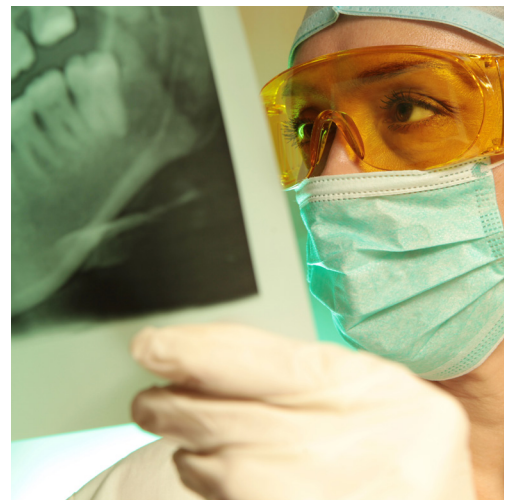


The Status of Oral Health in Minnesota

September 2013



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Table of Contents

- EXECUTIVE SUMMARY 2**
- HIGHLIGHTS: MINNESOTA ORAL HEALTH 4**
- CHAPTER 1: INTRODUCTION AND BACKGROUND 5**
 - PURPOSE, USE AND TARGET AUDIENCE OF BURDEN OF ORAL DISEASE DOCUMENT 5
- CHAPTER 2: STATE DEMOGRAPHICS 7**
 - OVERVIEW OF THE STATE 7
 - OVERALL POPULATION, GROWTH AND DIVERSITY 7
 - SOCIO-ECONOMIC STATUS 8
- CHAPTER 3: NATIONAL AND STATE OBJECTIVES FOR ORAL HEALTH 9**
 - UNITED STATES SURGEON GENERAL AND THE INSTITUTE OF MEDICINE REPORTS 9
 - OVERVIEW OF HEALTHY PEOPLE 2010/2020 10
- CHAPTER 4: THE BURDEN OF ORAL DISEASE 11**
 - DENTAL CARIES EXPERIENCE IN CHILDREN 11
 - DENTAL CARIES EXPERIENCE IN ADOLESCENTS 12
 - UNTREATED TOOTH DECAY (CARIES) IN CHILDREN 12
 - UNTREATED TOOTH DECAY (CARIES) IN ADULTS 13
 - PERIODONTAL DISEASE: GINGIVITIS AND PERIODONTITIS 13
 - TOOTH LOSS IN ADULTS 14
 - ORAL HEALTH DISPARITY IN ADULTS 15
 - ORAL HEALTH DISPARITY IN CHILDREN 17
 - BIRTH DEFECTS 18
 - ORAL CAVITY AND PHARYNGEAL CANCERS 19
 - DISPARITY 22
 - DENTAL HOSPITAL VISITS 23
 - HOSPITAL-TREATED ORAL-DENTAL CONDITIONS 24
 - ECONOMIC IMPACT 26
 - ORAL DISEASES AND OTHER HEALTH CONDITIONS 26
- CHAPTER 5: PROTECTIVE FACTORS AFFECTING ORAL DISEASE 28**
 - COMMUNITY WATER FLUORIDATION 28
 - DENTAL SEALANT PROGRAMS 29
 - FLUORIDE VARNISH 30
- CHAPTER 6: RISK FACTORS AFFECTING ORAL DISEASE 31**
 - TOBACCO USE 31
 - BEVERAGE CONSUMPTION 32
- CHAPTER 7: ACCESS TO ORAL HEALTH CARE 33**
 - DENTAL PROFESSIONAL SHORTAGE DESIGNATION 33
 - DENTAL WORKFORCE CAPACITY 33
 - ENHANCING WORKFORCE MODELS AND CREATING NEW PROVIDERS 35
 - ORAL HEALTH FINANCING 35
- CHAPTER 8: CONCLUSION 38**
- APPENDIX A: ACRONYMS 39**
- APPENDIX B: MAPS 40**
- REFERENCES 41**

Executive Summary

Oral health is integral to overall health. The mouth not only reveals signs of poor nutrition and diseases such as infections, immune disorders, injuries, and certain cancers, but research has shown associations between chronic oral infections and heart and lung diseases, stroke, low-birth-weight, premature births, as well as diabetes. Among the top risk factors for oral disease are high-sugar beverages and foods, which also contribute to obesity, along with tobacco and alcohol. There are several ways in which people suffer from pain and discomfort because of poor oral health: tooth decay; oral and craniofacial diseases; gum disease; cleft lip and palate; oral and facial pain syndromes; traumatic injury; and oral and pharyngeal (mouth and throat) cancers. Tragically, untreated oral disease can also lead to death. Yet many of these conditions and diseases are preventable.

In 2000, Surgeon General David Satcher released *Oral Health in America: A Report of the Surgeon General*.¹ The report found a low awareness of oral health among the public, a significant disparity between racial and socioeconomic groups in regard to oral health, and ensuing overall health issues. Since then several steps have been taken to promote access to oral health care for all, especially the disadvantaged, minority and at risk children.

In April 2009, the Institute of Medicine (IOM) through their publication 'Advancing Oral Health in America: Publication of the Committee on an Oral Health Initiative'² recognized that factors such as settings of care, workforce, financing, quality assessment, access, education and stakeholders in private and public sector, influence oral health and the entire health care system. To provide a foundation for sustainability and to set measureable goals and objectives for the initiative, benchmarks were set in the form of Healthy People 2020 indicators.

While Minnesotans in general enjoy a high level of oral health, there is room for improvement, especially among underserved populations who bear the brunt of oral diseases. Significant disparities exist for low-income children and adults, people of color, and the elderly, all of whom disproportionately suffer from oral diseases due to inadequate access to affordable dental care.

This report presents the updated information on oral disease morbidity and mortality (oral and pharyngeal cancer), identifies risk factors and high risk groups, reports on preventive strategies such as dental sealants and community water fluoridation, and offers insight into dental care access and workforce supply and distribution. Based on available data, state and national data are compared with the Healthy People 2020 objectives.

Even though dental caries (tooth decay) is nearly 100 percent preventable, it is the most common chronic childhood disease and is five times more common than asthma¹. According to Minnesota Basic Screening Survey (BSS) 2010, 55% of third graders in Minnesota experienced dental decay compared to 53% of children 6 to 8 years in the nation (National Health and Nutrition Examination Survey (NHANES) 1999-2004). The survey also found 18% of third graders with untreated cavities compared to 29% in the nation (NHANES 1999-2004). Low-income and children of color bear the greatest burden of oral diseases and conditions when compared to

their more affluent and white peers. BSS showed that caries experience and untreated caries rise as income declines: the poorest children (schools with >75% of children on Free and Reduced Lunch) were almost twice as likely to experience tooth decay and almost three times more likely to have their tooth decay go untreated than students in more affluent schools. And, children of color were 12 percent more likely to experience caries and 7 percent more likely to have untreated caries when compared to white children.

Behavioral Risk Factor Surveillance System (BRFSS) data for 2010 shows that poorest Minnesota adults with income \$15,000 or less per year, were three times less likely to visit a dentist in the past year than adults making \$50,000 or more. Among the elderly, a person without a high school degree was 10 times more likely to have all their teeth extracted than someone with a college degree. Between 2004 and 2010, older Minnesotans who had any permanent teeth extracted declined slightly from 36 to 33 percent as national trends remained stagnant at 44 percent. While these downward trends are encouraging, with virtually no Medicare dental benefits for older adults in the state, it is less likely that this population will seek oral health care and will eventually compromise their quality of life and health.

According to Centers for Medicaid and Medicare Services (CMS), in 2009, the national dental services expenditure was \$102.2 billion with 42 percent of that amount spent on out-of-pocket payments. The evidence also suggests that dental services offered through CMS are continuously underutilized by low-income children and their families. In Federal Fiscal Year (FFY) 2011, of the 453,502 eligible Early Periodic Screening Diagnostic and Treatment (EPSDT) children in Minnesota, majority (59 percent) did not receive dental services. On the flip side, a 6 percent increase in children 21 years and younger eligible for Medicaid from FFY2010 to FFY2011 was noted; it is anticipated that this number will increase once the Affordable Care Act is fully enacted by 2014.

Trends indicate that issues related to accessibility and affordability have led people to seek care in emergency departments and hospitals adding to the overall cost to health care. From 2008 to 2010, cost for hospital-treated “non-traumatic” conditions that could have been treated by a dentist, rose by 9 percent with the cost totaling \$148 million. Four times more people sought treatment for non-traumatic oral emergencies at hospitals as compared to those seeking treatment for traumatic conditions. From 2007 to 2010, just over a third (37 percent) of patients visiting emergency departments with traumatic conditions were from rural areas. Significantly, people who sought treatment from a hospital for non-traumatic oral emergencies were four times more likely to be admitted to the hospital than those seeking treatment for oral trauma conditions. This may be attributable to dental conditions that could have been treated by a dentist early on having evolved into more complicated and costly ailments that needed hospitalization.

Highlights: Minnesota Oral Health

Children

- 55% of 3rd graders experienced dental decay (caries experience) (2010)
- 18% of 3rd graders have untreated cavities (2010)
- Children of color are 12% more likely to experience caries and 7% more likely to have untreated caries as compared to white children (2010)
- Minnesota's 64% school-based sealant rate far exceeds the national average of 32% (2010)
- 59% children with Medicaid coverage did not receive any dental services by or under the supervision of a dentist during FFY2011.
- 403 cases out of 361,109 births or 1 in 1,000 births had an oro-facial defect such as clefting (2005-2009)

Adults and the Elderly

- 79% of adults 18 years and older reported visiting a dentist or dental clinic within the past year (2010)
- The poorest adults (<\$15K) were 3 times less likely than their most affluent peers (\$50K+>) to visit a dentist in the past year (2010)

Adults and the Elderly

- Natural teeth extractions fell by 50% for older adults as compared to the national 36% drop in rate (1999-2010)
- An older person without a high school degree was 10 times (nationally and 7 times locally) more likely to have all their teeth extracted than one with a college degree (1999-2010)

Cancer of the Oral Cavity and Pharynx

- Minnesota incidence rate is 11.4/100,000 population for oral and pharyngeal cancers compared to 10.9/100,000 nationally (2005-2009)
- Minnesota mortality rate for oral and pharyngeal cancers is 2.0/100,000 population compared to 2.5/100,000 nationally (2004-2008)
- Oral and pharyngeal cancer is highest (23%) among Minnesota's American Indian men living on or near Indian reservations (2004 and 2008)

Community Water Fluoridation

- 78% of Minnesotans receive fluoridated water compared to 64% of people across the nation (2010)
- Almost all Minnesotans have access to fluoridated water through the public water system (2010)

Dental Workforce

- 47% of dentists are 55 years or older (2009-2010)
- Of the 3,908 dentists who renewed their Minnesota license, only 26% were practicing in rural areas (2010)
- Just over half (53%) of practicing dentists submitted at least one dental claim for patients on public programs to the Minnesota Department of Human Services (2010)
- In 2009, Minnesota signed into law two new types of "mid-level" dental providers: dental therapist and advanced dental therapist
- Only 7% of dentists and 6% of hygienists work with a "collaborative agreement" (2009-2010)
- Only 23% of dentists are female (2010)
- Only 6% of dentists are people of color (African American, Native American, Asian or multiracial); 2% are Hispanic (2010)
- As of March 2013, there are 25 licensed Dental Therapist in the state. Out of these 25, 16 are practicing and all of them have established at least one Collaborative Management Agreement

Chapter 1: Introduction and Background

According to the first Surgeon General's Report on Oral Health in 2000, the health of the mouth and surrounding craniofacial (skull and face) structures is central to a person's overall health and well-being^{3,4}. Over the past 50 years, significant improvement in the oral health of Americans is a public health success story. Most of the gains are a result of effective disease prevention and treatment efforts. Community water fluoridation is one of the major successes of the twentieth century and seven out of ten Americans enjoy the benefit of receiving fluoridated water through public water systems.

