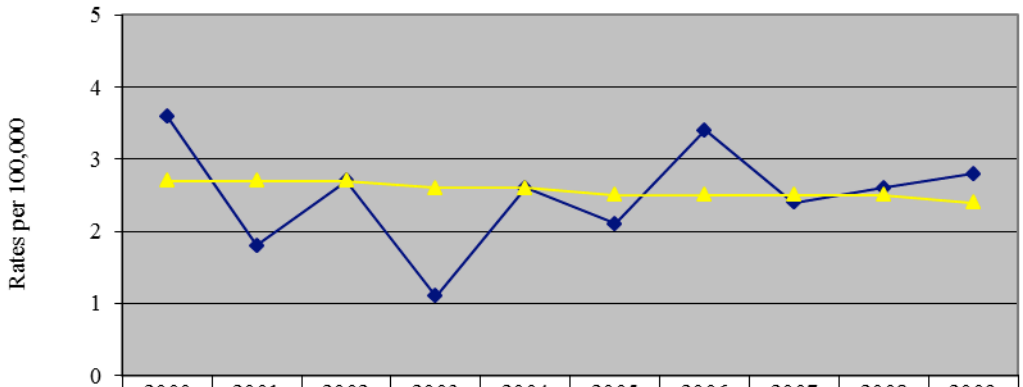
Figure 10. Age-adjusted Incidence Rates of Oral & Pharyngeal Cancers, Vermont Males and Females. 2000-2009.



Data Source: Vermont Cancer Registry. 2000-2009.

The oral cancer mortality rate for Vermont and the United States is shown in Figure 11. While the U.S. is following a pattern of slow decline in death rates, Vermont has shown no improvement. Vermont needs to focus on the improvement of incidence and mortality rates of oral and pharyngeal cancers in the state.

Figure 11. U.S. and Vermont Mortality Rates, Oral & Pharyngeal Cancer. 2000-2009.



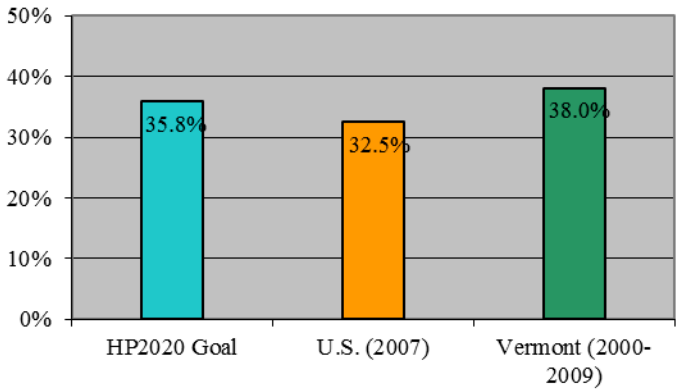
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Vermont All	3.6	1.8	2.7	1.1	2.6	2.1	3.4	2.4	2.6	2.8
U.S. (SEER 9) All	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.5	2.5	2.4

VT Data Source: Vermont Cancer Registry. 2000-2009.

Based on available evidence that oral cancer diagnosed at an early stage has a better prognosis, *Healthy People 2020* objective OH-6 specifically addresses early detection of oral cancer to "Increase the proportion of oral and pharyngeal cancers detected at the earliest stage". Data for Vermont and the United States on the proportion of oral cancer cases detected at the earliest stage

(stage I, localized) are presented in Figure 12. Vermont has a slightly better detection rate of 38 percent than the *Healthy People 2020* target of 35.8 percent.

Figure 12. Oral & Pharyngeal Cancer Cases Detection Rate At the Earliest (Localized) Stage.



VT Data Source: Vermont Cancer Registry. 2000-2009.

Disparities

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. populations. As reported above, these groups tend to be more likely than non-Hispanic whites to experience dental caries in some age groups, are less likely to have received treatment for it, 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.

Women's Health

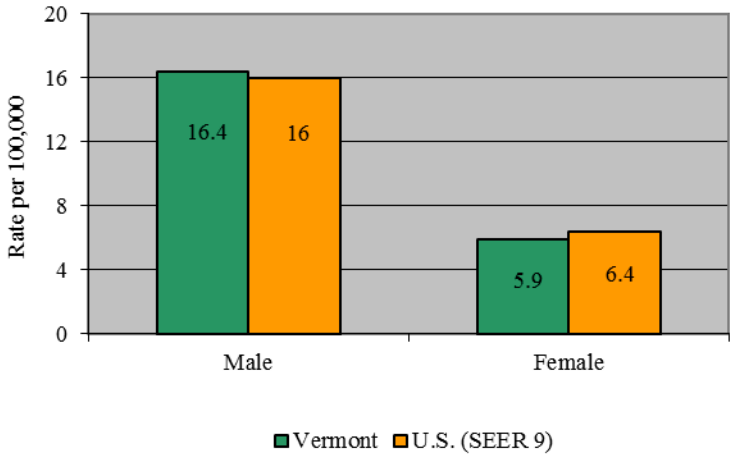
Most oral diseases and conditions are complex and are the product of interactions between genetic, socioeconomic, behavioral, environmental, and general health influences. Multiple factors may act synergistically to place some women at higher risk of oral diseases. For example, the comparative longevity 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 affect their interaction with dental care providers and could affect treatment recommendations as well.

Many, but not all, statistical indicators show women to have better oral health status than do men [Redford 1993; USDHHS 2000a]. Women are less likely than men at each age group 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, respectively. 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.

In Vermont, women have been shown to have slightly higher rates of visiting a dentist within the past year than men. Women are less likely to be current smokers than men. Consequently, the incidence rate of oral cancer is much lower among women than men (see Figure 13). Historically women in Vermont visit emergency department for disorders of teeth and jaws less frequently than men, though that gap is getting smaller every year. Diseases of tooth development and eruption, dentofacial anomalies including malocclusion, and diseases of the jaws are more common among women than men as reasons for emergency department visits.

Figure 13. Oral and Pharyngeal Cancer Incidence Rate by Gender in the U.S. and Vermont. 2000-2009.



VT Data Source: Vermont Cancer Registry. 2000-2009.

The practice of good oral hygiene is particularly important for pregnant mothers. During their pregnancies, women are at risk for pregnancy gingivitis affecting up to 50 percent of pregnant women [AAP 2008]. In addition, there is some research that suggests that periodontal disease is associated with preterm low birth weight babies [Offenbacher et al. 2001]. However, in a more recent clinical trial it was found that the treatment of periodontal disease during pregnancy improves periodontal disease and is safe, but does not significantly alter the rates of preterm birth [Michalowicz et al. 2006].

Sixty-one percent of women who recently had a baby reported they went to a dentist or dental clinic during their most recent pregnancy, according to the 2009-2010 Pregnancy Risk Assessment Monitoring System (PRAMS) survey. Approximately 24 percent of mothers, or 1,400 women, indicated they needed to see a dentist for a problem during their pregnancy. Only 65 percent of the women with a dental problem indicated that they went to a dentist or dental clinic during pregnancy; this indicates that one in three new mothers did NOT receive dental care when they needed it.

Groups less likely to have a visit when they had a problem include mothers who are under age 25, without a high school degree, living in poverty, unmarried mothers, and WIC or Medicaid recipients.

Mothers who had six or more stressors (emotional, financial, partner, and traumatic stresses) during pregnancy and those with unintended pregnancy were less apt to receive prenatal dental care when they had a problem.

Figures 14-19 show the dental visits during pregnancy by different demographics (VT PRAMS 2009-2010).

Figure 14. Mothers Who Needed to See a Dentist by Age Group. 2009-2010.

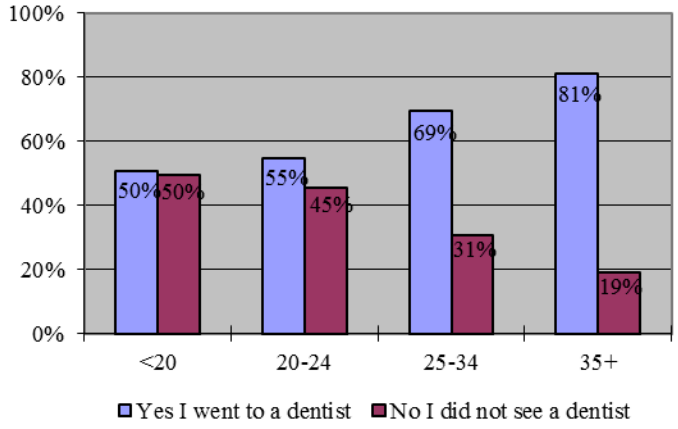


Figure 15. Mothers Who Needed to See a Dentist by Education Level. 2009-2010.

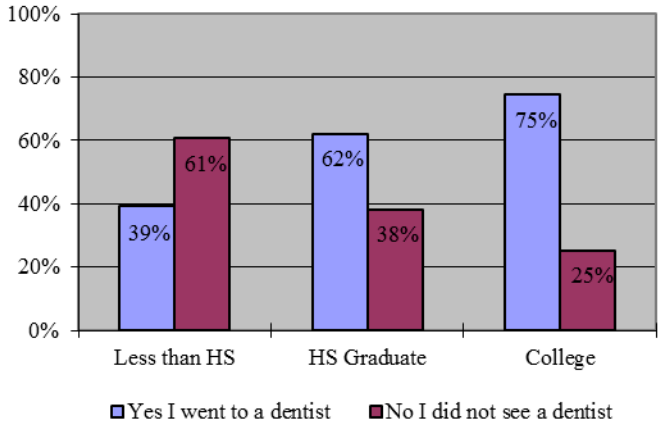


Figure 16. Mothers Who Needed to See a Dentist by Poverty Level. 2009-2010.

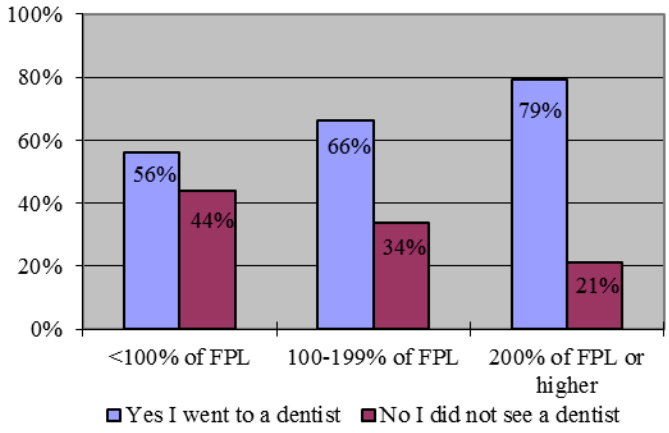


Figure 17. Mothers Who Needed to See a Dentist by Medicaid Status. 2009-2010.

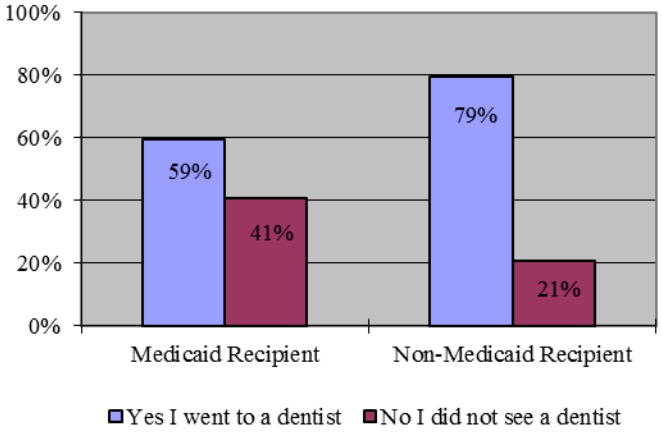


Figure 18. Mothers Who Needed to See a dentist by WIC Enrollment Status. 2009-2010.

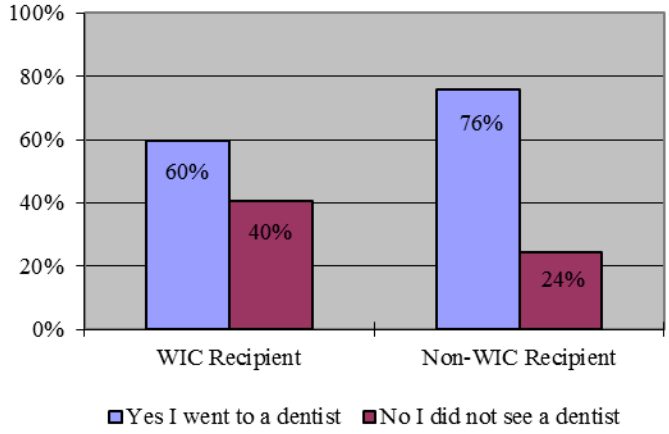
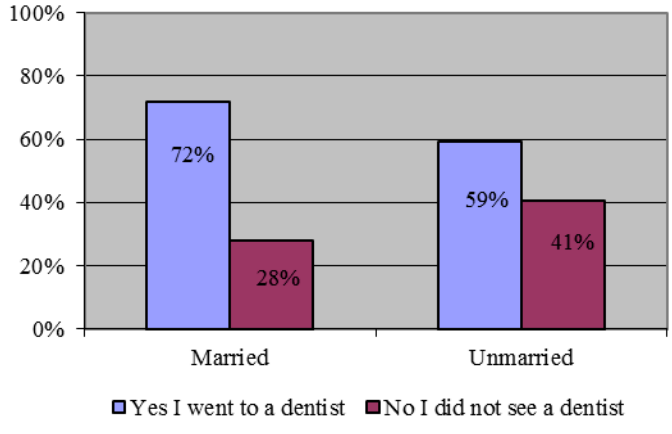


Figure 19. Mothers Who Needed to See a Dentist By Marital Status. 2009-2010.



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 an inability to receive the personal and professional health care needed to maintain oral health. More than 54 million persons are defined as disabled under the Americans with Disabilities Act, including almost 1 million children under 6 years of age and 4.5 million children between 6 and 16 years of age.

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 needs for periodontal disease treatment than 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. Caries rates among people with disabilities vary widely among people with disabilities but overall their caries rates are higher than those of people without disabilities [USDHHS 2000a].

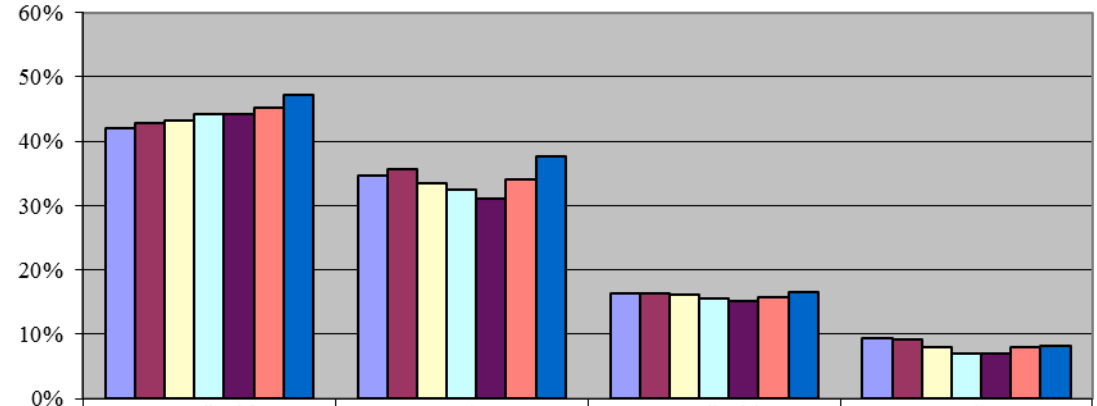
Children

Between 2006 and 2010, there were 36 babies born with cleft lip with and without cleft palate in Vermont, a rate of 11.4 per 10,000 live births. Similarly, there were 22 babies born with cleft palate without cleft lip during the same timeframe, a rate of 6.9 per 10,000 live births [VDH Birth Information Network Dec., 2012]. Recently, CDC and the National Birth Defects Prevention Study (NBDPS) reported that smoking is a risk factor for craniofacial defects [Honein MA, Rasmussen SA, Reefhuis J, Romitti PA, Lammer EJ, Sun L. 2007]. In the PRAMS 2010 survey, 31.4 percent of mothers reported they smoked cigarettes in the three months before they became pregnant. More early prevention efforts are needed, especially among young mothers with less education and lower household income who are more likely to smoke during pregnancy.

The 2007 National Survey of Children with Special Health Care Needs (NS-CSHCN) found that 72 percent of children with special health care needs (CSHCN) aged 1-17 in Vermont are reported to have teeth that are in excellent or very good condition. Among non-CSHCN, a much higher percent (83.5) reported having teeth in excellent or very good condition. The incidence rate of having two or more oral health problems in the past six months was higher among CSHCN than non-CSHCN (8.4 percent vs. 4.2 percent, respectively). Moreover, the NS-CSHCN 2009-2010 reported 6.9 percent of CSHCN had unmet needs for preventive dental care and 5.2 percent had other unmet dental care needs.

Approximately 2 percent of Medicaid enrolled children aged 0-20 is also enrolled in the Vermont Children with Special Health Needs Program and/or Family Infant and Toddler Program. For both preventive and restorative dental care, children with special health needs receive much less care than the other Medicaid children (Figure 20).

Figure 20. Dental Service Utilization for Medicaid Eligible Children and Special Needs Children, Ages 0-20. CY2003-2009.



	Preventive		Restorative	
	Medicaid	CSHN/FITP	Medicaid	CSHN/FITP
2003	42.1%	34.7%	16.3%	9.4%
2004	42.9%	35.6%	16.4%	9.1%
2005	43.2%	33.5%	16.2%	7.9%
2006	44.3%	32.5%	15.6%	7.0%
2007	44.3%	31.1%	15.2%	7.0%
2008	45.3%	34.1%	15.8%	8.0%
2009	47.3%	37.7%	16.5%	8.1%

Data Source: Dept. of Vermont Health Access. 2003-2009.

Adults

Adults with disabilities are also less likely to visit a dentist than people without disabilities. In 2010, the prevalence of a dental visit in the past year among disabled adults was 68 percent, whereas it was 76 percent among people without disabilities. Moreover, disabled adults have more teeth removed than the non-disabled group. The 2010 BRFSS reported that 39 percent of disabled people and 61 percent of non-disabled people reported no teeth removed; 31 percent of disabled and 28 percent of non-disabled reported "1 to 5"; 19 percent of disabled and 7 percent of non-disabled reported "6 or more, but not all"; and 11 percent of disabled and 3 percent of non-disabled reported to have lost all of their teeth.

Socioeconomic Disparities

People living in low-income families bear a disproportionate burden from oral diseases and conditions. For example, despite progress in reducing dental caries 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 caries seen in individuals of all ages from poor families is more likely to be untreated than caries in those living above the poverty level.

Nationally, 50 percent of poor children aged 2 to 11 years have one or more untreated decayed primary teeth, compared with 31 percent of children who are not poor [USDHHS 2000a]. Poor adolescents aged 12 to 17 years in each racial/ethnic group have a higher percentage of untreated

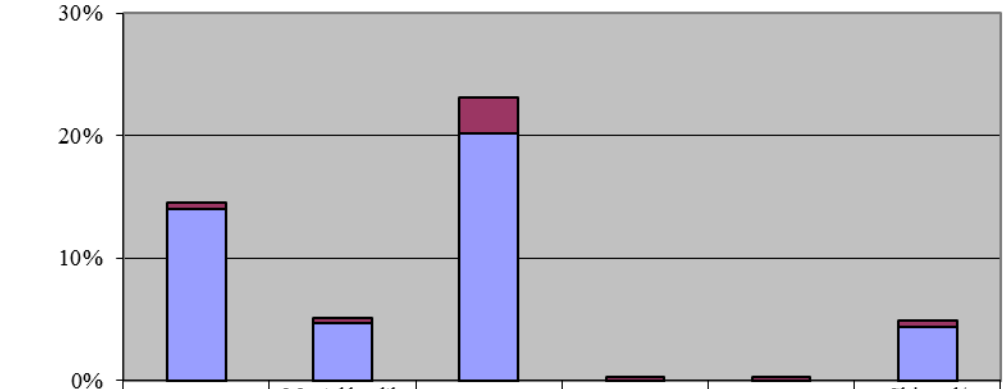
decay in the permanent teeth than does the corresponding group of adolescents who are not poor. The pattern is similar in adults, with the proportion of untreated decayed teeth higher among poor adults than those who are not. At every age, a higher proportion of those at the lowest income level than at the higher income levels have periodontitis. Adults with some college (15 percent) have 2 to 2.5 times less destructive periodontal disease than do adults with high school (28 percent) or with less than high school (35 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 it [USDHHS 2000a]. Among older adults aged 65 years and older, 38.1 percent with less than a high school education were edentulous in 2010, compared with 5.5 percent of older adults with at least some college [CDC 2010].

In Vermont, 51.4 percent of people aged 65 and older with less than a high school education were edentulous in 2010 compared to five percent of college graduates [BRFSS]. In addition, 46.4 percent of adults aged 65 and older with less than $15,000 income level were edentulous, whereas only 3.4 percent with $50,000 + income level were edentulous.

According to the Vermont Household Health Insurance Survey conducted in 2009 by the Vermont Department of Financial Regulation, formerly the Vermont Department of Banking, Insurance, Securities and Health Care Administration (BISHCA), 20.2 percent of uninsured children aged 0-17 did not receive needed dental care including check-ups because their parents could not afford it, compared to 2.9 percent of children who were insured (Figure 21). Similarly, 34.5 percent of uninsured adults aged 18-64 did not seek needed dental care including check-ups because they could not afford it compared to 13.1 percent of those with insurance (Figure 22).

Cost can represent a barrier to health care for many Vermonters, especially those lacking health insurance. In the same survey, respondents were asked how much their family actually paid for medical care out of their own pocket in the last 12 months. Table 3 summarizes the responses by primary insurance type.

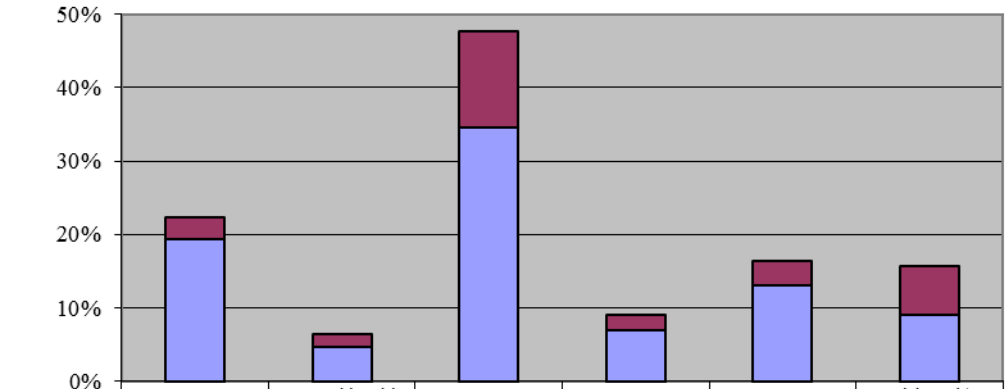
Figure 21. Percentage of Children (0-17) Who Did NOT Get Needed Medical Care Because They Could Not Afford, by Insurance Status. 2009.



	Medical care from Dr.	Mental health care or counseling	Dental care incl.checkups	A diagnostic test	Prescription medicines	Skipped/ smaller amt.Rx
Insured	0.5%	0.4%	2.9%	0.3%	0.3%	0.5%
Uninsured	14.0%	4.7%	20.2%	0.0%	0.0%	4.4%

Data Source: Vt. Dept. of Financial Regulation (formerly BISHCA) 2009.

Figure 22. Percentage of Adults (18-64) Who Did NOT Get Medical Care Because They Could Not Afford It, by Insurance Status. 2009.



	Medical care from Dr.	Mental health care or counseling	Dental care incl.checkups	A diagnostic test	Prescription medicines	Skipped/ smaller amt.Rx
Insured	3.0%	1.9%	13.1%	2.0%	3.3%	6.6%
Uninsured	19.4%	4.6%	34.5%	7.0%	13.0%	9.0%

Data Source: Vt. Dept. of Financial Regulation (formerly BISHCA) 2009.

Table 3. Average Amount Spent Per Year by Vermont Families by Primary Insurance.

	Private	Medicaid	Medicare	Military	Uninsured	Total
Prescription Drugs	$622	$563	$779	$515	$786	$646
Dental and Vision Care	$868	$720	$721	$624	$1,054	$828
All other medical expenses	$1,305	$1,116	$1,066	$863	$2,057	$1,265

Data Source: VT Dept. of Financial Regulation (Formerly BISHCA). 2009.

Vermont has a General Assistance Voucher Program for emergency dental treatment as a means of providing emergency treatment to relieve pain, bleeding and/or infection. It is issued by the Economic Services Division of the Vermont Department for Children and Families. In State FY 2010 over $2 million was spent on emergency treatment. Below is the table that summarizes the use of vouchers for 2009-2010 (Table 4).

Table 4. GA Voucher Claims Utilized for Dental Services from July 2009 - July 2010.

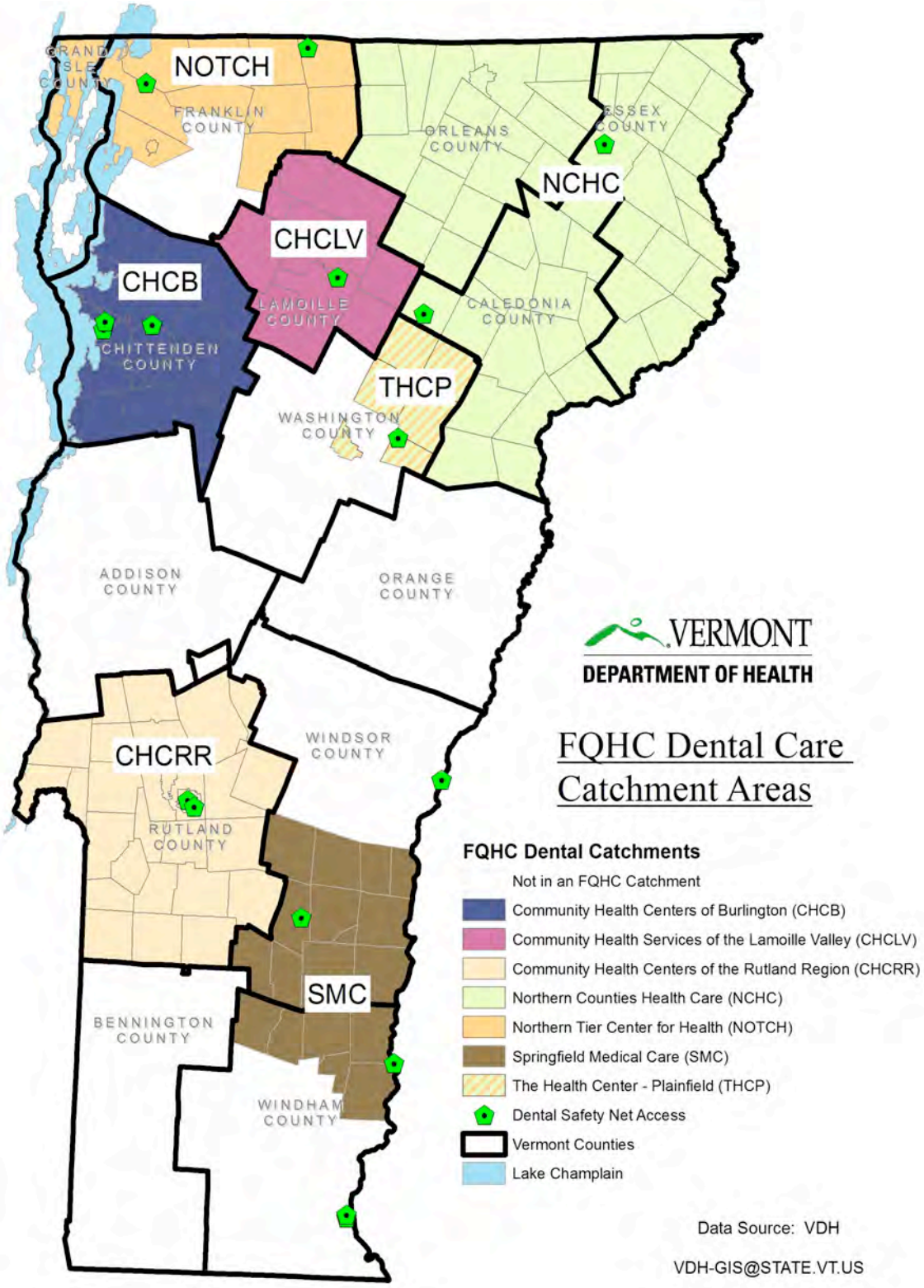
Total unduplicated count of GA voucher recipients receiving dental services	4,054
Sum of paid dental claims with GA voucher funds	$2,046,642.43
Average dollar amount of a paid dental claim with GA voucher funds	$504.85
Maximum dollar amount of an individual paid dental claim with GA voucher funds	$4,535.00
Total Number of PAID claims	23,370
Average Number of PAID claims per recipient	6
Maximum number of PAID claims for any one recipient	38

Data Source: VT Dept. for Children and Families. 2009-2010.