There are several ways in which oral health can be compromised. Oral and craniofacial diseases and conditions include dental caries (tooth decay), periodontal (gum) diseases, cleft lip and palate, oral and facial pain, traumatic lesions, and oral and pharyngeal (mouth and throat) cancers. In Minnesota, although a large portion of the population enjoys a high level of oral health, there are segments of the population that bear an uneven burden of oral disease. Studies show that access to adequate health care, and dental care in particular, is affected by education level, income, race, and ethnicity.

To address the pressing oral health issues in the state, the Minnesota Department of Health (MDH) received funding from the Centers for Disease Control and Prevention (CDC) and the Health Services and Resources Administration (HRSA) to develop capacity and infrastructure for oral health in the state. Since its inception in 2008, Oral Health Program (OHP) has made tremendous progress by developing the first State Oral Health Plan (OHP), a blueprint for reducing the prevalence of oral disease. The OHP also conducted the first open-mouth screening (Basic Screening Survey) of Minnesota third grade children, developed communications via the oral health website, increased activities with policy and compliance, and enhanced collaborations with programs and departments including Health Promotion and Chronic Disease Division (HPCD), Center for Health Promotion (CHP), Drinking Water Protection, Maternal and Child Health (MCH), tobacco control, Minnesota Obesity Project and Department of Education.

In 2009, to promote oral health and improve the dental care delivery system for underserved populations, then Minnesota Governor, Tim Pawlenty signed a bill into law creating new dental professionals called Dental Therapists (DT) and Advanced Dental Therapists (ADT). These new providers are now working under direct/indirect supervision of a dentist through a collaborative management agreement and are part of the dental teams. Minnesota is the first state after Alaska to work with this new type of dental workforce to reduce oral health disparities.

Purpose, Use and Target Audience of Burden of Oral Disease Document

The purpose of the 'Burden of Oral Disease' document is to raise awareness of the need to monitor burden of oral disease in populations, to guide efforts to prevent and treat oral diseases to enhance quality of life of Minnesotans. Data comparisons on national, state and

'Healthy People 2020' objectives are being made on several indicators depending on the availability of the information.

This document can be used to provide information for decision making, policy development and implementation of preventive strategies to address oral health needs of vulnerable populations in particular.

This document is written for oral disease prevention/oral health promotion stakeholders committed to recognizing oral health as integral to overall health, improving oral health, enhancing healthy behavior, preventing and reducing burden of oral disease and disparities.

Chapter 2: State Demographics

Overview of the State

Geographically, Minnesota is located in the north central United States. In the North, it borders Canadian provinces of Manitoba and Ontario, in the west, borders North Dakota and South Dakota, in the south borders Iowa, and in the east Wisconsin and Lake Superior.

Minnesota ranks 12th in the nation in land area. It is the fourth healthiest state after Vermont, New Hampshire and Massachusetts.⁵ The residents have low rates of premature death, infant mortality, cardiovascular disease, and occupational fatalities, higher life expectancies, and a high rate of health insurance.

Overall Population, Growth and Diversity

The large majority of residents are white (Scandinavian and German descent). Ethnic diversity (African, Asian, and Latin American) has increased in recent years as shown in the following table.

Figure 1: Minnesota Population Change by County: 2000 - 2010

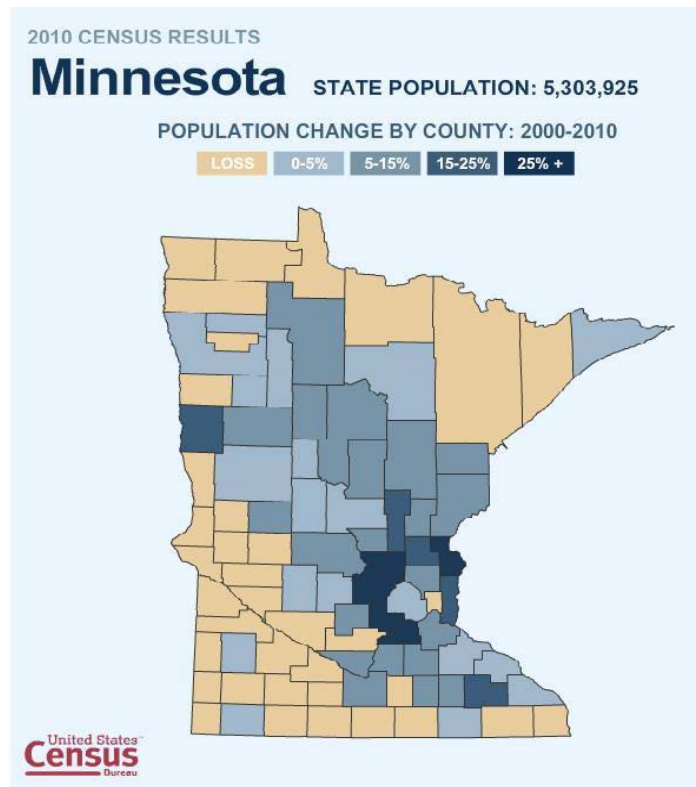


Table 1: Minnesota State Population by Race and Hispanic Ethnicity, 2010⁶

Racial/Ethnic groupings	2010 Census	% of population	Change 2000-2010
White	4,524,062	85.3	+ 2.8
Blacks, African American	274,412	5.2	+ 58.9
American Indian Alaskan Native	60,916	1.1	+ 10.8
Asian	214,234	4.0	+ 50.9
Native Hawaiian/Other Pacific Islander	2,156	0.04	+ 8.9
Other race	103,000	1.9	+ 56.5
Two or more races	125,145	2.4	+ 51.2
Ethnic Origin			
Hispanic or Latino origin (may be of any race)	250,258	4.7	+ 74.5
Non-Hispanic or Latino	5,053,667	95.3	+ 5.8
Total	5,303,925		+ 7.8

As stated above, during the 2010 census, Minnesota State Population was 5,303,925. However, 2012 population estimates have shown a growth of 1.4% (75,214) to 5,379,139⁷.

Socio-economic Status

Public health professionals and policy makers have started to realize that complex, integrated and overlapping social structures and economic systems are responsible for health disparities. Several studies have shown that health outcomes improve as a result of improved socioeconomic status. According to the CDC, socioeconomic gradients in health can be measured through an individual's income, occupation or the highest level of education⁸.

Research has also shown a strong correlation between health outcomes and education. According to U.S. Census data, 46 percent of Minnesota's population age 25 years and older attained an associate degree or higher⁹ as compared to 38 percent of adults having an associate degree or higher nationally. During the same year, the high school graduation rate [10](#) in the state (88.2 percent) was higher than the national rate (78.2 percent).

According to the census bureau report issued in September 2012, official poverty rate did not change from 2010 to 2011 (15 percent or 46.2 million people both years)¹¹. In Minnesota, 11.9 percent of the population live in poverty (about 612,970 people), which puts Minnesota 13th in the nation in number of those living below the poverty line (\$11,344 for an individual or \$22,113 household income for a family of four)¹². In 2009, per capita income in the state (\$55,621) was higher than the nation (\$50,221). According to the Bureau of Labor Statistics Current Population Survey, the unemployment rate for Minnesota in May 2013 was 5.2% compared to 7.6% nationwide¹³

Chapter 3: National and State Objectives for Oral Health

United States Surgeon General and the Institute of Medicine Reports

On May 25, 2000, Surgeon General David Satcher released *Oral Health in America: A Report of the Surgeon General*¹. Since 2000, this report has framed the science on vital health issues in a way that has helped educate, motivate and mobilize the public to more effectively deal with oral health related issues. The report found a low awareness of oral health among the public, a significant disparity between racial and socioeconomic groups in regard to oral health, and ensuing overall health issues. Based upon these findings, the Surgeon General called for action to promote access to oral health care for all Americans, especially the disadvantaged and minority children found to be at greatest risk for severe medical complications resulting from minimal oral care and treatment.

In 2009, HRSA approached the Institute of Medicine (IOM) to provide recommendations for a potential oral health initiative. The committee, organized by IOM recognized that factors such as settings of care, workforce, financing, quality assessment, access, education and stakeholders in private and public sector influence oral health and its care system. The committee used oral health in its most comprehensive sense—as the responsibility of the entire health care system.

The recommendations on an oral health initiative for Health and Human Services (HHS) were published in April 2011 titled ‘*Advancing Oral Health in America: Publication of the Committee on an Oral Health Initiative*¹⁴’ with the following organizing principles:

1. Establish high-level accountability.
2. Emphasize disease prevention and oral health promotion.
3. Improve oral health literacy and cultural competence.
4. Reduce oral health disparities.
5. Explore new models for payment and delivery of care.
6. Enhance the role of non-dental health care professionals.
7. Expand oral health research, and improve data collection.
8. Promote collaboration among private and public stakeholders.
9. Measure progress toward short-term and long-term goals and objectives.
10. Advance the goals and objectives of Healthy People 2020.

To give the initiative a foundation for sustainability and to set measureable goals and objectives for the initiative the committee advised HHS to use well-accepted set of benchmarks developed through strong collaboration of multiple partners in the form of Healthy People 2020.