Geographical Disparities

People living in rural areas also have a higher disease burden because of difficulties in accessing preventive care and treatment services. There are seven Federally Qualified Health Centers (FQHCs) in Vermont that provide dental services. Though some progress has been made to expand the service of FQHCs into more counties, most of the central and southern parts of Vermont do not offer access to dental care at FQHCs (Figure 23).

Figure 23. FQHC Catchment Area. 2012.



Societal Impact of Oral Disease

Social Impact

Oral health is related to well-being and quality of life as measured along functional, psychosocial, and economic dimensions. Diet, nutrition, sleep, psychological status, social interaction, school, and work are affected by impaired oral and craniofacial health. Oral and craniofacial diseases and conditions contribute to compromised ability to bite, chew, and swallow foods; limitations in food selection; and poor nutrition. These conditions include tooth loss, diminished salivary functions, oral-facial pain conditions such as temporomandibular disorders, alterations in taste, and functional limitations of prosthetic replacements. 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. It is associated with sleep deprivation, depression, and multiple adverse psychosocial outcomes.

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

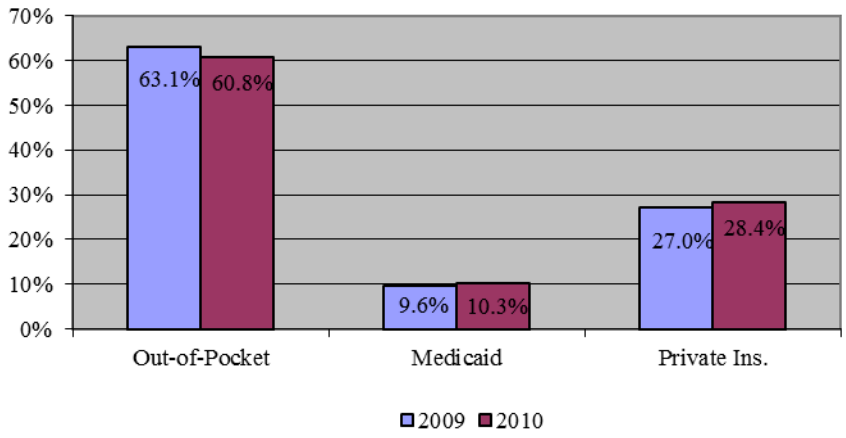
Direct Costs of Oral Diseases

Expenditures for dental services in the United States in 2003 were $74.3 billion, 4.4 percent of the total spent on health care that year [Centers for Medicare & Medicaid Services 2004]. In Vermont, 2010 health care expenditures totaled $4.93 billion; dental services accounted for 4.3 percent of the total, or $214 million [Green Mountain Care Board 2010].

A large proportion of dental care is paid out-of-pocket by patients. Nationally in 2003, 44 percent of dental care was paid out-of-pocket, 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 was paid out-of pocket, 50 percent was covered by private medical insurance, and 33 percent was paid by government sources [Centers for Medicare & Medicaid Services, 2005].

From the 2010 Vermont Health Care Expenditures report by Green Mountain Care Board, 60.1 percent of dental costs were paid out-of-pocket, 10 percent by Medicaid, and 28 percent by private insurance (Figure 24). Private insurance includes self-insured and workers' compensation.

Figure 24. How Vermonters Pay for Dental Service. 2009-2010.



Data Source: Green Mountain Care Board. 2009-2010.

Moreover, an analysis of Medicaid claims for Vermont children aged 0 to 5 years who underwent endodontic treatment, dental restoration, or extractions due to dental caries in 2009, found the overall cost to Medicaid (amount paid) was $2.2 million that year (VDH 2012). The average cost to Medicaid per child was $1,004.00, while the maximum cost was $10,126.00 for a single child.

Indirect Costs of Oral Diseases

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. schoolchildren missed 1.6 million days of school as a result of acute dental conditions, which is more than 3 days for every 100 students. Acute dental conditions also were responsible for more than 2.4 million days of work loss and contributed to a range of problems for employed adults, including restricted activity and bed days [DHHS 1999]. In addition, conditions such as oral and pharyngeal cancers contribute to premature death and can be measured by years of life lost.

There were a total of 76 deaths caused by cancer of oral cavity or pharynx between 2005 and 2009 in Vermont. This equates to 1,232 years of potential life lost, and the average number of years of life lost was 16.2 years.

Oral Disease and Other Health Conditions

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, and 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. 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. 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 et al. 2001; Davenport et al. 1998; Beck et al. 1998; Scannapieco et al. 2003; Taylor 2001]. More research is needed in these areas.

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 or Type II diabetes [American Diabetes Association, 2006].

The prevalence of diabetes among adults in Vermont was 6.8 percent in 2010 [BRFSS]. The Vermont BRFSS 2010 reported that adults 18 years and older with diabetes are less likely to have visited a dentist, dental hygienist or dental clinic than those without diabetes (68 percent vs. 76 percent, respectively). Further, among adults with diabetes, those who make $50,000 or less are less likely to have recently visited the dentist than those who make more than $50,000 per year. The likelihood of visiting the dentist among adults 18 years and older with diabetes increases as the level of education increases (High school or less: 51 percent vs. College degree or higher: 84 percent).

Among adults 18 years and older who did not visit a dentist, nearly half of them (47 percent) reported their general health to be fair/poor. Similarly, 46 percent reported they were smokers, and 47 percent reported having cardiovascular disease.

RISK AND PROTECTIVE FACTORS AFFECTING ORAL DISEASES

The most common oral diseases and conditions can be prevented. Safe and effective measures are available to reduce the incidence of oral disease, reduce disparities, and increase quality of life.

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 dental caries. In the United States, community water fluoridation has been the basis for the primary prevention of dental caries 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, and inexpensive, requires no behavior change by individuals, and does not depend on access or availability of professional services. Water fluoridation is equally effective in preventing dental caries 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].

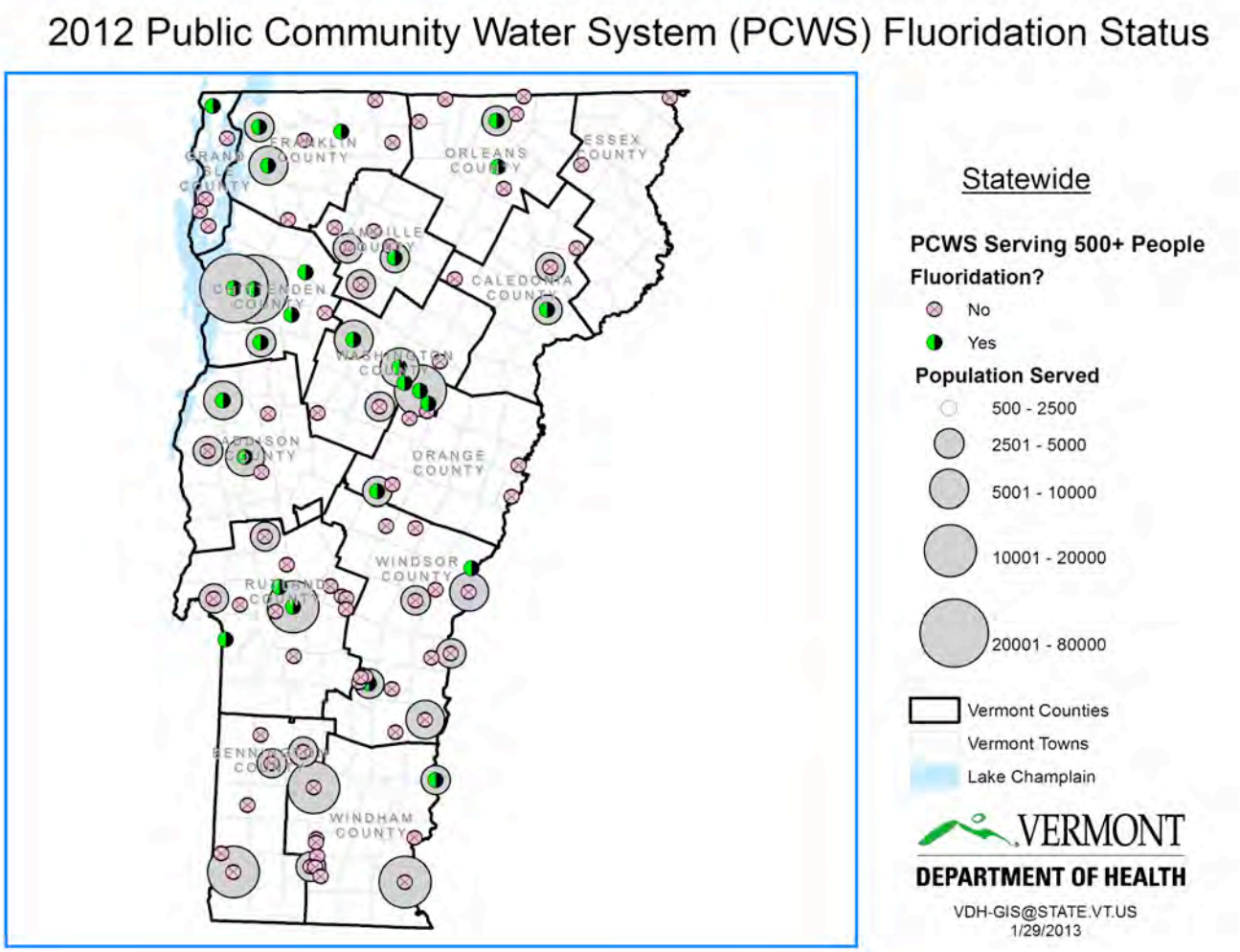
Recognizing the importance of community water fluoridation, *Healthy People 2020* objective OH-13 is to "Increase the proportion of the U.S. population served by community water systems with optimally fluoridated water to 79.6 percent." In the United States during 2002, approximately 170 million persons (67 percent of the population served by public water systems) received optimally fluoridated water [Bailey et al. 2008].

Not only does community water fluoridation effectively prevent dental caries, it is one of very few public health prevention measures that offer significant cost savings to almost all communities [Griffin et al. 2001]. It has been estimated that about 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.

In 1952, the City of Burlington became the first Vermont community to provide fluoridated water to its residents. Since then, public water systems throughout Vermont have been providing this important community dental health measure. Despite the effort, however, Vermont is still below the *Healthy People 2020* projected target of 79.6 percent. In 2012, approximately 252,920 people had access to community water fluoridation, representing 56.2 percent of the population served by community water systems (Figure 25). Of 460 community water systems in Vermont, 71 systems currently fluoridate their drinking water and another 23 systems are eligible to participate in community water fluoridation. To be eligible for fluoridation a community water system must serve a population of more than 500 and have a state licensed class 3 water operator. The Vermont Department of Health (VDH) provides on-site training for all water plant operators for each new fluoridated water system and offers a 6-hour training course annually in conjunction with the Vermont Rural Water Association.

Many families in the rural areas of Vermont are on private well systems. VDH Office of Oral Health and the Laboratory offer private well testing for naturally-occurring fluoride through the Fluoride in Well Water Program. Families with children ages four and younger are eligible to have their water tested for fluoride at no charge. There are geographic areas in Vermont where private wells or springs are well above the recommended level for optimum health.

Figure 25.



Topical Fluorides and Fluoride Supplements

Because frequent exposure to small amounts of fluoride each day will best reduce the risk of dental caries 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 dental caries, 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 caries.

The School-based Fluoride Mouthrinse Program has been in existence for 30 years in the state of Vermont, providing weekly fluoride mouth rinse to children in schools in areas without community water fluoridation. Each year, over 90 percent of eligible Vermont schools participate in the program. A summary of school participating in Vermont's school-based Fluoride Mouthrinse Program is shown below (Tables 5 and 6).

Table 5. Vermont Elementary Schools Participating in Fluoride Mouth Rinse Program, 2011-2012.

Schools (2011-2012)	
Total # of potentially eligible elementary Schools	176
Total # of Participating Elementary Schools	167
Total percent of Participating Elementary Schools	95%
Total percent of non-participating schools that are targeted*	25%

* schools that do not benefit from community water fluoridation and have over 36 percent of students eligible for the free and /or reduced price meal program.
Data Source: VDH Office of Oral Health. 2011-2012.

Table 6. Percent of Students Participating in Fluoride Mouth Rinse Program.

Students
Total # of possible participating students Grade 1-8: 20,972.
Total # of participating student grade 1-8: 13,246.

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Total percent rinsing in Grades 1-6	69%	71%	70%	70%	68%	66%
Total percent rinsing in Grades 7-8	39%	35%	53%	54%	51%	37%
Total percent rinsing in Grades 1-8	66%	67%	69%	69%	66%	63%

Data Source: VDH Office of Oral Health. 2006-2012.

Beginning in late June, 2010, primary care providers are able to bill for fluoride varnish procedures for Medicaid eligible children ages 0-5. In SFY 2011, only six out of 4,196 fluoride varnish procedures were billed by nurse practitioners or physicians. During the following year (June 2011-June 2012), there were 104 claims filed by non-dentist health care providers. The overall number of fluoride varnish procedures also increased by three percent in the second year.

Dental Sealants

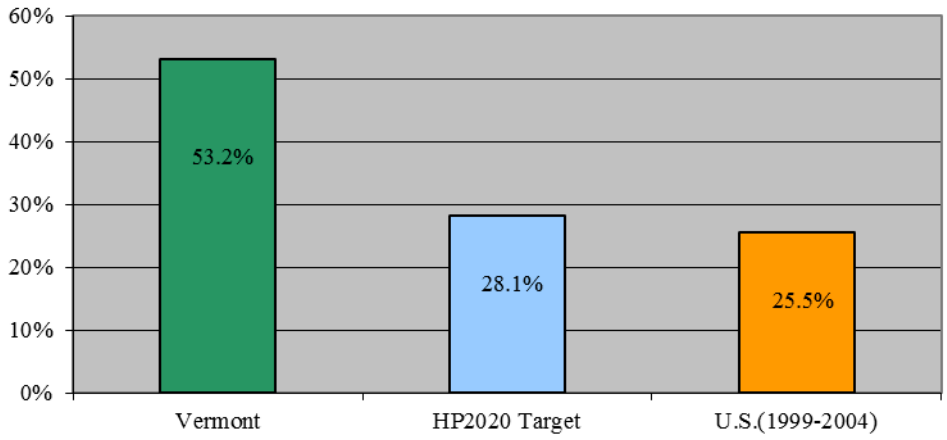
Since the early 1970s, the incidence of childhood dental caries on smooth tooth surfaces (those without pits and fissures) has declined markedly because of widespread exposure to fluorides. Most decay among school age children now occurs on tooth surfaces with pits and fissures, particularly the molar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

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

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 dental caries 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 2020* target for dental sealants on molars are 1.5 percent for 3 to 5 year-olds, 28.1 percent for 6 to 9 year-olds and 21.9 percent for 13 to 15 year-olds. Vermont collected dental sealant data on grades 1-3 children through the 2009-2010 Basic Screening Survey. More than half of children (53 percent) in grades 1-3 had sealants on at least one of their permanent molars. This is 13 percent more than in 2002-2003 (40 percent). Vermont exceeds the *Healthy People* 2020 target by nearly 25 percent. For 3rd graders alone, the percentage of children with sealants increases to 64 percent. For comparisons between Vermont, the Nation, and the *Healthy People 2020* targets, see Figure 26.

Figure 26. Percentage of Children Grades 1-3 with Dental Sealants, Vermont, U.S., and HP2020 Target.



VT Data Source: BSS 2009-2010.

The most recent estimates of the proportion of the U.S. children aged 8 years in the Nation with dental sealants on one or more molars are presented in Table 7. The prevalence of sealants varies by gender and the education level of the head of household.

Table 7. Percentage of Children in the United States with Dental Sealants on Molar Teeth, by Age and Selected Characteristics.

Children, Selected Ages, 1999–2000 (unless otherwise indicated)	Dental Sealants on Molars	
	Aged 8 years (percent)	Aged 14 years (percent)
***Healthy People 2020* Target**	50	50
TOTAL	28	14
Gender		
Female	31	12
Male	25	17
Education Level (head of household)		
Less than high school	17 [c]	4 [c]
High school graduate	12 [c]	6 [c]
At least some college	35 [c]	28 [c]

C - Data are from NHANES III, 1988-1994.
Data Source: *Healthy People 2010, Progress Review, 2004.* U.S. Department of Health and Human Services.

Vermont has had a school-linked dental sealant program, the Tooth Tutor Program (TTP), since 1997. Its main goal is to connect children with local dental homes where they can receive comprehensive dental care, including sealants. Currently there are approximately 35 dental hygienists working as Tooth Tutors in 120 elementary schools, as well as all Vermont Head Start programs throughout the state. While Tooth Tutors' primary goal is improving dental access by connecting children to dental homes, the program's success as a school-linked sealant program is evident in BSS data. In the 2009-2010 school year, schools with TTP had a higher rate of sealants among 1st-3rd grade children (57 percent) compared to children in schools without Tooth Tutors (50 percent). This program, however, does not have the data collection capacity to track the true progress of the program that links children to dental home. In 2010, modification of TTP data tracking system began with assistance from a CDC cooperative agreement, and in the 2011-2012 school year an updated pilot program of TTP (TTP 2.0) was developed and is currently being implemented in 31 schools. It will allow better data collection and tracking of the program effectiveness.

Preventive Visits

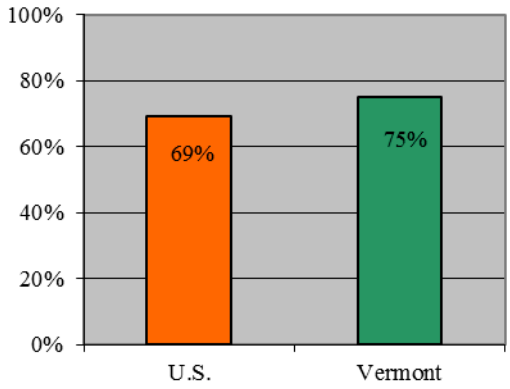
Maintaining good oral health takes repeated efforts on the part of the individual, caregivers, and health care providers. Daily oral hygiene routines and healthy lifestyle behaviors play an important role in preventing oral diseases. Regular preventive dental care can reduce the development of disease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

Adults

In 2010, three-quarters of Vermont adults had their teeth cleaned in the previous 12 months, a rate slightly higher than the U.S. national rate of 69 percent (Figure 27). Ten percent of adults in

Vermont reported not having their teeth cleaned for five or more years, and 15 percent less than five years ago. The age group least likely to have routine teeth cleanings was ages 25-44. Adults with more education and higher annual household incomes are more likely to regularly have their teeth cleaned than those with less education and income (Table 8).

Figure 27. Percentage of Adults (18+) Who Had Their Teeth Cleaned in Last Year. 2010.



VT Data Source: BRFSS. 2010.

Table 8. Percentage of Adults (18+) Who Had Their Teeth Cleaned in the past Year, 2010.

	U.S. (percent)	Vermont (percent)
Total	68.5	75.5
Age		
18-24	66.7	76.4
25-44	65.0	67.5
45-64	70.5	79.5
65+	73.6	80.7
Education Level		
Did Not Graduate High School	45.5	55.7
High School	60.0	65.5
Attended College or Technical School	68.0	75.5
College or Technical School Graduate	80.3	84.8
Income		
<$15,000	42.3	46.5
$15,000 - $24,999	49.4	59.9
$25,000 - $34,999	60.9	62.8
$35,000 - $49,999	67.1	71.8
$50,000 +	81.0	86.6

Data Source: BRFSS. 2010.

Pregnant women

According to the 2009-2010 Vermont Pregnancy Risk Assessment Monitoring System (PRAMS) survey, 65 percent of mothers reported having their teeth cleaned by a dentist or hygienist in the

year before their pregnancy. The lowest prevalence of pre-pregnancy teeth cleaning occurred among mothers younger than 25, with less than a high school education, low incomes, who smoked before becoming pregnant, and those with six or more stressors (Figures 28-31).

Figure 28. Percent of Mothers with Pre-pregnancy Teeth Cleaning by Age Group. 2009-2010.

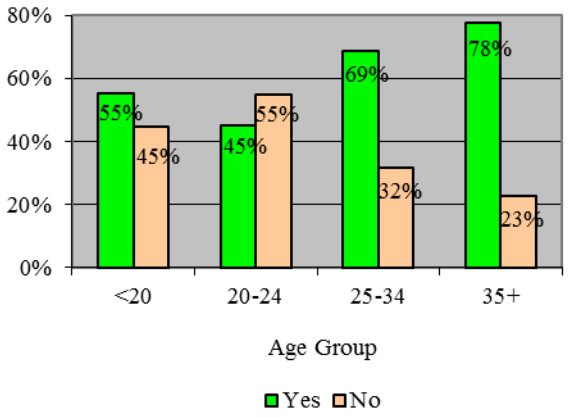


Figure 29. Percent of Mothers with Pre-pregnancy Teeth Cleaning by Education Level. 2009-2010.

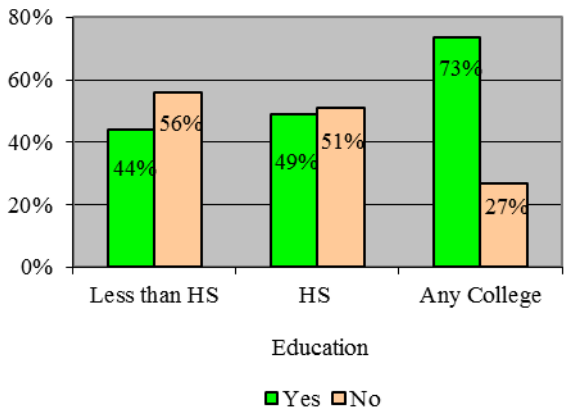


Figure 30. Percent of Mothers with Pre-pregnancy Teeth Cleaning by No. of Stressors. 2009-2010.

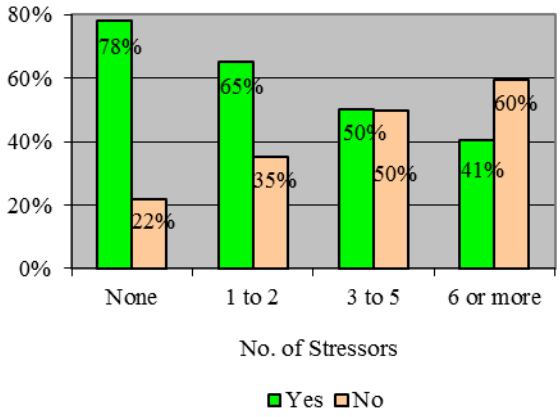
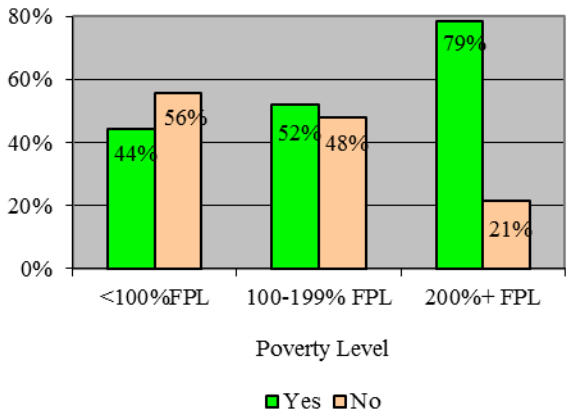


Figure 31. Percent of Mothers with Pre-pregnancy Teeth Cleaning by Poverty Level. 2009-2010.



Screening 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 and specificity 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 6 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]. Individuals should also be advised to avoid other potential carcinogens, such as exposure to sunlight (a risk factor for lip cancer) without protection (use of lip sunscreen and hats is recommended).

Recognizing the need for dental and medical providers to examine adults for oral and pharyngeal cancer, *Healthy People 2020* objective OH-14.2 (developmental) 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/ethnicity. Vermont does not collect data on oral and pharyngeal cancer screening.

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, and smoking causes over $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 & 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 et al. 1991; AAP 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 cessation among young people and adults.
- Eliminating nonsmokers' exposure to secondhand tobacco smoke.
- Identifying and eliminating the disparities related to tobacco use and its effects among different population groups.

The BRFSS collects data on smoking status among adults in Vermont. In 2011, one in every five, or 20.2 percent of adults, reported smoking cigarettes. Males, younger adults, individuals with lower education levels, racial or ethnic minorities, and those living at less than 250 percent of the federal poverty level (FPL) are more likely to be current smokers than females, older adults, Vermonters with higher education levels, white non-Hispanics, and those at 250 percent of FPL or higher, respectively. Table below summarizes the results (Table 9).

Table 9. Adult Smoking Prevalence in Vermont by Selected Demographics. 2011.

	Percent	Estimated Vermonters**
Overall	20.2	95,000
Gender		
Female	17.6	42,000
Male	22.7	53,000
Age Group*		
18 to 24 years	23.9	16,000
25 to 44 years	26.9	40,000
45 years and older	13.9	39,000
Education		
High school or less	32.6	61,000
Greater than high school	11.9	33,000
Race-Ethnicity		
White non-Hispanic	19.2	85,000
Racial/Ethnic Minority	34.5	8,000
Federal Poverty Level (FPL)* **		
<250 % of FPL	25.8	N/A
≥250 % of FPL	8.7	N/A

*All percentages, with the exception of age group categories, are age-adjusted to standard U.S. 2000 population according to the *Healthy People 2020* guidelines.