In the fall of 2009, with support from HRSA and the California HealthCare Foundation, the National Research Council (NRC), IOM formed the Committee on oral health access to services to assess the current oral health care system and to focus on the delivery of oral health care to

vulnerable and underserved populations. After reviewing the evidence, overall conclusions of the committee were:

1. Improving access to oral health care is a critical and necessary first step to improving oral health outcomes and reducing disparities.
2. The continued separation of oral health care from overall health care contributes to limited access to oral health care for many Americans.
3. Sources of financing for oral health care for vulnerable and underserved populations are limited and tenuous.
4. Improving access to oral health care will necessarily require multiple solutions that use an array of providers in a variety of settings.¹⁵

Overview of Healthy People 2010/2020

Healthy People 2020 (HP2020) is a continuation of Healthy People 2010, a ten year evidence-based strategy to improve the nation's health through monitoring progress toward a set of benchmarks. The process guides health professionals to make informed health decisions, and measure impact of prevention activities by encouraging collaborations across sectors. A consortium of more than 2,000 organizations including public health and prevention experts, federal, state and local government officials and public have been involved in developing these objectives and indicators. The Leading Health Indicators (LHI) are composed of 26 indicators organized under 12 topics including access to health services, clinical preventative services, environmental quality, injury and violence, maternal, infant, and child health, mental health, nutrition, physical activity, and obesity, oral health, reproductive and sexual health, social determinants, substance abuse, and tobacco. This is the first time that oral health has been included as one of the 26 LHI. The indicator is: persons aged 2 years and older who have used the oral health care system in the past 12 months (OH-7). There are 17 oral health HP2020 objectives covering children and adolescents, adults, preventive services, oral health interventions, monitoring and surveillance systems and public health infrastructure¹⁶.

Chapter 4: The Burden of Oral Disease

Generally, the term “Oral” refers to the mouth and associated structures which include not only the teeth and the gums (gingivae) and their supporting connective tissues, ligaments, and bone, but also hard and soft palate, soft mucosal tissue lining of the mouth and throat, tongue, lips, salivary glands, chewing muscles, and upper and lower jaws, which are connected to the skull by the temporomandibular joints. Equally important are the branches of the nervous, immune, and vascular systems that animate, protect, and nourish the oral tissues, as well as provide the connections to the brain and the rest of the body. The genetic development pattern in utero also reveals the relationship of oral tissues to brain development and to the tissues of head and face that surround the mouth.

Hence, when the term oral health is used, it means being free of chronic oral-facial pain conditions, oral and pharyngeal (throat) cancers, oral soft tissue lesions, birth defects such as cleft lip and palate, and scores of other diseases and disorders that affect the oral, dental, and craniofacial tissues, collectively called the craniofacial complex. These tissues allow us to speak, smile, smell, touch, taste, chew, swallow, cry out and make facial expressions.

Dental Caries Experience in Children

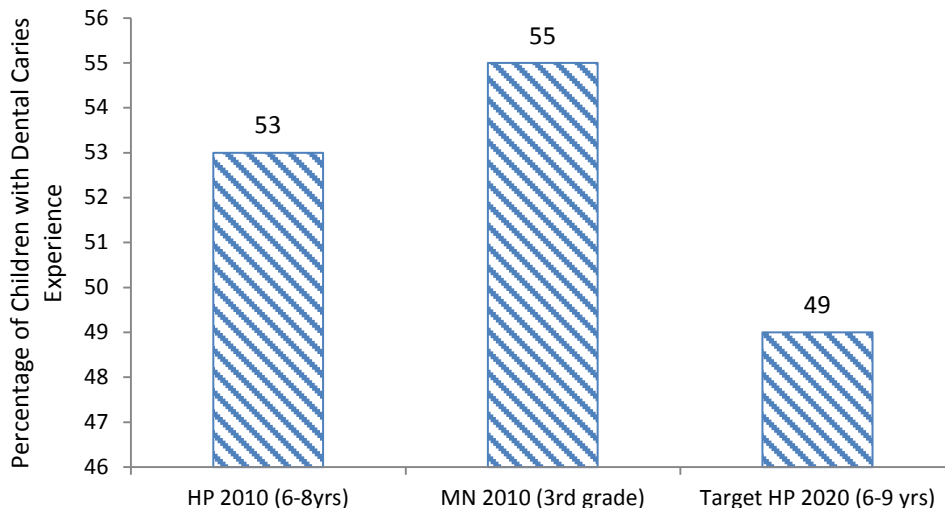
Dental caries is a disease in which acids produced by the action of bacteria on the teeth lead to loss of minerals from the enamel and dentin. If unchecked, caries can result in destruction of tooth structure, inadequate tooth function, unsightly appearance, pain, infection, and ultimately tooth loss. According to a study published in the American Journal of Public Health, dental visits or dental problems account for 117,000 hours of school lost per 100,000 children.¹⁷

It also affects nutrition, growth and weight gain. According to the CDC, dental caries/tooth decay, though preventable, remains the most common chronic disease of children ages 6 to 19. It is four times more common than asthma among ages 14 to 17 years. Nationally, treating caries costs an estimated \$3,513 per 1,000 children.¹⁸

Early Childhood Caries (ECC) affect children age birth to 71 months of age. It is defined as the presence of one or more decayed surfaces (non-cavitated or cavitated lesions), missing teeth (due to caries) or filled tooth surfaces in any primary tooth.¹⁹ According to National Health and Nutrition Examination Surveys (NHANES) prevalence of ECC among US children 2 to 4 years increased from 18.5% (1988-1994) to 23.7% (1999-2004).²⁰

Generally, prevalence of dental caries in children is measured through the ASTDD Basic Screening Survey (BSS) tool.²¹ In 2010, the Minnesota Department of Health conducted its first BSS on students in third grade attending public schools. The survey showed 55% of children in third grade had caries experience (history of dental caries) which was slightly higher than the nation (53%) for children 6-8 years. The state had 11% higher prevalence than the Healthy People 2010 target (42%).

**Figure 2: Dental Caries Experience in Children
Comparison of HP2010, HP2020 with MN Data**



Date Sources: HP2010-NHANES 1999-2004, MN 2010-Minnesota BSS 2010 on third graders, Target HP2020 NHANES

Dental Caries Experience in Adolescents

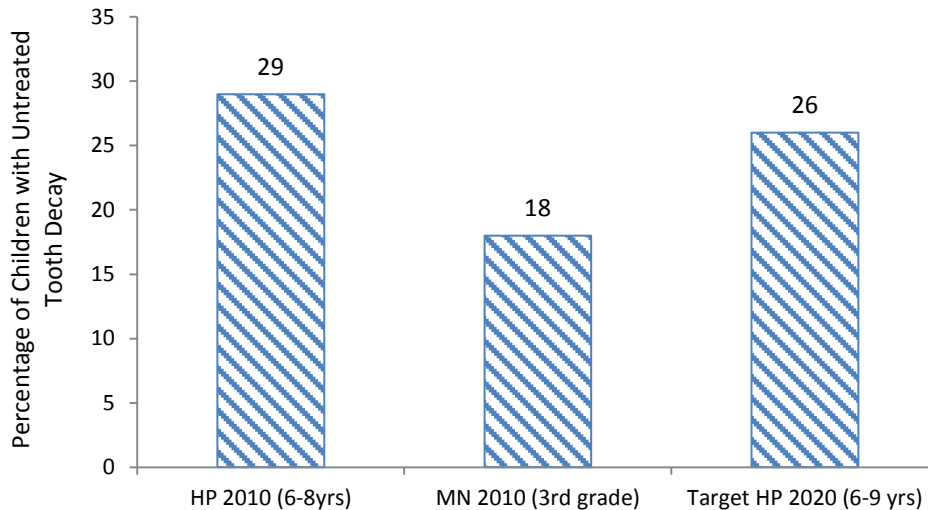
According to NHANES data 1999-2004, 56.1% adolescents (age 15 years) nationwide had caries experience. Data also showed higher prevalence in females (60.1%) than males (52.7%)²².

Untreated Tooth Decay (caries) in Children

Untreated tooth decay is one of the best predictors of future caries activity. HP2010 report showed that the nation could not achieve the target set for this indicator as 19% (target for HP2010 was 9%) of children age 2-4 years and 29% (target for 2010 was 21%) of children ages 6-8 years had untreated dental decay. State level BSS 2010 data indicated only 18% of third graders had untreated tooth decay which was even lower than the set target for HP2020 of 25.9%.

Nationally, untreated tooth decay for adolescents age 15 years (18%) was higher than the target set for HP2010 (15%). Therefore, for HP2020, the bar for this indicator has not been raised and the target has been kept almost the same (15.3%).

**Figure 3: Untreated Tooth Decay in Children
Comparison of HP2010, HP2020 with MN Data**



Date Sources: HP2010-NHANES 1999-2004, MN 2010-Minnesota BSS 2010 on third graders, Target HP2020 NHANES

Untreated Tooth Decay (caries) in adults

Generally, people throughout their lives are susceptible to dental caries. Adults, like children and adolescents can experience new decay on the crown and can also develop caries on the root surfaces of teeth. According to NHANES data for 1999-2004 reported for the HP2010 final report, nationwide 27.8% adults, ages 35-44 years and 18% of adults, age 65 years and above had untreated caries.²³

Periodontal disease: Gingivitis and Periodontitis

Periodontal disease including gingivitis and periodontitis are bacterial infections, which affect gums and bone supporting the teeth and can cause tooth loss if left untreated.²⁴

During 2009–2010, 45% of adults aged 45–64 years had moderate or severe periodontitis. Prevalence was significantly higher for Hispanic and non-Hispanic black adults (59% and 60%, respectively) compared with non-Hispanic white adults (39%). Among adults aged 65–74 years, 58% had moderate or severe periodontitis. Hispanics had a higher prevalence of periodontitis (74%) compared with non-Hispanic whites (53%).²⁵

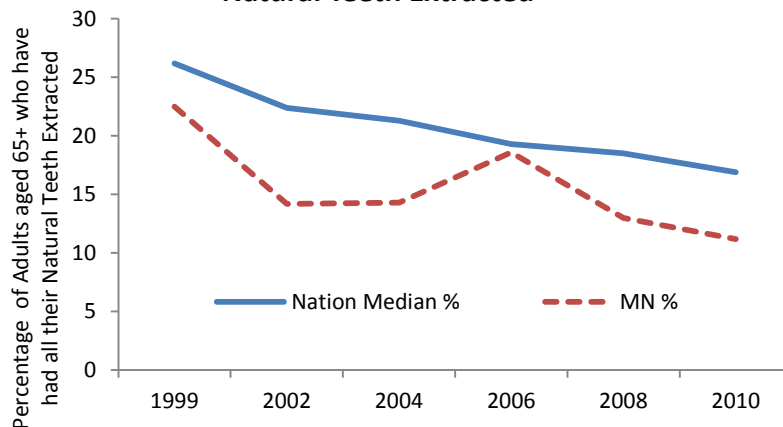
According to CDC, 4 to 12 percent of adults in the US are affected by gum diseases. Cigarette smoking causes half of the cases of severe gum disease and prevalence of gum diseases is three times higher in smokers than non-smokers.²⁶ Periodontal diseases are recognized as the "sixth complication" of diabetes.²⁷ Expert committee on 'Diagnosis and Classification of Diabetes