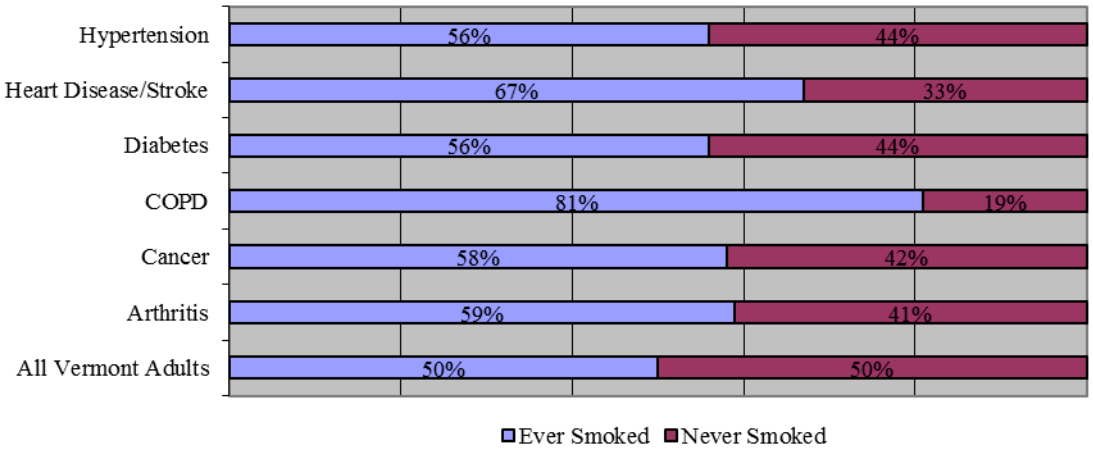
** Estimated counts are rounded to the nearest thousand Vermonters and not age-adjusted.

*** Estimated Vermonters for Federal Poverty Level cannot be calculated due to survey methodology.

Data Source: BRFSS. 2011.

Many Vermonters with chronic diseases such as chronic obstructive pulmonary disease (COPD), heart disease/stroke, hypertension, cancer, diabetes, and arthritis are smokers. People with chronic diseases are especially vulnerable to the effects of tobacco use, which can worsen their health conditions considerably, sometimes leading to death. Approximately 800 Vermonters die each year from tobacco-related diseases [VDH 2013]. The figure below shows the percent of Vermonters with chronic diseases who reported they had "ever smoked" (Figure 32).

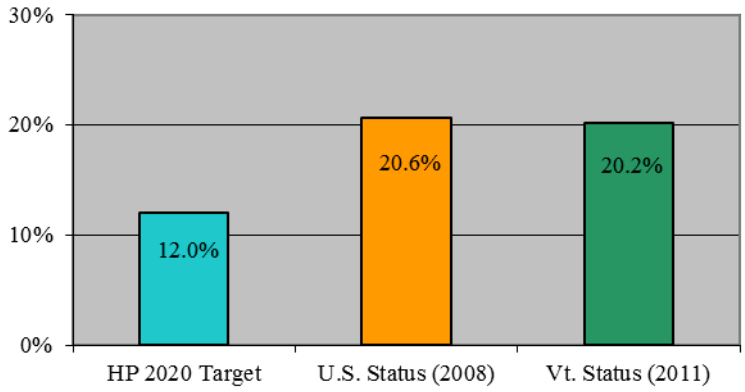
Figure 32. Vermonters with Chronic Disease and Smoking Status. 2011.



Data Source: BRFSS. 2011.

Although more than half of Vermont smokers reported attempting to quit smoking in 2011, Vermont still has not met the *Healthy People 2020* target of 12 percent. For comparisons with Vermont, the Nation, and the *Healthy People 2020* target, see Figure 33.

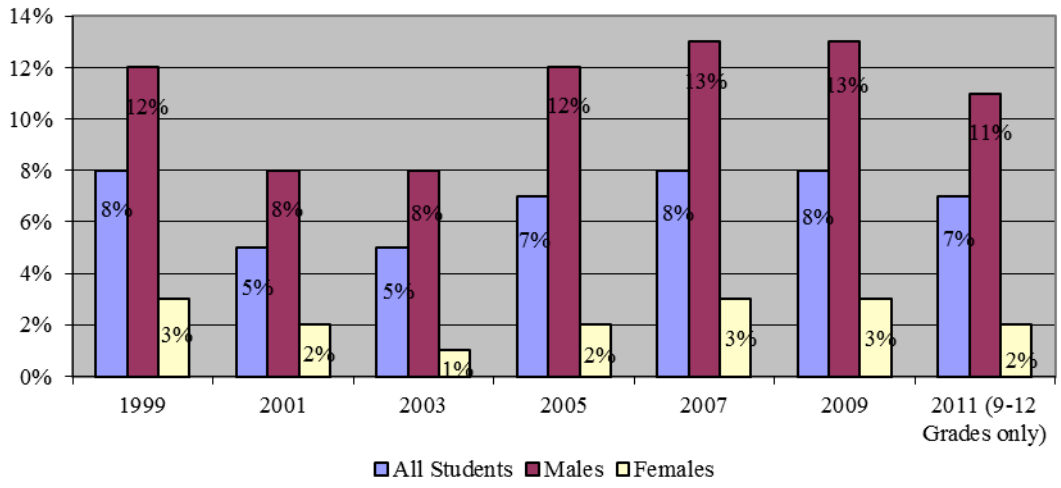
Figure 33. Percentage of Current Smokers Among Adults 18 yrs. and Older.



VT Data Source: BRFSS. 2011.

Vermont collects youth tobacco use data through the Youth Risk Behavior Survey. In 2011, 13.3 percent of high school students (grades 9-12) reported smoking cigarettes on at least one day in the past 30 days. In addition, seven percent of students reported using chewing tobacco, snuff, or dip during the past 30 days (Figure 34). The percentage for use of other tobacco products has not improved greatly over the past 10 years, and males have been the predominant users of those tobacco products.

Figure 34. Percentage of Students in Grades 8-12 Who Used Chewing Tobacco, Snuff, or Dip in Past 30 Days. 1999-2011.

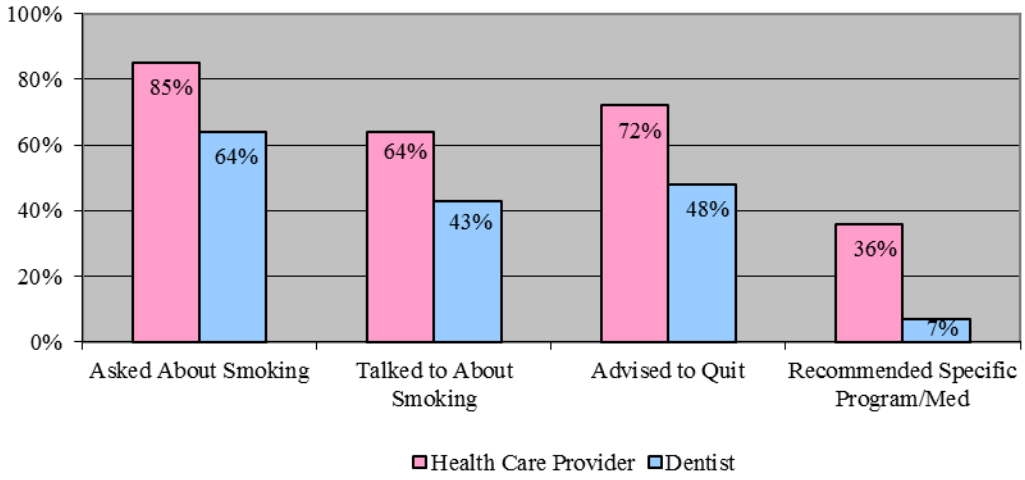


Data Source: YRBS. 2011.

The dental office provides an excellent venue for providing tobacco intervention services. More than one-half of adult smokers see a dentist each year [Tomar et al. 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 et al. 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.

According to Vermont Adult Tobacco Survey in 2010 [VDH], three-quarters of the current smokers had seen a health care provider (77 percent) and about a half had been to the dentist in the last year (51 percent). Since 2001, the proportions of current smokers who reported visiting health care providers and dentist in the last year increased significantly (50 to 77 percent and 31 to 51 percent, respectively). Figure 35 indicates that in general, fewer current smokers reported having conversations about smoking with a dentist than with a health care provider.

Figure 35. Comparison of Interactions with Current Smokers, Health Care Providers and Dentists. 2010.

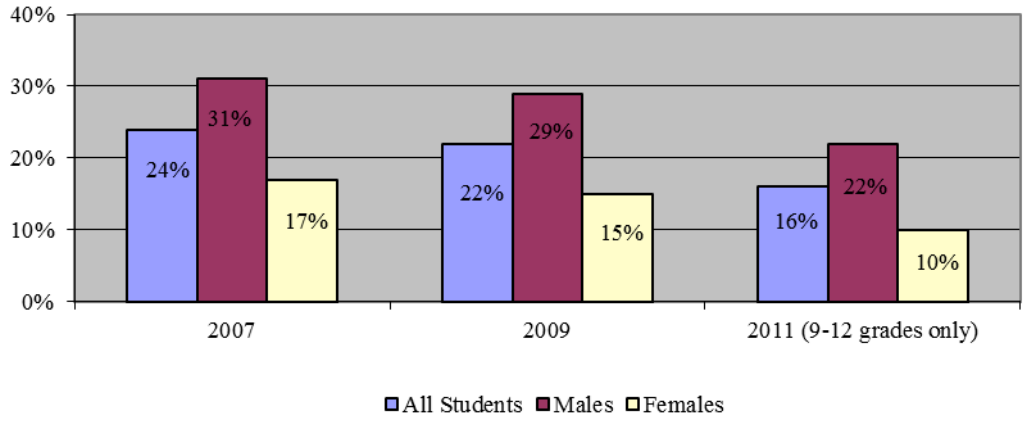


Data Source: VDH Vermont Tobacco Survey. 2010.

Other Risk Factors

Overconsumption of sugar-sweetened drinks such as soda, sports drinks and fruit-flavored drinks is associated with a number of chronic diseases including obesity and dental caries. Continuous consumption of sugar-laden drinks will likely increase the risk for extensive caries into adulthood. In 2007, about one-fourth of adolescents consumed sodas daily. The percentage of soda consumption among 8-12th grades has been slowly decreasing, though male students are much more likely than female students to drink soda (Figure 36). In the United States, forty-three percent of elementary schools, 74 percent of middle schools, and 98 percent of senior high schools have vending machines, school stores, or snack bars that sell soda [VDH HPDP, 2007].

Figure 36. Grades 8-12 Soda Consumption at Least Once in Past Week. 2007-2011.



Data Source: VT YRBS. 2007-2011.

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 environmental changes as needed to facilitate this goal; and conducts professional training and research to the same end [Kressin & 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.

According to VT PRAMS 2009-2010, only 56 percent of mothers overall indicated that a dentist or other health care professional talked with them about how to care for their teeth and gums. However, if they had a dental visit during their pregnancy, the rate climbs to 84 percent.

After their baby was born, only about 32 percent of mothers reported that a health care professional talked with them about how to prevent their infant from getting tooth decay.

The Office of Oral Health has been working with the Office of Local Health to develop positions to place a public health dental hygienist in Women, Infant, and Child (WIC) clinics in each of the 12 district offices in order to provide oral health education, oral health risk assessments, fluoride varnish, and referrals for treatment. Additionally, the public health dental hygienist will provide outreach to local dental offices and support the Tooth Tutor Program (TTP). Currently three of the 12 district offices employ public health dental hygienists.

Tooth Tutors, who are dental hygienists and dental assistants, identify students who have not accessed oral health care in the past year and connect them to a local dental home. They additionally provide important oral health educational programs to school-aged children as part of TTP. About half the elementary schools in Vermont participated in TTP during the 2009-2010 school year. Tooth Tutors visit classrooms at least once a year to deliver educational programming and use a curriculum developed for students in preschool through eighth grade by the American Dental Association. Tooth Tutors also work in three school-based dental clinics, provide oral health education to broader school communities, and work closely with the parents of children who have not accessed dental care in the past year.

PROVISION OF DENTAL SERVICES

Dental Workforce and Capacity

Dentist Workforce

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.

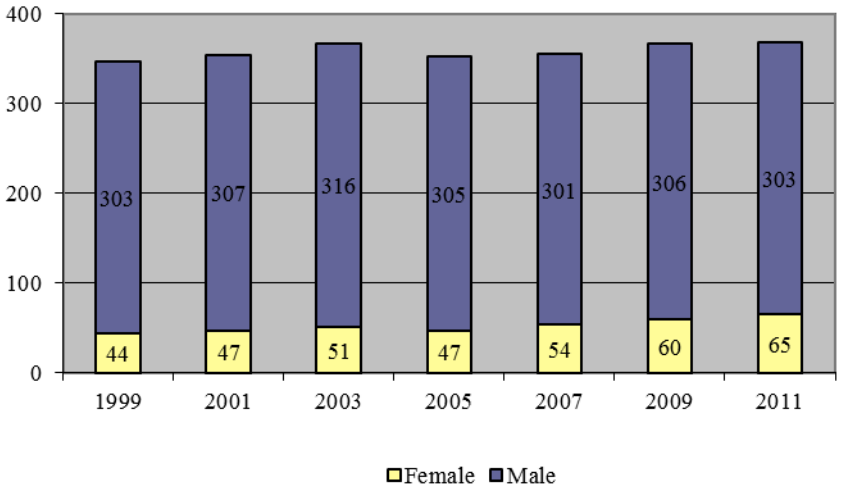
Although appropriate home oral health care and population-based prevention are essential, professional care is also necessary to maintain optimal dental health. Regular dental visits provide

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.

According to the 2011 Vermont Dentist Survey conducted biennially by the Department of Health, there were 368 dentists providing patient care in Vermont. The majority of dentists (81 percent) practice primary care dentistry, which consists of 288 general and 9 pediatric dentists; 71 dentists, or 19 percent, provide specialty care which include oral surgery (23), orthodontics (23), endodontics (10), periodontics (10), prosthodontics (1), and one unknown specialty. The survey also reported that 44.8 percent work in a solo practice; 30 percent have a practice of two dentists; and 23 percent practice with three or more dentists. Overall, 80 percent of dentists employ dental hygienists.

Vermont has seen little increase in the number of dentists between 1999 and 2011, even with aggressive recruiting efforts (Figure 37), although the state population grows at the average of 2.8 percent (2000 - 2010).

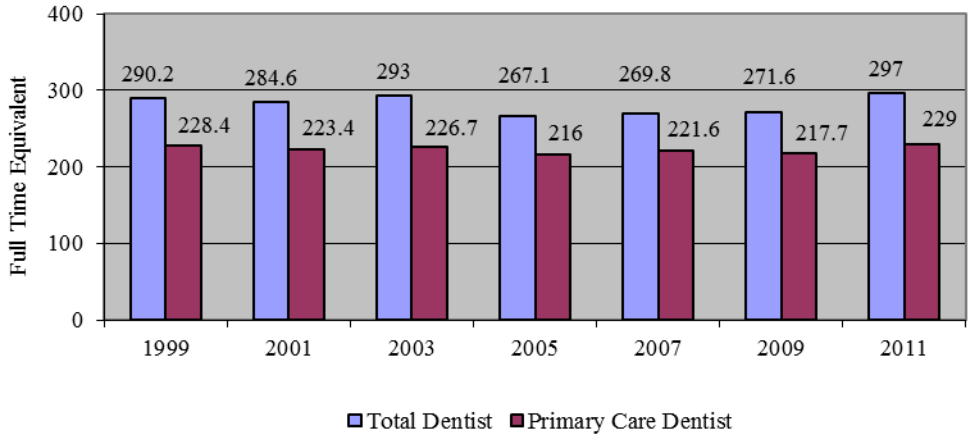
Figure 37. Number of Dentists in Vermont. 1999-2011.



Data Source: VDH Dentist Survey. 1999-2011.

The 368 dentists correspond to 281.2 full time equivalents (FTEs) where 1 FTE equals to 40 hours per week, and 229 FTEs are in primary care. As seen in Figure 38, the total number of FTEs for all dentists as well as for the primary care dentists has not changed significantly between 1999 and 2011.

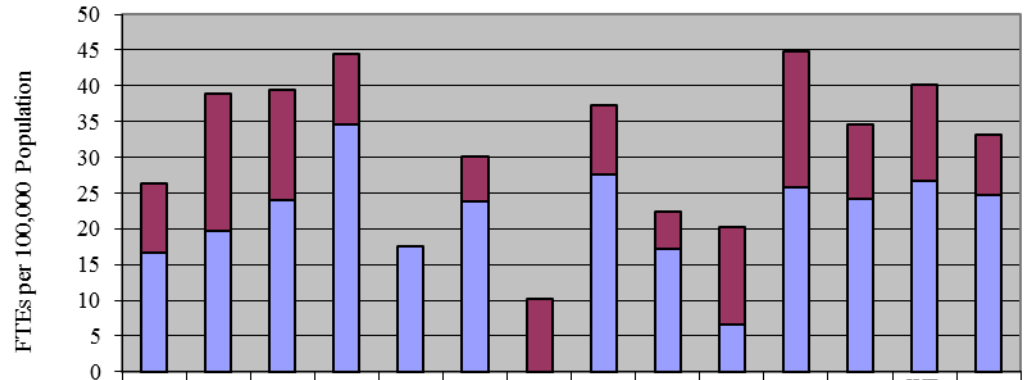
Figure 38. All Dentists FTE, Primary Care Dentists FTE. 1999-2011.



Data Source: VDH Dentist Survey. 1999-2011.

The Primary Care dentist FTE to population ratio was 36.6 per 100,000 population in 2011 and has not changed significantly since 1999 (37.8). However there are wide variations in the ratio by county ranging from 9.8 in Grand Isle County to 44.8 in Rutland County (Figure 39).

Figure 39. Primary Care Dentists to Population Ratios by County and Age Group. 2011.

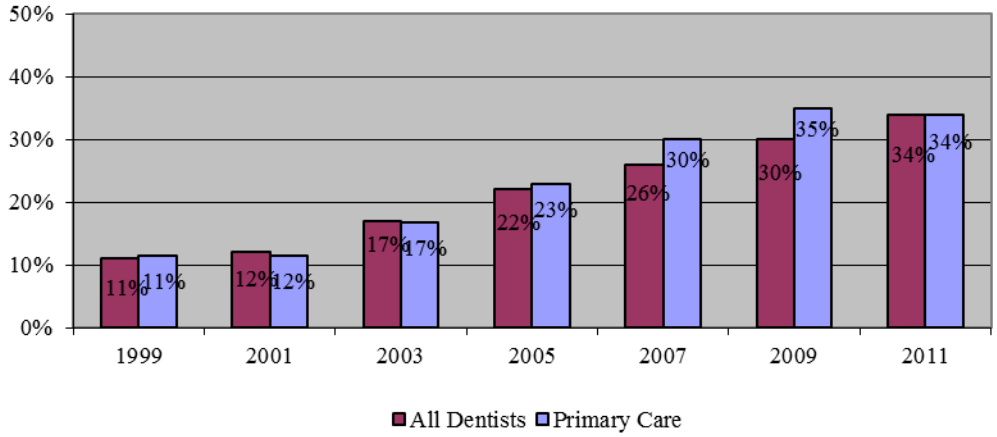


	ADD	BEN	CAL	CHI	ESS	FRA	GI	LAM	ORA	ORL	RUT	WAS	WDM	WDR
60 & Older	9.80	19.20	15.40	9.91	0.00	6.24	10.10	9.72	5.17	13.62	19.09	10.40	13.55	8.47
Under 60	16.60	19.75	24.07	34.61	17.49	23.90	0.00	27.53	17.24	6.62	25.78	24.15	26.66	24.70

Data Source: VDH Dentist Survey. 1999-2011.

Of additional concern is the aging of Vermont dentists. The percent of dentists 60 years of age and older has increased from 11 percent in 1999 to 34 percent in 2011 (Figure 40).

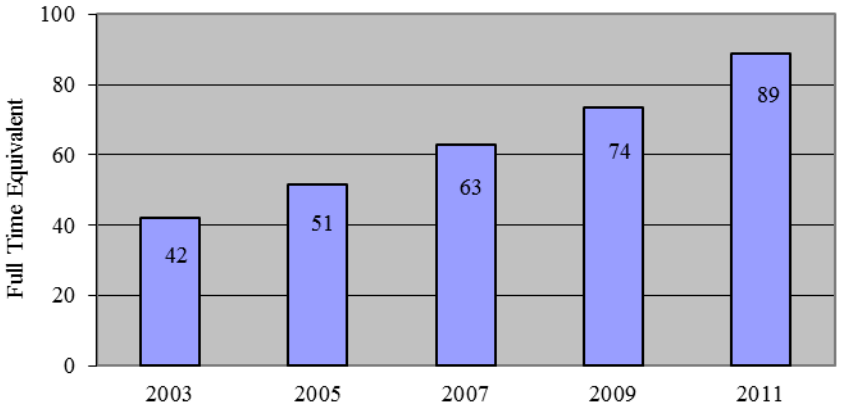
Figure 40. Percentage of All Dentists and Primary Care Dentists, 60 Years and Older. 1999-2011.



Data Source: VDH Dentist Survey. 1999-2011.

In addition to the increase in the number of dentists age 60 and older, the FTEs of older dentists are also increasing, and increasing as a percentage of the total FTEs in the state (Figure 41).

Figure 41. All Dentists FTE, 60 Years and Older. 2003-2011.



Data Source: VT Dentist Survey. 2003-2011.

As these dentists leave the workforce it will create a shortage of quality services to all Vermonters and limited access to care. When asked in 2009 "do you plan to retire or leave your practice", 23.8 percent (87) of the Vermont dentists answered "within 5 years", and 23 percent (84) of them answered "in 6 to 10 years". This is a time frame that is fast approaching.

Factors affecting the dental workforce may include the high costs of dental school tuition, the number of dentists retiring from practice, and difficulty retaining and finding new faculty at dental schools. An average debt for graduating dentists was $203,374 in 2011. In comparison the average debt for graduating doctors was $166,750 in 2012 [Association of American Medical Colleges, 2012].

Dental Education

New England sends fewer students to dental schools than any other region. In addition, Vermont is one of 16 states without a dental school and it does not send as many of its residents to dental school in relation to the population. As a result, the state is much more dependent on dentists who are not originally from Vermont.

In 2004 the Community Health Center of Burlington became the site of Vermont's only dental residency program. The program has been in existence for over 40 years and is run by the University of Vermont. Approximately one-third of dental residents who go through this program remain in Vermont to practice.

The Vermont Technical College is the site of Vermont's only Dental Hygiene program. Each year approximately 20 students graduate with an Associate of Science in Dental Hygiene, and about 30 percent go on to pursue their Baccalaureate Degree in Dental Hygiene.

The Center of Technology, Essex (CTE) Dental Assisting Program is the only dental assisting program in the state. It is accredited by the ADA Commission on Dental Accreditation. Each year CTE graduates an average of 30 traditional dental assistants, with about 25 percent taking the Dental Assisting National Board Exam to become Certified Dental Assistants. Approximately 90 percent of the CTE graduates stay in Vermont.

Nationally, the number of dental school applicants has leveled off since 2008 [ADEA 2011]. Consequently, the number of professionally active dentists per 100,000 U.S. population is projected to decline in 2030 to 54 dentists per 100,000 populations from 60 dentists per 100,000 populations in 2005.

State-Funded Scholarship Incentive/Loan Forgiveness Program

For current dental and dental hygiene students the Vermont Student Assistance Corporation administers a loan forgiveness program. Students agree to practice in Vermont once they have completed training (including the residency program) or the scholarship converts to a loan and must be repaid. Similarly, the Vermont Area Health Education Center Program (AHEC) administers Vermont Educational Loan Repayment Programs for dentists.

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 [USDHHS 2000b]. Data on the race/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 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. The race and ethnicity of dentists in Vermont is currently not available.

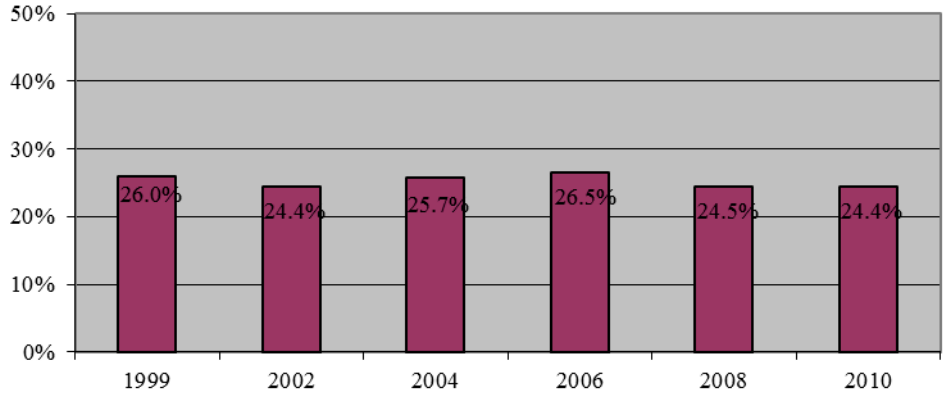
Use of Dental Services

General Population

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. The Figure below shows the percentage of adults in Vermont who did not visit dentists in the past year. About one in every four did not visit a dentist, and that number has not improved since 1999.

Figure 42. Percentage of Adults Who Did Not Visit Dentist in the Past 12 Mo. 1999-2010.



Data Source: BRFSS. 1999-2010.

Socioeconomic factors such as income and education level greatly affect the use of dental services. About half of the individuals (49.2 percent) without a dental visit in the past year had a household income less than $15,000. As income levels climbed, the number of people who visited the dentist also increased. Similarly, 48.8 percent of adults who did not visit a dentist in the past year were those with less than a high school education.

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. In 2010 BRFSS, it was reported that those who did not visit a dentist in the past year had higher rates of teeth loss when compared to those who visited a dentist. The table below summarizes the association of teeth loss and dentist visit (Table 10).

Table 10. Dental Visits and Tooth Loss. 2010.

Visited Dentist in the past 12 Mo?	No Tooth Loss	1 to 5	6 or More, but Not All	All
NO	44.7 %	24.7 %	13.7 %	16.9 %
YES	59.7 %	30.5 %	8.9 %	1.1 %

Data Source: BRFSS 2010.

Special Populations

Schoolchildren

The National Survey of Children's Health (NSCH) collects national and state-level data on many child health indicators including oral health on children ages 0-17. In 2007, seventy-five percent of Vermont parents reported that their child had one or more preventive dental visits during the previous 12 months, compared to 78.4 percent nationwide. In addition 80 percent of parents thought their child's teeth are in very good or excellent condition. However, 5.2 percent, or an estimated population of 6,441, reported they had two or more of four oral health problems during the previous six months: toothache, cavities or decay, broken teeth, bleeding gums.

The Vermont School Nurse Report collects health-related data annually on kindergarten to 12th grade students. This survey reported a lower rate of dental visits among school children: during school year 2007-2008, 61.8 percent of students had a dental check-up in the past year. The prevalence is slowly rising each year, however. In 2011-2012, the rate of dental visits climbed to 67.3 percent.

Pregnant Women

Studies documenting the effects of hormones on the oral health of pregnant women suggest that 25–100 percent of these women experience gingivitis and up to 10 percent may develop more serious oral infections [Amar & Chung 1994; Mealey 1996]. Recent evidence suggests that oral infections such as periodontitis during pregnancy may increase the risk of preterm or low birth weight deliveries [Offenbacher 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 et al. 2001].

The 2009-2010 Vermont PRAMS survey found that 65 percent of mothers visited a dentist a year before their pregnancy. During pregnancy, the rate of mothers who went to a dentist/dental clinic drops slightly to 61 percent. Twenty-six percent of new mothers did not receive dental care during either time period. Those without dental care tended to have less than a high school education, were in their early twenties, were uninsured before pregnancy and reported six or more stressful events during their pregnancy (Table 11).

Table 11. Timing of Dental Care Among Mothers Before, During, and After Pregnancy.