Mellitus', referred periodontal disease as one of the pathological conditions often found in adults with diabetes.²⁸

Tooth Loss in adults

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. In adults, tooth decay and periodontal (gum) disease are the most common reasons for tooth loss. At national and state level BRFSS data in figure 4 shows declining trends since 2006 for adults ages 65 and above who have had all their natural teeth extracted. The decline is much sharper in Minnesota as compared to the nation. In 2010, median percentage for adults aged 65+ who have had all their natural teeth extracted was higher for the nation (16.9%) than the state (11.2%).²⁹

Figure 4: Adults Aged 65+ who have had all their Natural Teeth Extracted

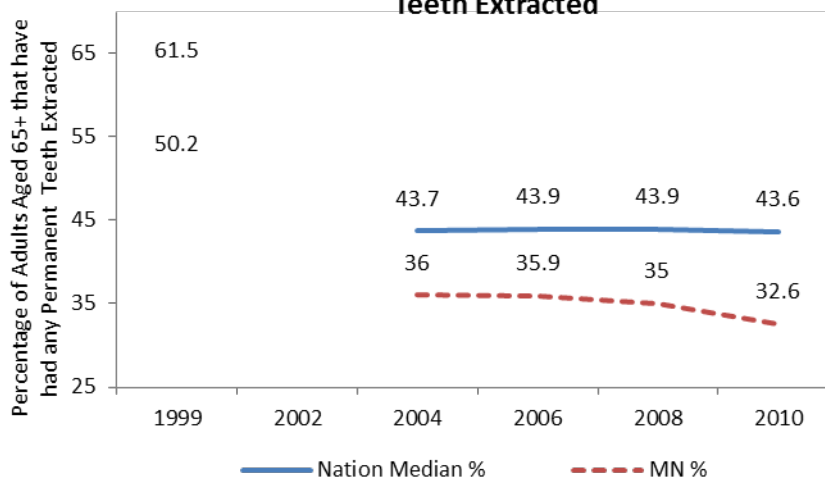


Data source: BRFSS 1999-2010

Figure 4 shows that nationally and locally, over the past 10 years, percentage of adults ages 65 and above who have had all their natural teeth extracted has declined. Rate of decline was higher at the state level (50.2%) compared to the national level (35.5%).

The following graph shows trend between the years 2004 to 2010 for percentage of adults ages 65 and above who have had any **permanent teeth** extracted. Not much change was observed nationally whereas, state level trend show a decline of 4%. In 2002 BRFSS survey, data on this indicator was not collected.

Figure 5: Adults Aged 65+ that have had any permanent Teeth Extracted

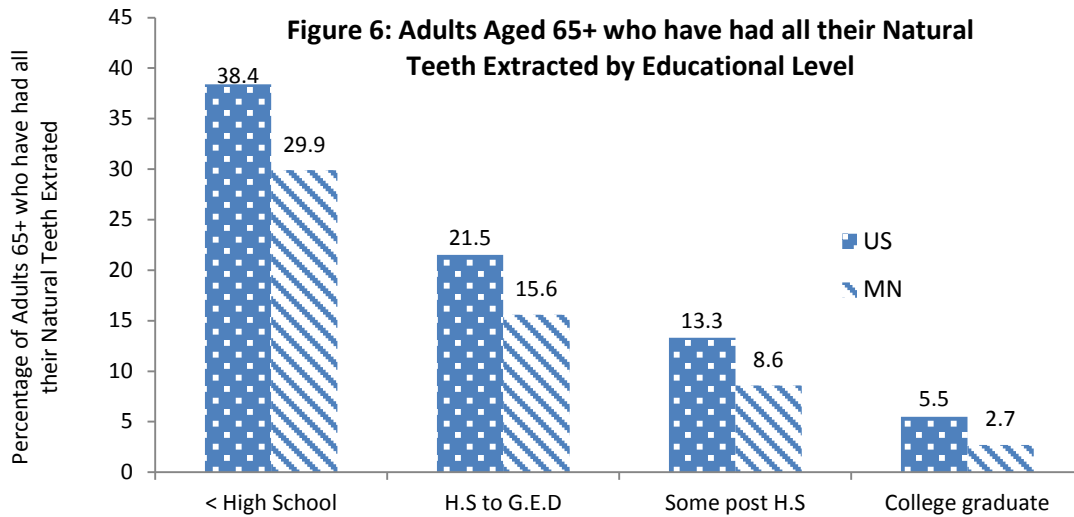


Data source: BRFSS 1999-2010

Oral Health Disparity in Adults

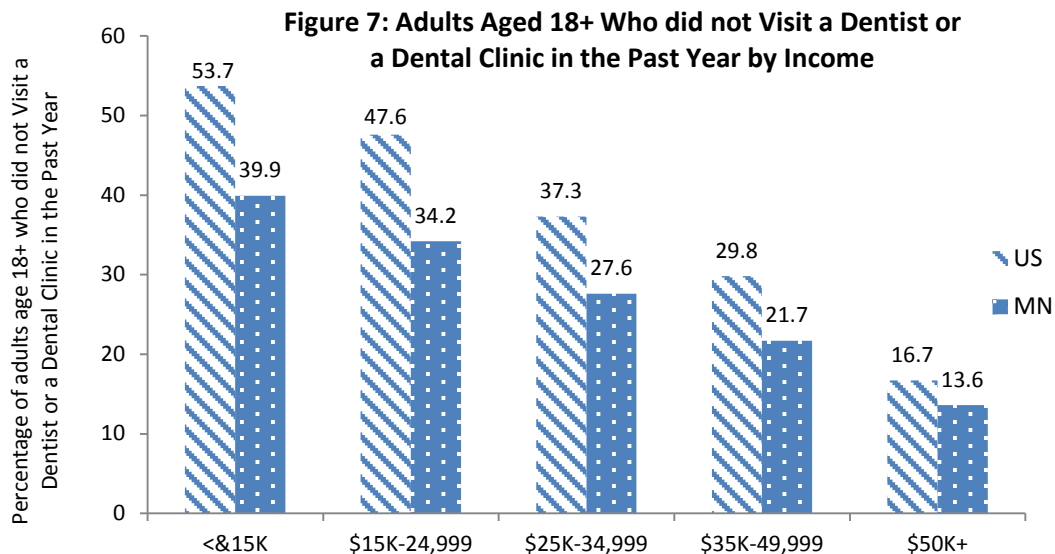
Health disparities are differences that socially disadvantaged populations experience in the burden of disease and opportunities to achieve optimal health.³⁰ Multiple factors contribute to create health disparities such as race or ethnicity, gender, education or income, disability, geographic location (rural/urban), inadequate access to health care or individual and behavioral factors.

Figures 6 and 7 reflect the phenomenon of disparity. They depict that adults with lower socioeconomic status (measured by level of education and personal income) had poorer dental health. For example, the percentage of adults 65+ who have had all their natural teeth extracted was higher in individuals who did not finish high school and was lowest in individuals with a college degree. Although these graphs show a slightly better picture of adults living in Minnesota compared to the nation, there are an estimated 73,714 individuals age 65 and older in the state who have experienced tooth loss and related discomfort such as improper mastication and loss of function of food chewing ability.



Data source: BRFSS 1999-2010

Figure 7 presents an inverse relationship between the income levels in adults aged 18+ who did not visit a dentist or dental clinic in the past year. The figure shows that as the income increases, percentage of adults 18+ who did not visit a dentist or a dental clinic in the past year decreases. National and state level data show that at each income level, the state had lower percentage of adults 18+ who did not visit a dentist or dental clinic in the past year compared to the nation.



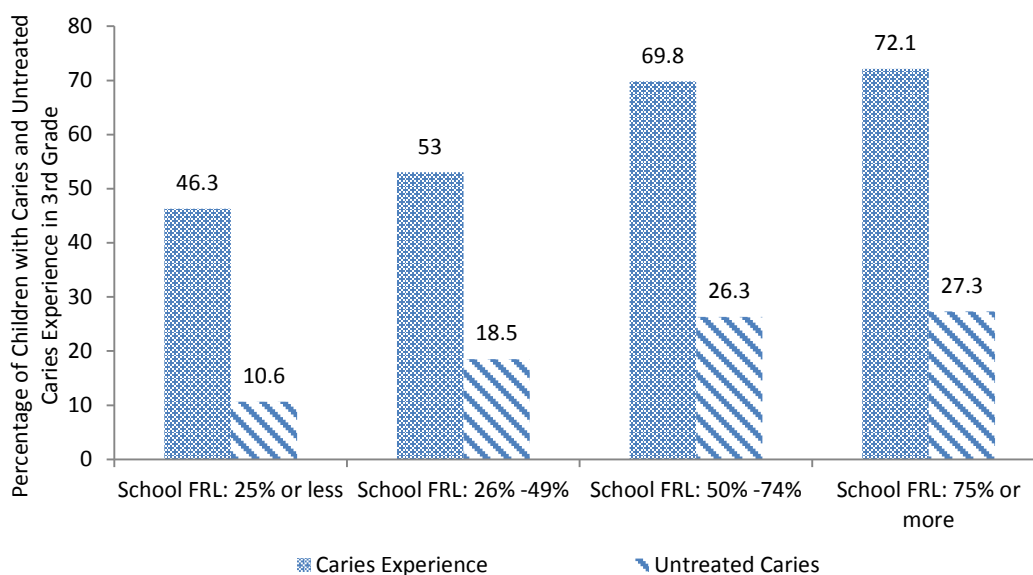
Data source: BRFSS 1999-2010

Oral Health Disparity in Children

In general, lower-income communities bear a disproportionate burden of oral diseases and conditions. A schools' Free or Reduced Lunch (FRL) eligibility status can be used as a proxy for community socio-economic status. Minnesota BSS 2010 indicated a positive correlation between oral health indicators and FRL eligibility status among children in third grade. Schools with higher proportions of students on/or qualified for FRL program performed worse on all the oral health indicators measured on BSS.

Despite progress in reducing dental caries in the United States, sharp disparities exist across income levels. Figure 8 reflects disparity in children in Minnesota. In general, schools with 25 percent or fewer students on/or qualified for FRL program had better oral health status than their peers in schools with 75 percent or more of students were qualified for the FRL program. Generally, the caries seen in individuals of all ages from poor families is more likely to be untreated than caries in children who live above the poverty level.

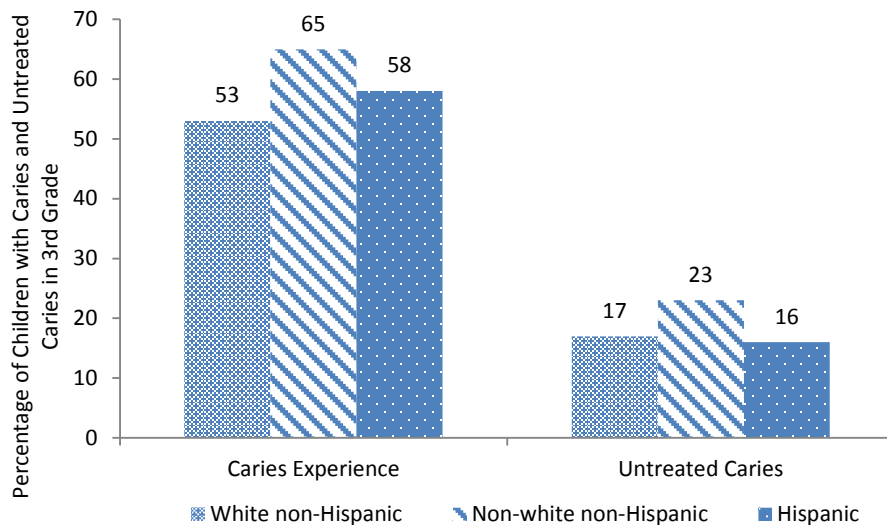
Figure 8: Caries and Untreated Caries Experience in Students in 3rd Grade by Free and Reduced Lunch Eligibility



Data source: Minnesota BSS 2010 on third graders

Ethnicity is another risk factor which compromises oral health as shown in the figure 9. Non-white non-Hispanic children are more likely to experience caries and untreated caries as compared to white non-Hispanics and Hispanic children in third grade.

Figure 9: Caries and Untreated Caries Experience in Students in 3rd Grade by Race



Data source: Minnesota BSS 2010 on third graders

Birth Defects

The most common oral birth defects are cleft lip and cleft palate; facial and oral malformations that occur within the first six to eight weeks of pregnancy.³¹ Cleft lip and palate is the fourth most common birth defect in the US with about one oral birth defect per 700 births. It's commonly prevalent in Asian, Latino or Native Americans. Cleft lip with and without cleft palate affects boys twice as much as girls, whereas cleft palate without cleft lip affects girls twice as much as boys. The average treatment costs for treating cleft lip or cleft palate per patient over their lifetime has been estimated by NIH about \$250,000.³² In most cases, the cause of oral clefting is unknown. Most scientists believe it is due to a combination of genetic and environmental factors.³³ Cleft palate usually makes breastfeeding difficult because babies cannot suck properly. Children born with cleft palate may also have frequent ear infections which can eventually cause hearing loss. Speaking clearly is another challenge for children with this type of anomaly.

MDH birth defect surveillance system recorded 403 cases of oro-facial abnormalities for the 361,109 births between 2005 and 2009.³⁴

Oral Cavity and Pharyngeal Cancers

Oral cavity and cancers of the pharynx represent about 2.4% of all cancer sites combined. These cancers are found on lip (excluding skin of the lip), tongue, salivary glands, gum, mouth, pharynx, oropharynx, and hypo pharynx. According to the American Cancer Society (ACS) estimates for the US population, in the year 2012, 40,250 (Males: 28,540, Females: 11,710) new cases will be diagnosed and 7,850 (Males: 5,440, Females: 2,410) people will die of this type of cancers.³⁵

Over the five-year period from 2005 to 2009, each year in Minnesota, an average of 419 cases of oral/pharyngeal cancer was diagnosed (4.6% of all new cancer cases) and 111 people died (1.2% of all the cancer related mortality) from this cancer.³⁶

Incidence, Mortality and Lifetime Risk by Age and Gender

The average annual incidence and mortality rates for oral cavity and pharyngeal cancer from 2005 to 2009 were 11.4 and 2.0 per 100,000 respectively in Minnesota. The incidence rate was significantly lower in females (7.2 per 100,000 females) than males (16.4 per 100,000 males) for the above reporting period. Average mortality rate for the state (2.0 per 100,000) was lower than the average for the nation (2.5 per 100,000).

Table 2 below shows that in Minnesota, median age at diagnosis for males is 61 year and for females is 63 years. Table also depicts higher lifetime risk of diagnosis and death for males as compared to females.

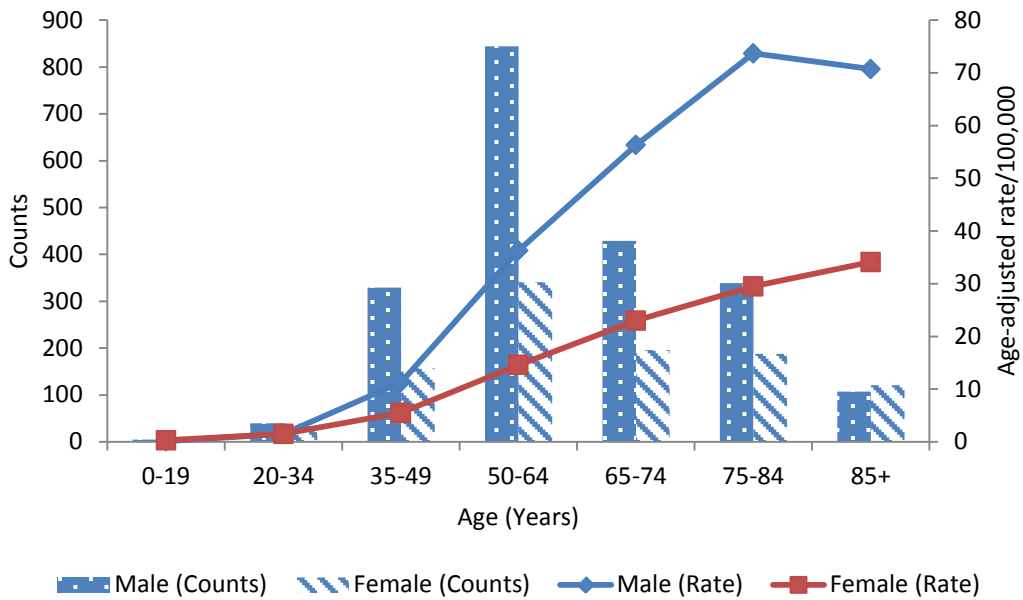
Table 2 Median Age at Diagnosis/Death and Lifetime Risk of Diagnosis/Death from Oral Cavity and Pharynx Cancer 2006-2008

Indicators	Males	Females
Median age at diagnosis (in years)	61	63
Median age at death (in years)	68	75
Lifetime risk of diagnosis	1.7	0.8
Life time risk for death	0.3	0.2

Data Source: MCSS

Figure 10 shows that the incidence rate for OCPC, in both genders increases with age. More than two-thirds of the new cases are identified after the age of 74 years. Incidence rates are twice in males compared to females.

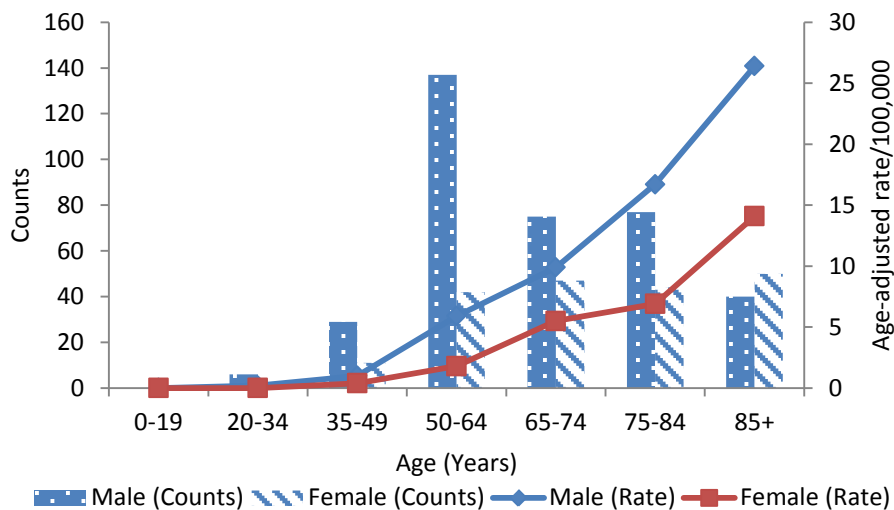
**Figure 10: Incidence of Oral Cavity and Pharynx Cancer
By Age and Gender, 2005-2009**



Data Source: MCSS

Mortality rates for OCPC increase sharply after age 64 years in both genders. Similar to incidence rates, females had lower rates of mortality by OCPC.

**Figure 11: Mortality with Oral Cavity and Pharynx Cancer
By Age and Gender, 2005-2009**



Data Source: MCSS

Table 3 shows that five-year relative survival is highest for localized tumors (82.4%), whereas metastasized tumors have the lowest relative survival (34.9%). Most of the OCPCs in Minnesota are diagnosed at the regional stage. A little over one-third of the cases are diagnosed at the localized stage.

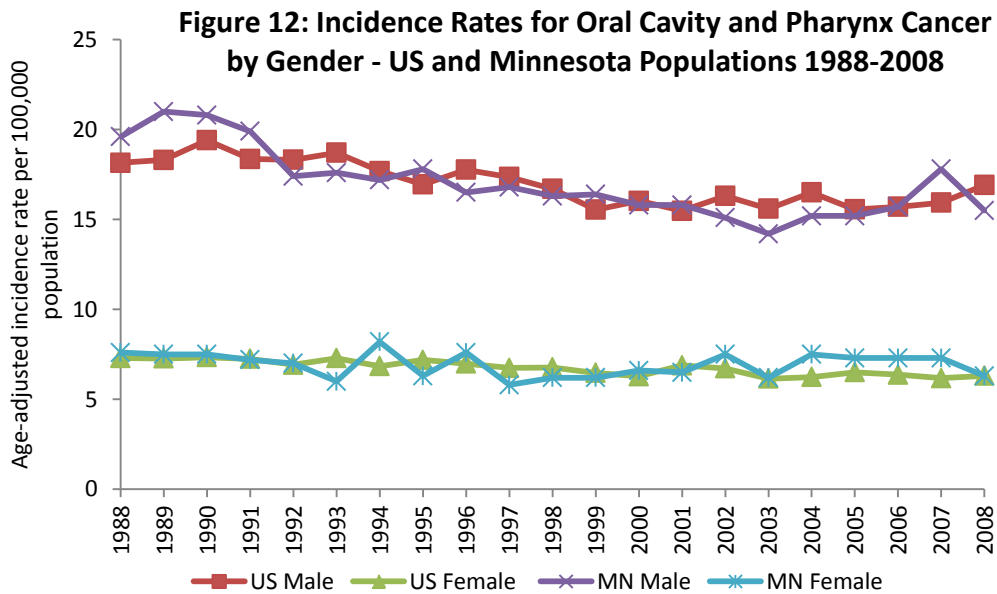
Table 3 Cases Distribution and Five-Year Relative Survival by Extent of Disease at Diagnosis Oral Cavity and Pharynx Cancer 2006-2008