Timing of Dental Care	**All Mothers**	**<High School**	**Uninsured before Preg.**	**Age 20-24**	**Had 6+ stressors**	**Medicaid Recipient***
Before Pregnancy Only	14%	20%	16%	15%	14%	13%
During Pregnancy Only	9%	12%	20%	15%	9%	15%
Before & During	51%	24%	23%	30%	36%	36%
No Dental Care	26%	44%	41%	40%	40%	36%
Total	100%	100%	100%	100%	100%	100%

*Medicaid includes Dr. Dynasaur during any time period, before, during, or after pregnancy.
Data Source: VT PRAMS 2009-2010.

In Vermont, effective October 1, 2012, pregnant women receiving benefits under the Dr. Dynasaur/Medicaid program can receive the same dental benefits that are available for children on the program and will be exempted from the $495 adult dental cap. This benefit is in effect for the duration of the pregnancy and for 60 days following the end of the pregnancy. By lifting this cap during pregnancy and for 60 days postpartum, the expanded Medicaid coverage will help ensure that pregnant and postpartum women receive the necessary dental care that enhances their overall health and the health of their children.

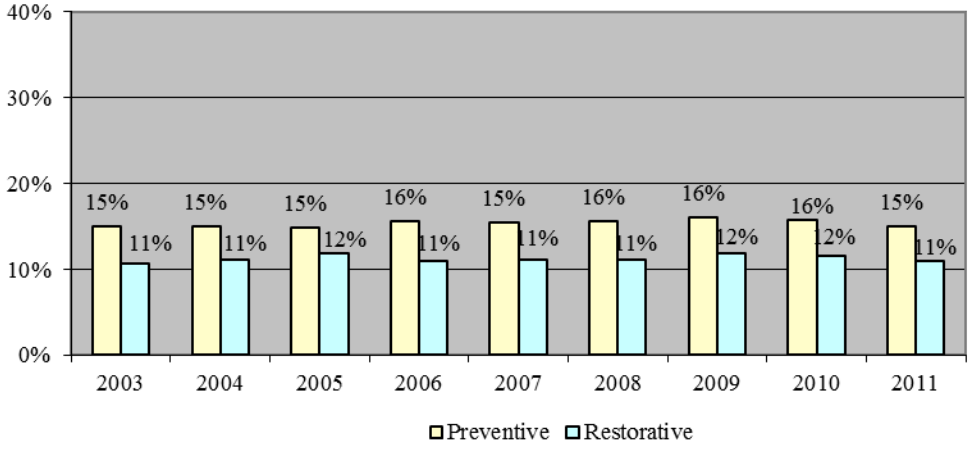
Dental Medicaid and State Children's Health Insurance Programs

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 under the age of 21 years, as a required component of the Early and Periodic Screening, Diagnostic 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 [Centers for Medicare & Medicaid Services, 2004].

Nationally, federal Medicaid expenditures for dental services totaled $2.3 billion in 2003, or three percent of the $74.3 billion spent on dental services nationally [Centers for Medicare & Medicaid Services 2004]. Vermont spent $1.19 billion for Medicaid in 2010, of which $22 million or 1.9 percent was for dental services.

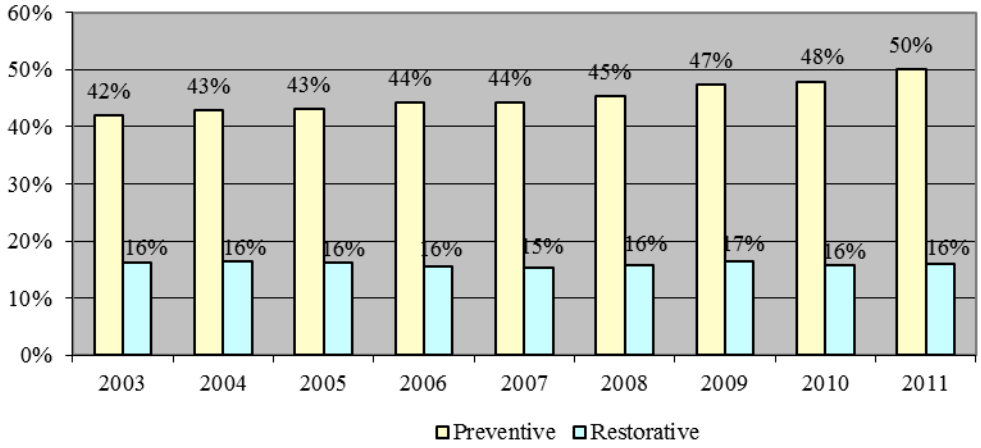
In CY 2011, 29.2 percent of Medicaid eligible adults 21 years and older and 55.5 percent of Medicaid-eligible children (SCHIP excluded) utilized dental service. Among adult patients half of the visits were for restorative care, whereas children's visits were mostly for preventive care (75 percent). The utilization rate of dental care among adults has not changed significantly since 2003, while the rate among children has been rising slowly as preventive care has increased (Figures 43 and 44). The rate of restorative care has not declined for children however.

Figure 43. Percentage of Medicaid Eligible Adults 21 and Older with Preventive and Restorative Dental Care. CY2003-2011.



Data Source: Department of Vermont Health Access. 2003-2011.

Figure 44. Percent of Medicaid Eligible Children 0-20 with Preventive and Restorative Dental Care. CY2003-2011.

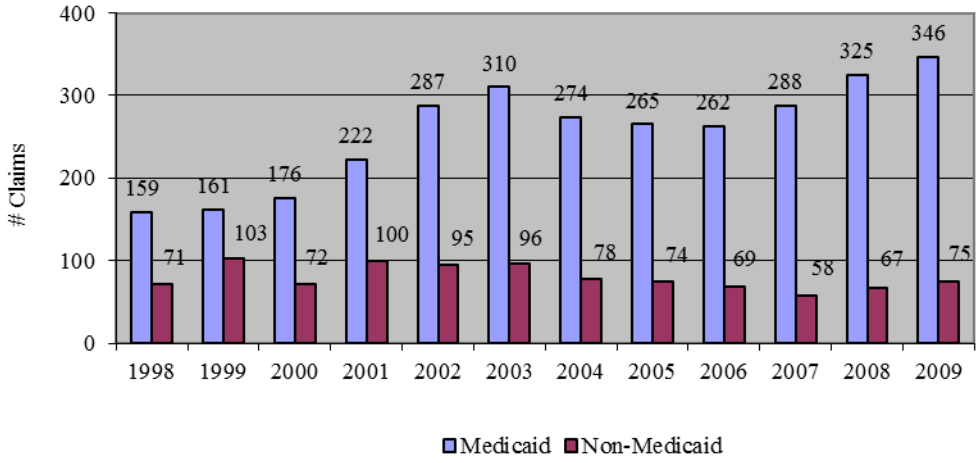


Data Source: Department of Vermont Health Access. 2003-2011.

The figure below shows the number of claims in Vermont and New Hampshire hospitals among Vermont children age 0-5 with hospital outpatient visits for dental caries (Figure 45). The number

of claims among non-Medicaid children has not changed. However the number of claims among Medicaid children has been increasing at an alarming rate. In 1998, 69 percent of the claims were for Medicaid children; in 2009 that proportion has gone up to 82 percent.

Figure 45. Children 0-5 Yrs. Outpatient Visits to Vermont and New Hampshire Hospitals for Dental Caries. 1998-2009.

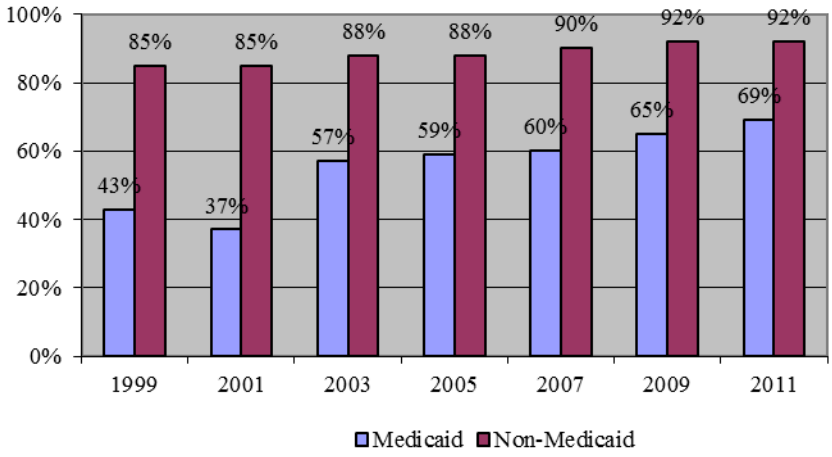


Data Source: VT Uniform Hospital Discharge Data Set. 1998-2009.

Due to the low reimbursement rate, burdensome administrative requirements, or patient issues such as frequently missed appointments, dentists' participation in Medicaid are nationally low [U.S. Government Accountability Office, 2000]. Additionally, among dentists who do participate in Medicaid, many may place limits on the number of Medicaid patients that they will treat. Figures 46 and 47 illustrate the percentage of primary care dentists in Vermont who accept new patients, and the percentage of primary care dentists who accept five or more new patients, respectively.

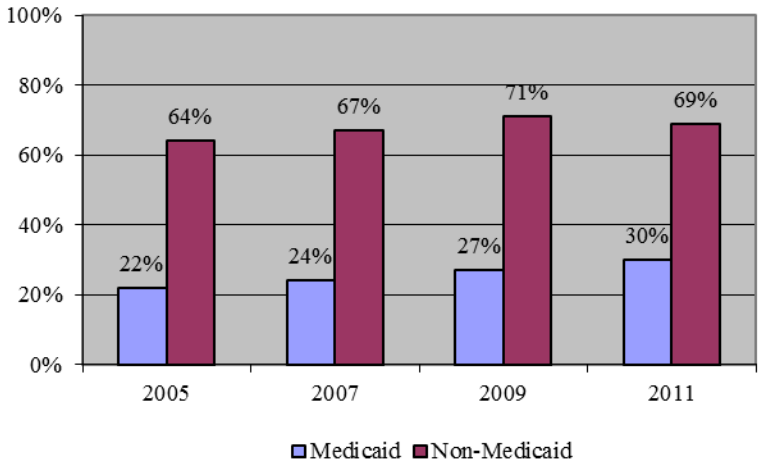
Although there has been an increase in the percentage of dentists accepting new Medicaid patients, disparities between accepting Medicaid and non-Medicaid patients continues to exist. This is especially evident in the percent accepting 5 or more new patients. To a lesser extent this pattern is also seen among orthodontists in Vermont (Figures 48 and 49).

Figure 46. Percentage of Primary Care Dentists Accepting New Patients. 1999-2011.



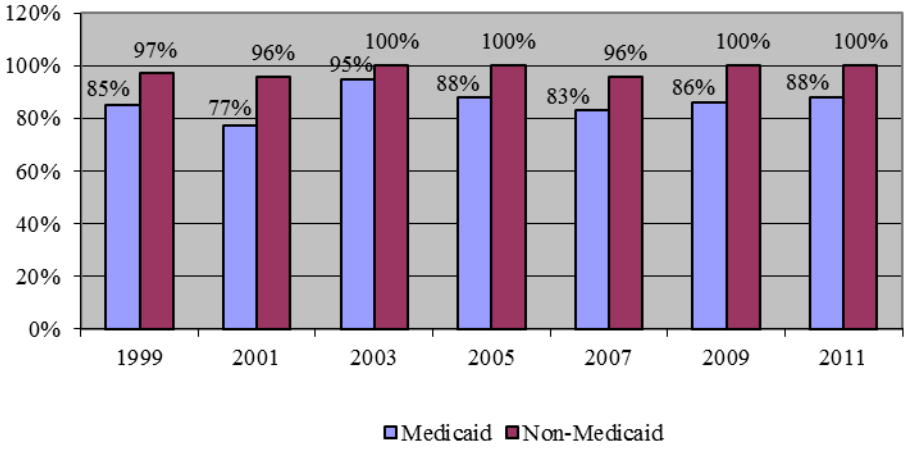
Data Source: VT Dentist Survey. 1999-2011.

Figure 47. Percentage of Primary Care Dentists Accepting 5 or More New Patients per Month. 2005-2011.



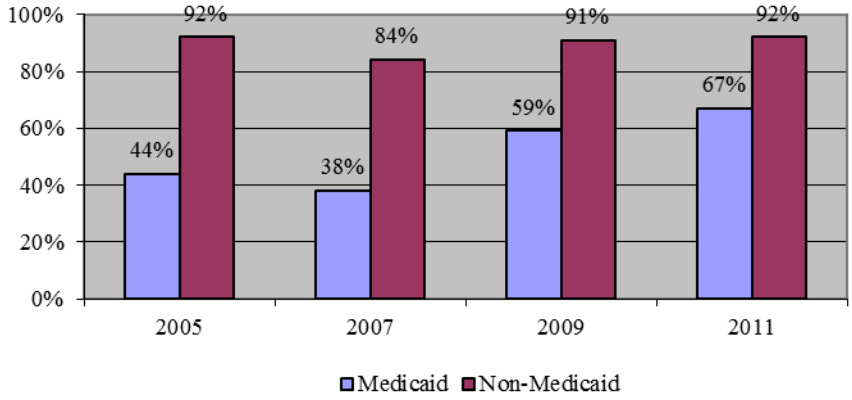
Data Source: VT Dentist Survey. 2005-2011.

Figure 48. Percentage of Orthodontists Accepting New Patients. 1999-2011.



Data Source: VT Dentist Survey. 1999-2011.