Stage at Diagnosis	Cases (%)	Five-year Relative
Localized (confined to primary site)	367.0	82.4
Regional (spread to regional lymph nodes)	38.8	57.3
Distant (cancer has metastasized)	11.3	34.9
Unstaged (Unknown)	7.2	50.5

Data Source: MCSS

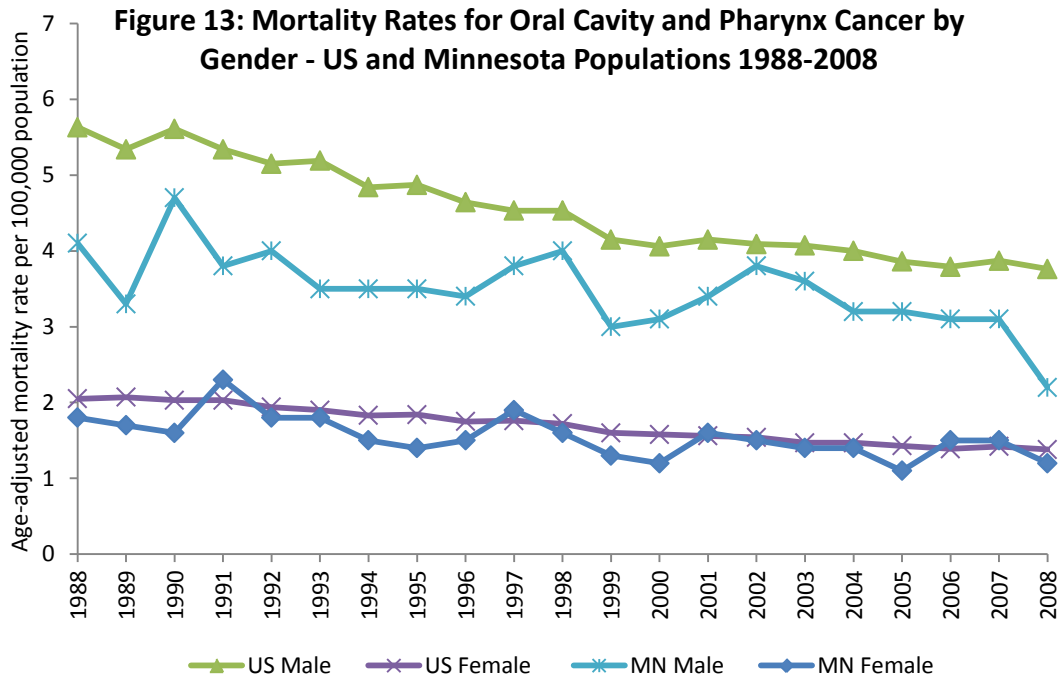
Trends

In the state, from 1988 to 2008 incidence rate for OCPC for women has been stable. Among males, the rate declined significantly from 1988 to 2006 (figure 12). A slight increase was noticed in 2007. State’s incidence rates were consistent with national rates.



Data Source: MCSS

Mortality rates for the state decreased significantly among males from 1988 to 2008. They were consistently lower than the national statistics. For females the rates were consistent and were closer to the national figures.



Data Source: MCSS

Disparity

The average annual incidence rates among American Indians living in a Contract Health Service Delivery Area (CHSDA) were 17% higher than among American Indians living in the geographic areas covered by SEER (Surveillance Epidemiology and End Results). Table 4 shows that average annual incidence rates of OCPC were highest among CHSDA males followed by blacks. In females, American Indian females had highest incidence rate. Mortality rates were higher in Asian/pacific Islander populations.

Table 4: Oral Cavity and Pharyngeal Cancers Average Annual Rates by Race and Ethnicity in Minnesota

Race	Average Annual		Mortality Rate	
	Male	Female	Male	Female
Non-Hispanic white	16.2	6.8	2.8	1.2
Hispanic all races	6.9	7.3	~	~
Black	19.3	8.2	4.3	~
Asian/Pacific Islanders	13.9	8.0	8.8	~
American Indians	21.0	12.3	~	~
CHSDA*	25.2	~	~	~
All Races combined	16.4	7.2	3.0	1.2

Data Source: MCSS

**Contract Health Services Delivery Area*

~Race-specific rates based on fewer than 10 cases or deaths are not presented.

Risk Factors

Use of tobacco and heavy consumption of alcohol are widely considered major risk factors for OCPC.³⁷ Recently, human papillomavirus (HPV) exposure and infection have been documented as a strong risk factor for certain types of OCPC, particularly in men. A case-control study published in 2007 showed that independent of tobacco and alcohol use, HPV exposure and infection increase the risk of oropharyngeal squamous cell cancer. Most cases of OCPC are preventable. Reduction in exposure to tobacco and alcohol is the single most effective measure to lower the risk of developing this type of cancer.

Dental Hospital Visits

Access to dental care whether due to shortages of oral health care providers or providers not accepting uninsured or under insured populations have made hospital emergency rooms as a dental destination for the patients in pain and suffering. This recent phenomenon of increased utilization of Emergency Department (ED) for preventive and less severe oral health problems has serious financial implication to the overall health care system. Often the care being offered in ED may result in additional visits and corrective procedure as the ED staff is not generally trained in dealing with oral health problems.

Since the summer of 2010, few publications and reports have identified various aspects which are significantly important in reviewing the financial burden of these inappropriate admissions to ED.³⁸³⁹⁴⁰⁴¹ Following observations were noted in these publications:

- Urgent care dental visits to ED were more pronounced among uninsured populations
- In 2007, over 10,000 visits to ED related to oral health occurred in one year period, costing nearly \$5 million to the public programs
- Barriers to dental care including lack of insurance, dental provider not accepting Medicaid, lack of transportation, dental health literacy, cultural and societal habits were implicated in the realm of ED admissions

Hospital-treated Oral-dental conditions

For oral conditions, hospital discharge data based on primary diagnosis using ICD-9 (International Classification of Disease) can be divided into two categories – oral trauma and non-trauma. Hospital treated oral trauma includes broken tooth, open wound of internal structures of mouth etc. Whereas, non-trauma conditions include disorder of tooth development and eruption, abscess, periodontal diseases, gingivitis, dentofacial anomalies, malocclusion and other diseases of the internal structure of mouth.

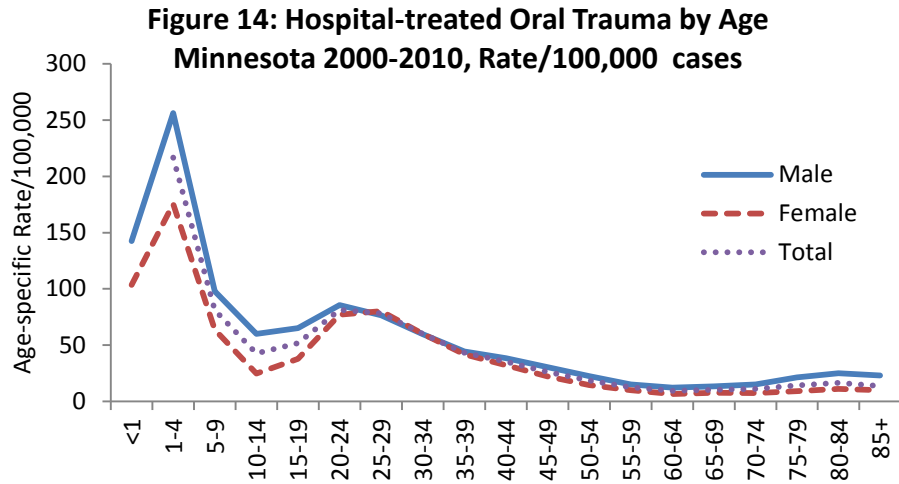
Table 5 shows that males contributed higher to ER visits with traumatic conditions, whereas females contributed more ER visits for non-traumatic oral conditions. More patients with non-traumatic condition were admitted in the hospital as compared to traumatic. Slightly lower than half of the patients visited ER with traumatic condition were from rural areas. This could be attributable to the availability of lesser number of dental offices in rural areas, compelling rural population to seek refuge in hospitals for non-traumatic oral conditions.

Table 5: Profile of Hospital Treated Patients with Traumatic and Non-traumatic Oral Conditions, 2000 - 2010

Patients	Traumatic		Non-traumatic	
	#	%	#	%
Total number of cases	32,553		136,982	
Male	18,816	57.8	65,340	47.7
Female	13,737	42.2	71,642	52.3
Urban Residents	20,443	62.8	74,655	54.5
Patients treated in Emergency	32,293	99.2	131,914	96.3
Patients hospitalized	260	0.8	5,068	3.7

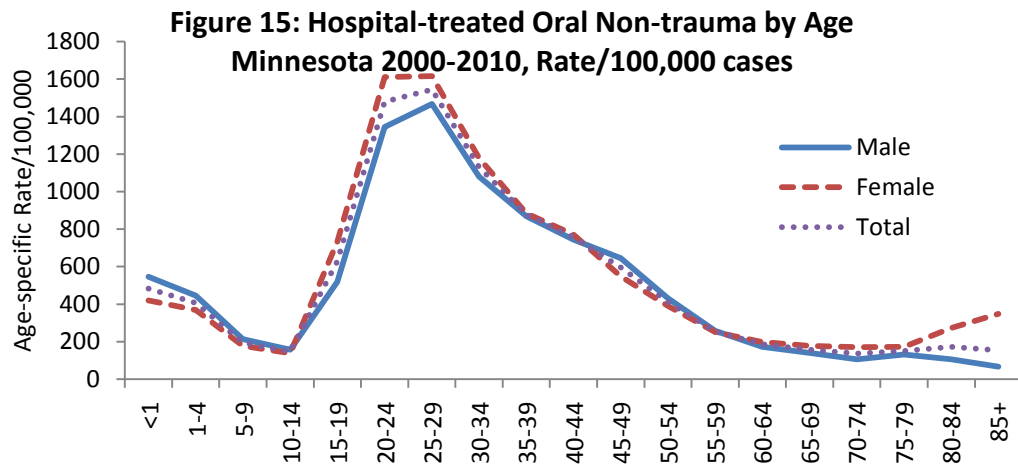
Data source: Statewide hospital discharge and emergency department uniform billing data from the Minnesota Hospital Association, 2000-2010

Figure 14 below presents that hospitalization rates for oral-dental conditions vary by age. Age specific rates for oral trauma are highest in children ages one to four followed by adults ages 20 to 29 years. Males and females show similar pattern.