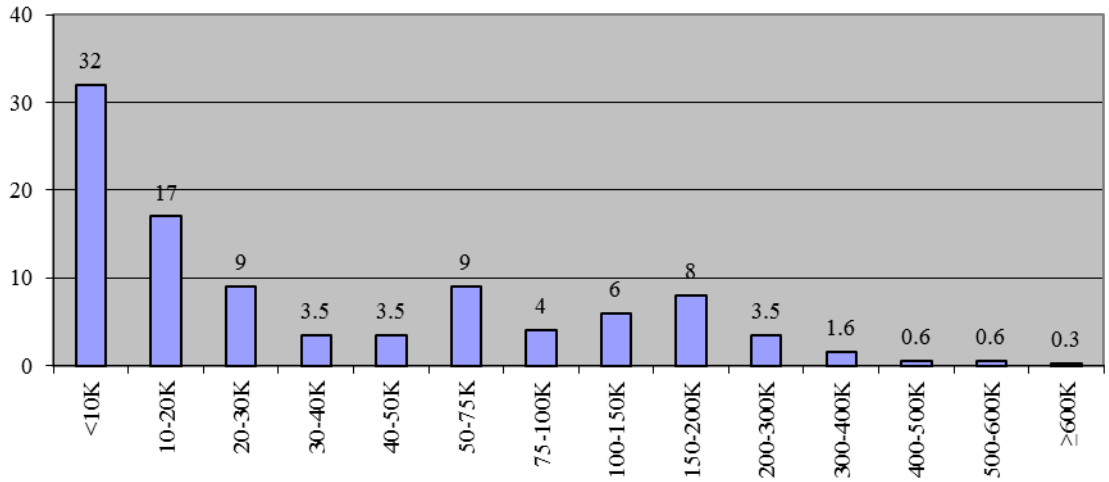
Figure 49. Percentage of Orthodontists Accepting 5 or More New Patients per Month. 2005-2011.



Data Source: VT Dentist Survey. 2005-2011.

In CY-2011, 309 (84 percent) of Vermont's 368 dentists (general dentists and specialists) participated at some level in Vermont's Medicaid program. Although this participation rate is far above most states, looking at the bar graph below gives some perspective to the high rate of participation (Figure 50). Thirty-two percent or 100 of the 309 dentists had less than $10,000 in claims during 2011. However, more notable is the fact that 105 (35 percent) of the dentists participated in Medicaid with claims totaling $50,000 or more.

Figure 50. Percentage of Dentists with Medicaid Claims. CY2011.



Data Source: VT Dept. of Heath Access. CY2011.

The high percentage of dentist participation in the Medicaid program still is not enough to address the concerns regarding access to care. For instance, in the 2009 Vermont Family Health Insurance Survey, about one in ten (9.2 percent of Medicaid recipients) indicated they did not get needed medical care because they could not find a doctor that accepted state health insurance. VDH Office of Oral Health is very interested in collecting data on the barriers to care and has added questions about dental insurance coverage and reasons for not visiting a dental office or clinic in the past year to the 2012 BRFSS. This information may help explain Vermont's low rate of dental care utilization among Medicaid adults, and assess whether current programs and/or policies meet the oral health care needs of Vermonters.

Community and Migrant Health Centers and other State, County, and Local Programs

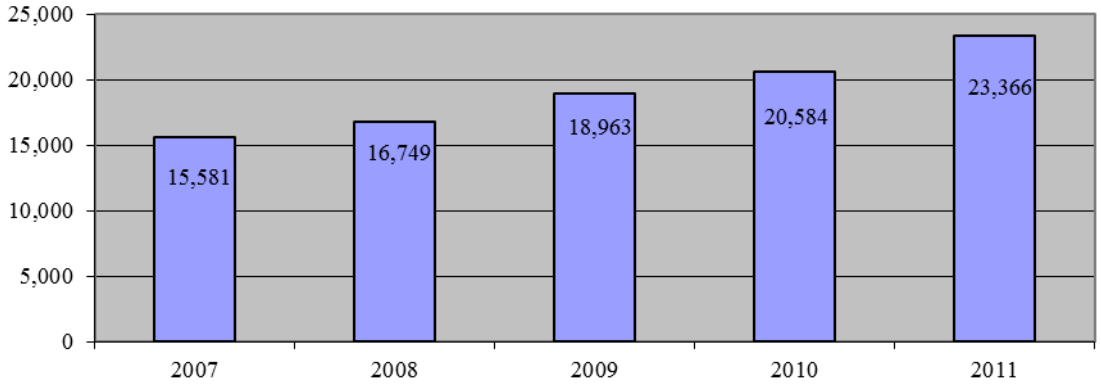
Community Health Centers (CHCs) provide family-oriented primary and preventive health care services for people living in rural and urban medically underserved communities. CHCs exist in areas where economic, geographic, or cultural barriers limit access to primary health care. The Migrant Health Program (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.

The *Healthy People 2020* objective OH-10.1 is to "Increase the proportion of Federally Qualified Health Centers that have an oral health component". In the U.S., 75 percent of Federally Qualified Health Centers (FQHCs) had an oral health care component in 2007; the *Healthy People 2020* target is 83 percent. In the U.S., 17.5 percent of patients at FQHCs received oral health services in 2007; the *Healthy People 2020* target is 33.3 percent. In Vermont 87.5 percent of the FQHCs provide an oral health component and 19.2 percent of patients received oral health services in 2011.

There are seven FQHCs in Vermont with associated dental centers that have a sliding scale for dental care [catamounthealth.org]. In 2005, the Vermont legislature put into statute, "the goal shall be to ensure there are FQHCs in each county in Vermont" Act 71 of 2005, Section 277 (f). There are active FQHC development efforts underway in Addison, Bennington, and Orange Counties, and existing FQHCs are in the planning stages of expansions in additional areas of the state.

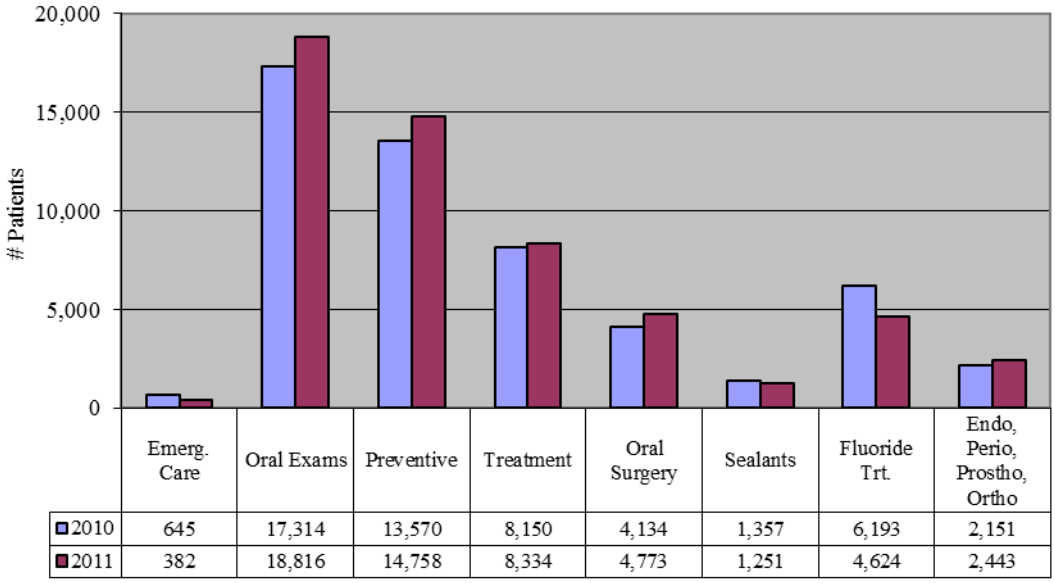
The total number of patients receiving dental care increased from 15,581 in 2007 to 23,366 in 2011, an increase of more than 7,000 Vermonters (Figure 51). The most common services provided at FQHCs were oral exams and preventive care (Figure 52).

Figure 51. Number of Patients Served at VT FQHCs for Dental Care. 2007-2011.



Data Source: HRSA. 2007-2011.

Figure 52. Types of Dental Services Provided at VT FQHCs. 2010-2011.



	Emerg. Care	Oral Exams	Preventive	Treatment	Oral Surgery	Sealants	Fluoride Trt.	Endo, Perio, Prostho, Ortho
2010	645	17,314	13,570	8,150	4,134	1,357	6,193	2,151
2011	382	18,816	14,758	8,334	4,773	1,251	4,624	2,443

Data Source: HRSA. 2010-2011.

Hospital Emergency Departments

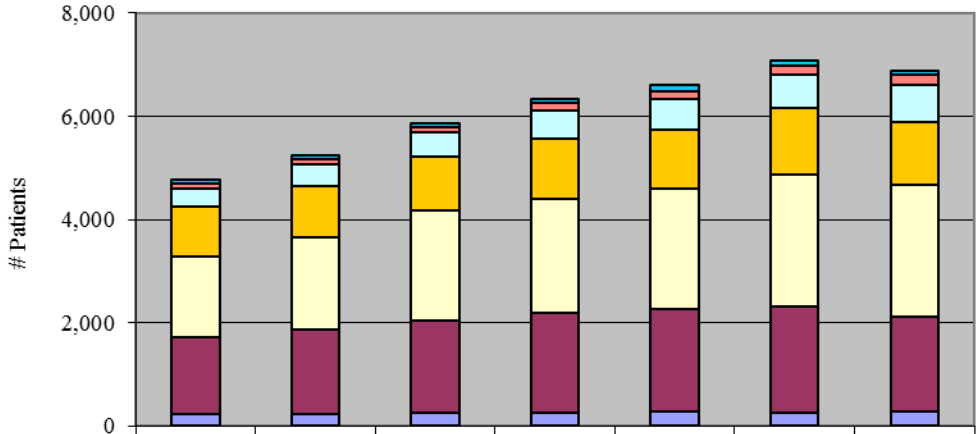
Visits to hospital emergency departments for non-traumatic dental complaints have increased over the past several decades throughout the United States [Teresita et al 2006]. Nationally, Medicaid members and uninsured individuals have a more difficult time obtaining dental services compared to medical services [Berk & Schur 1998]. Many of the individuals who are unable to obtain dental care end up in emergency departments.

Visits to the Emergency Departments frequently do not treat the underlying problems, but instead provide temporary measures, such as pain relief or antibiotics for infection. This creates a vicious cycle of Medicaid recipients and/or uninsured individuals making repeated visits to the Emergency Department for temporary relief of pain.

In 2009 there were a total of 6,203 visits to emergency departments for disorders of teeth and jaw/dental complaints in Vermont [VUHDDS]. Medicaid was a primary payer for 55.7 percent of the visits and self-pay was listed for 25.8 percent. Adults between the ages of 25 and 34 were most likely to end up in the emergency department for non-traumatic dental complaints (Figure 53).

The increase in Emergency Department visits for Vermonters have been substantial between 2003 and 2009. Patients who were seen for diseases of hard tissue of teeth, e.g., dental caries, have more than doubled between 2003 and 2009 (Figure 54).

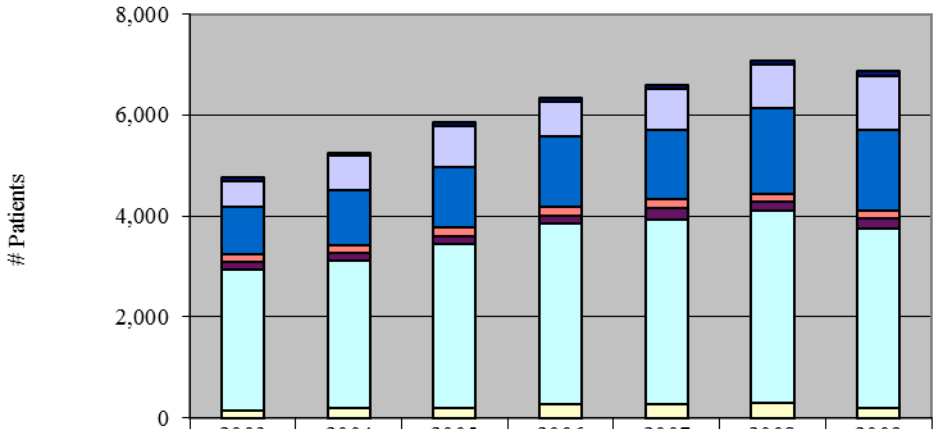
Figure 53. ED Visits for Vermonters by Age Group, at VT and NH Hospitals. 2003-2009.



	2003	2004	2005	2006	2007	2008	2009
65+	71	63	73	80	110	91	70
55-64	93	110	110	145	156	166	199
45-54	352	411	473	553	594	648	735
35-44	963	1009	1029	1173	1151	1303	1209
25-34	1554	1769	2133	2201	2326	2552	2561
18-24	1502	1660	1794	1941	1973	2048	1818
0-17	222	218	254	247	290	258	285

Data Source: VT Uniform Hospital Discharge Data Set. 2003-2009.

Figure 54. ED Visits for Vermonters. 2003-2009.



	2003	2004	2005	2006	2007	2008	2009
Tooth Dev. & Eruption	72	58	91	89	71	73	97
Hard Tissue	508	673	816	679	816	859	1070
Pulp & Periapical Tissue	938	1099	1185	1388	1387	1697	1602
Gingival & Peridontal	164	143	176	173	178	151	158
Dentofacial Anomalies	132	154	147	167	213	181	196
Other	2804	2927	3268	3587	3673	3801	3574
Jaws	138	186	182	257	258	301	179

Data Source: VT Uniform Hospital Discharge Data Set. 2003-2009.

CONCLUSIONS

Vermont has been ranked as the Nation's healthiest state since 2008. Although Vermonters strive to lead healthy lives, the burden of oral disease continues to silently affect many Vermonters, especially among certain demographic groups. Furthermore, there are populations, such as very young children, adolescents, the elderly and recent immigrants, whose oral health statuses are unknown and need to be addressed. There is much work to be done in Vermont to understand the bigger picture of oral health status, and to eliminate the disparities that exist.

Oral health is an integral part of overall health. A statewide collaboration between Vermont residents, communities, policymakers, health care professionals, and other private and public sectors is an essential step in ensuring that every Vermonter has access to dental care regardless of socioeconomic status or ability to get health insurance.

It is the goal of the Vermont Department of Health, Office of Oral Health that this Burden Document is used to target programs and develop policies with the goal of improving the oral health status of all Vermonters and reducing or eliminating the disparities that exist.

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