Data source: Statewide hospital discharge and emergency department uniform billing data from the Minnesota Hospital Association, 2000-2010

Figure 15 depicts rates of hospital treated oral non-trauma cases by age. The most affected age group was 20 to 29 years of age. Age specific rates were higher in females than males in the same age categories.



Data source: Statewide hospital discharge and emergency department uniform billing data from the Minnesota Hospital Association, 2000-2010

Economic Impact

According to the World Health Organization (WHO), in some countries, oral diseases are the fourth most expensive diseases to treat.⁴² According to CMS in 2011, dental services expenditure in the country was \$108.4 billion.⁴³ Forty two percent of the amount was out-of-pocket payment. The following table shows hospital charges have increased since 2008 for trauma and non-traumatic conditions. If these charges are not being paid by the patient then they become the liability to the public service. The observed change is much higher in non-traumatic cases compared to traumatic which could be attributable to the under insured and uninsured population utilizing hospital service for their regular dental needs.

Table 6: Hospital Charges for Hospital-treated Trauma and Non-Traumatic Oral Condition

Charges for Hospital-Treated Oral Trauma				Charges for Hospital Treated Oral Non-Traumatic		
	2008	2009-2010	% Change	2007-2008	2009-2010	% Change
Mean	\$453.16	\$483	6.6	\$1,053.75	\$1,148	8.9
Median	\$187	\$208	11.2	\$242	\$291	20.2
Total	\$11,720,194	\$12,755,259	8.8	\$67,378,817.37	\$80,356,318	19.3

Data source: Statewide hospital discharge and emergency department uniform billing data from the Minnesota Hospital Association, 2000-2010

Oral Diseases and Other Health Conditions

In recent years, rising chronic disease morbidity and mortality have emerged as threats to the well-being of populations. Research has demonstrated interrelationship between the chronic diseases and oral health. Studies have shown a strong association between periodontal (gum) disease and diabetes, cardiovascular diseases, stroke, respiratory infections, osteoporosis, HIV and adverse pregnancy outcomes.

Oral health and diabetes

As people with diabetes are more susceptible to contracting infections, they are more likely to have periodontal disease than people without diabetes. Periodontal disease is often considered the sixth complication of diabetes. People with uncontrolled diabetes are at even higher risk.^{44,45,46} A study found that poorly controlled type 2 diabetic patients are more likely to develop periodontal disease than well-controlled diabetic patients.⁴⁷ Research also suggests that the relationship goes both ways as periodontal disease may make it more difficult for diabetic patients to control their blood sugar.

Severe periodontal disease can cause a rise in blood sugar. This increases risk for diabetic complications. Therefore, diabetic patients should be treated for periodontal disease to avoid complications. Children with diabetes often develop gum diseases earlier in life than those

without diabetes. Clinical studies have also shown that diabetic children show more plaque and gingival inflammation than non-diabetic children.⁴⁸

Oral disease in pregnancy

According to the Pregnancy Risk Assessment Monitoring System (PRAMS) 2010, 63.7% pregnant women got their teeth cleaned 12 months prior to pregnancy. More than 50% of the pregnant women visited the dentist/dental clinic during their most recent pregnancy. Out of those who visited the dentists/dental clinic, 18% of pregnant women needed to see a dentist for a dental problem during their most recent pregnancy.⁴⁹ Studies have found that maternal oral health has significant implications for birth outcomes and baby's oral health. Periodontitis has been associated with poor pregnancy outcomes. A systematic review of studies was conducted to assess relationship between periodontitis and poor pregnancy outcome in 12 countries and three US states between 1996 and 2006. Twenty-four reviews demonstrated a positive relationship between periodontitis and preterm birth, low birth weight, or both.⁵⁰ Only 14 studies reported no relationship between periodontitis and poor pregnancy outcomes. However, another large U.S.-based Randomized Control Trial (RCT) did not find an association between periodontitis and preterm birth and low birth weight.⁵¹ Racial, socio-economic and delayed treatment for periodontal diseases, are hypothesized by authors as a possible explanation for conflicting findings.

Although literature is available on the association between maternal oral health and child's caries experience, no conclusive evidence has been found yet. Therefore, more study and research is needed to ascertain this relationship. In oral health programs, emphasis should be on improving the pre-pregnancy and during pregnancy oral health condition of women⁵².

Oral health and osteoporosis

Although more research is needed to assess the association between osteoporosis and tooth loss and periodontal disease, researchers cite that osteoporosis may be a risk factor for oral bone loss. Research findings suggest early detection of changes in bone density may be observed by dental health professionals with the use of high quality intra-oral dental radiographs. Some of the indicators such as loose teeth, severe gum disease, dentures that don't fit well and difficulty eating or speaking could be early sign of bone loss.^{53,54}

Oral health and cardiovascular disease

A few recent studies have shown that poor oral health combined with other risk factors may contribute to heart disease. On the other hand there are also a few studies refuting the possible link between periodontal disease and cardiovascular disease.⁵⁵

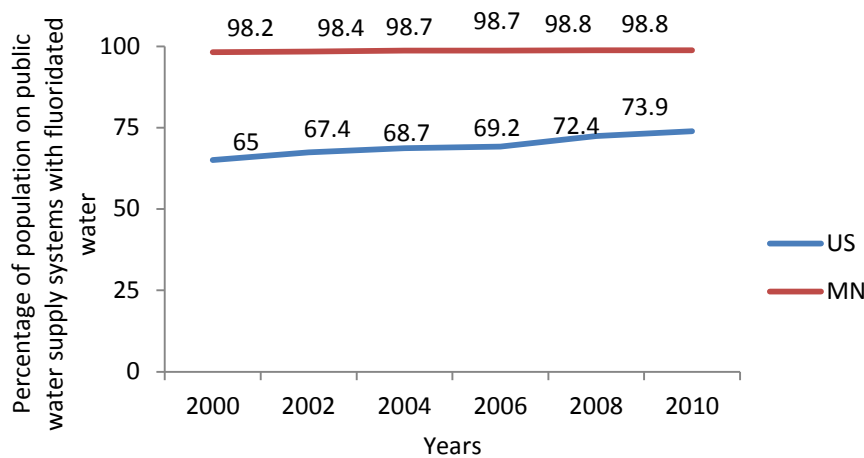
Chapter 5: Protective Factors Affecting Oral Disease

Community Water Fluoridation

Community water fluoridation has been recognized by CDC as one of the ten great public health achievements of 20th century.⁵⁶ It is one of the most cost-effective and equitable means to provide protection from tooth decay. CDC’s economic analysis found that communities with more than 20,000 people where community water fluoridation costs 50 cents per person, every dollar invested yields approximately \$38 savings in dental treatment cost.⁵⁷ Another study found that states where more than half of the communities have fluoridated water have 26% fewer decayed tooth surfaces per year in children 12 years old as compared to the states with less than one-quarter of the communities fluoridated.⁵⁸

Figure 16 depicts that in 2010, 73.9% of the US population on public water systems was receiving fluoridated water whereas 98.8% of Minnesotans on public water systems were receiving fluoridated water. This ranks Minnesota 4th in the nation after Kentucky, Maryland and Illinois for percentage of state population on public water systems receiving fluoridated water. HP2020 target for the nation has been set to 79.6%. Although Minnesota is far ahead of the set target, significant work needs to be done to maintain its status, while striving to achieve optimal oral health for its population.

Figure 16: Percentage of Population on Public Water Supply Systems with Fluoridated Water



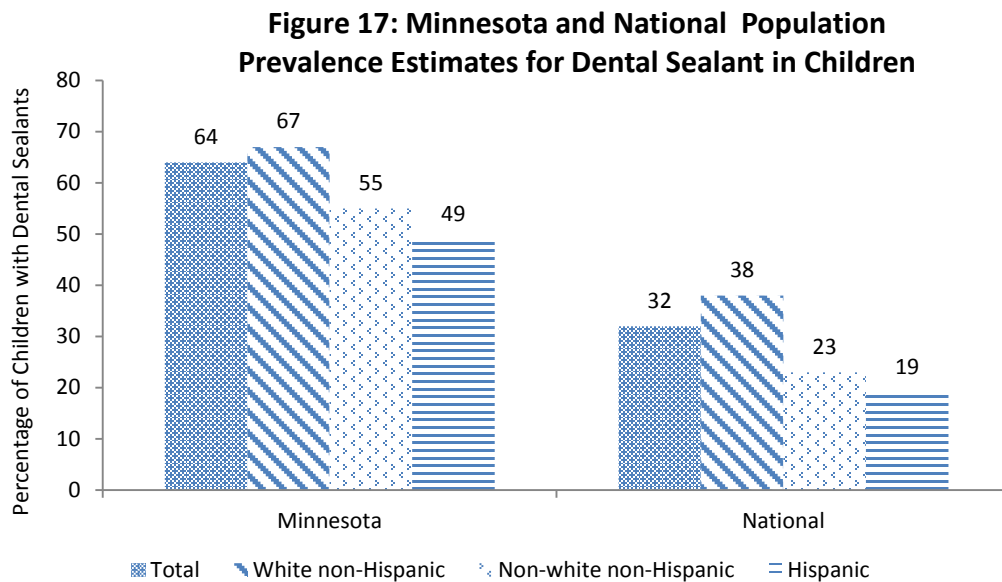
Data Source: Water Fluoridation Reporting System (WFRS)

According to the CDC Water Fluoridation Reporting System (WFRS), as of April 2012, in all the 87 counties of Minnesota, more than 75% of the county population, which was connected to public water supply, had their drinking water fluoridated.

Approximately 25% (one million) of Minnesotans rely on private, household wells as their source of fresh water in their homes which may not have optimal levels of fluoride to prevent tooth decay in children.⁵⁹

Dental Sealant Programs

The likelihood of developing pit and fissure decay begins early in life. Dental sealants (pit and fissure sealants) are effective in preventing decay and stopping the progression of early caries. A dental sealant is applied to the chewing surfaces of back teeth (molars) to prevent decay from occurring in the pits and fissures. Dental sealants are cost effective when given to children and adults who are at the highest risk of developing caries. They may last as long as five years. School-based sealant programs have shown evidence in reducing oral health disparities.⁶⁰ Colorado estimated a \$1.2 million in saving in a year if statewide sealant programs were implemented.⁶¹



Date Sources: Minnesota: BSS 2010 on third graders and National: NHANES 1999-2004

In 2011, after analyzing Basic Screening Survey findings, MDH established a coordinated school-based sealant program in five regional sites through its HRSA funding. MDH is also collaborating with DHS to achieve CMS Oral Health Initiative’s goal of increasing the rate of children who have received dental sealants by ten percentage points. Other partners participating in these efforts include 3M, Delta Dental, Smiles Across America, and the School Nurse Organization of Minnesota (SNOM). The goal of the program is to improve community-based prevention services by strengthening the infrastructure and expanding the capacity of school-based pit-and-fissure sealant delivery programs in Minnesota. The school-based sealant program targets second grade students in high-risk schools (schools with a >50 percent of students eligible for the Free or Reduced Lunch Program).

In 2009, less than 25 percent of high-risk schools had sealant programs. As shown in the following table, today more than 29 percent of high-risk schools have MDH-sponsored or coordinated dental sealant programs.

Table 7: Elementary School with School-based Dental Sealant Program, Academic Year 2010-2011

2010-2011 School Year: Elementary Schools	#	%
Total Number of Elementary Schools	946	
Total Number of High-Risk schools	392	41.4
Total Number of High-Risk with a School-based Dental Sealant Program	115	29.3

Source: Minnesota Department of Education and Minnesota Department of Health, 2011.

Data collected by the state Oral Health Program show that one-third (34%) of the eligible children in second grade participated in the program. On average, three dental sealants per child were applied on participating second graders molar teeth. According to CMS 416 report for the Fiscal Year 2011 only 15% (n=90,300) of eligible children ages 6 to 9 years received a sealant on a permanent molar tooth.

Fluoride Varnish

Several emerging dental preventive strategies are in the scientific literature. Fluoride varnish is one of those. Fluoride varnish is a high concentration of fluoride in a resin base, intended for professional use as a cavity liner and de-sensitizing agent. Recently varnish has been widely used in children to help to prevent early childhood caries. Studies have shown fluoride varnish has a substantial caries-inhibiting effect in both permanent and primary teeth⁶², which can also help arrest the caries process when applied early. Fluoride varnish has been found to be cost effective when dental service and non-hospital treatment costs can be 1.5 to 2 times higher. A study found improved clinical outcomes by 1.52 cavity-free months at a cost of \$7.18 for each cavity-free month gained per child and \$203 for each averted treatment⁶³.

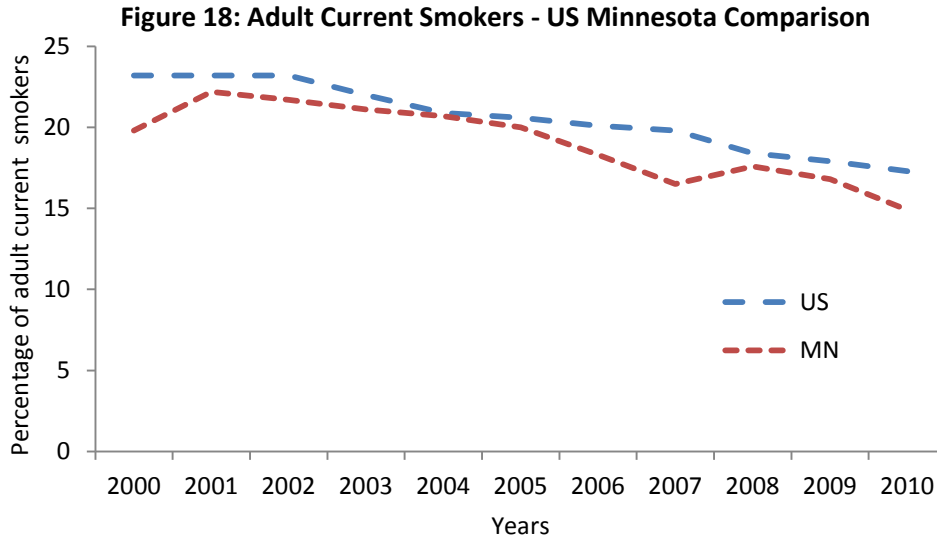
Chapter 6: Risk Factors Affecting Oral Disease

Tobacco Use

Tobacco is a known risk factor for oral cavity and pharyngeal cancers. Smoking and alcohol use are strongly associated with oral cancers, which are relatively common and have a poor prognosis compared with other types of cancer.

Smokers are four times more likely to develop gum diseases compared to non-smokers.⁶⁴ According to the American Academy of Periodontology, tobacco use may be one of the most significant risk factors in the development and progression of periodontal disease.

According to BRFSS⁶⁵ and the Minnesota Student Survey (MSS)⁶⁶ smoking rates have been on the decline statewide among adults and teenage students. Smoking rates among 12th graders, both nationally and locally, started to decline after peaking in 1998. In 2010, less than one in five high school seniors nationwide (19.5%) and in Minnesota (19.2%) reported smoking cigarettes in the past 30 days. Over the years, smoking rates have been higher among Minnesota students than their national counterparts. However, the downward trend since 1998 is more pronounced in Minnesota (1998 : 41.9%, 2010: 19.2%) than in the country (1997:36.4%, 2009: 19.5%).⁶⁷



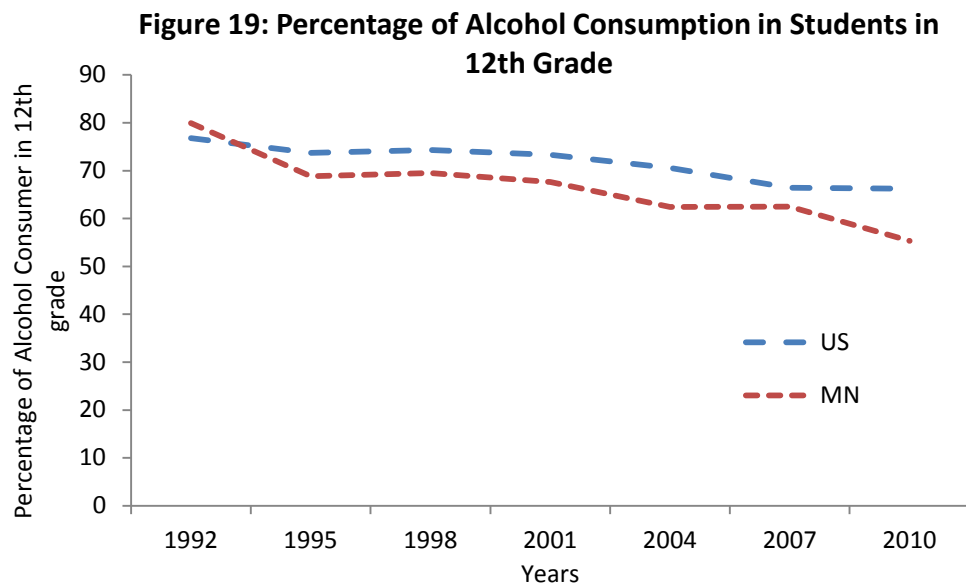
Data Source: BRFSS 2000-2010

Beverage Consumption

There is a positive causal relationship between sugar sweetened beverage consumption and dental caries in children. There are 40.5 grams of sugar in a 12 oz. can of Coke (equivalent to 10 teaspoons of sugar). Sugar sweetened soda also has a high level of acidity which is associated with increased dental caries in children and youth.⁶⁸

According to CDC, the most popular teen beverage as of spring 2010 was milk followed by water.⁶⁹ In 2007, about 49 percent of 6th grade to 12th grade students drink one to two glasses of milk per day, approximately 300 - 600 mg of calcium. For children and youth ages 9 to 18 years, the recommended daily intake of calcium is 1300 mg.⁷⁰ It is scientifically proven that intake of milk is good for bone including teeth.

In figure 19, alcohol use shows an overall declining pattern among 12th graders, both nationwide and in Minnesota.⁷¹ In 1992 nationwide, more than three quarters of high school seniors reported using alcohol during the past year, compared to about two-thirds in 2010. In 1992, alcohol use by students in the state was higher than the national level. In 1995, the levels fall below the national level and remained that way ever since as shown in the following graph.



Data source: Minnesota Student Survey, 1992-2010

Chapter 7: Access to Oral Health Care

Dental Professional Shortage Designation⁷²

Health Professional Shortage Area (HPSA) is a designation given by the Department of Health and Human Services (DHHS) to identify shortages of primary medical, dental or mental health providers within a geographic area, population group or a facility. As of September 2012, there were 112 dental HPSAs in the state. More than half (66 out of 112) are low-income population designations. Based on the dentist Full Time Equivalent (FTE) data serving Medicaid and/or low-income populations in these areas, DHHS estimates that 166,200 people have access to dental services and 362,569 experience barriers. The majority of dental HPSAs are located in rural parts of the state. There are 13 HPSAs designated in Hennepin County (four population and nine facilities) and five in Ramsey County (two population and three facilities). In five other metropolitan counties (Anoka, Washington, Carver, Dakota and Scott), there are two correctional facilities and one Native American tribal population designations. Maps of dental HPSAs are presented in appendix B1 and B2.

Dental Workforce Capacity

The Office of Rural Health and primary Care (ORHPC) collects dental workforce data through professional licensing process. Table 8 presents comparison of state and national dental provider data.

Table 8: Ratio of Dental Provider Types per 100,000 Population

Dental Professionals	*Minnesota: Number per 100,000 population	**National: Number per 100,000 Population
Dentists (practicing)	3,244 (61 dentists per 100,000)	195,628 (63 dentists per 100,000)
Collaborative Agreement	274 (5 dentist per 100,000)	~
Pediatric Dental Specialists	77 (6 dentists per 100,000 children <18 years)	6,181 (8 dentists per 100,000 children <18 years)
Advanced Dental Therapists	~	~
Dental Therapists	25 (4 per 1,000,000)	~
Hygienists (practicing)	3,594 (68 per 100,000)	152, 000 (49 per 100,000)
Collaborative Agreement Hygienists	276 (5 per 100,000)	~
Dental Assistants (practicing)	6,288 (119 per 100,000 pop)	297,200 (96 per 100,000)

**Total Minnesota population: 5,303,925; children under 18 years (24%): 1,267,638*

***U.S. Population: 308,745,538; children under 18 years (24%): 73,172,69*

Dentist

Comparison in table 8 shows that the Minnesota has lower ratio of dentists per 100,000 population compared to the nation. This difference may increase in the future as Minnesota Board of Dentistry license renewal data and survey data from ORHPC 2009-2010, showed that 47 percent of the surveyed dentists were 55 years or older and rural dentists (median age 57 years) were older than the urban dentists (median age 53 years). Most of the dentists surveyed (57%) plan to practice in Minnesota for more than ten years whereas only seven percent work in small rural areas. Of dentists who planned to stop practicing, 21% planned to stop in the next five years. Solo practice is the most common type of practice especially in rural areas (44%) followed by small group practice (37%). One-third (74%) of the dentists were practicing in urban areas. The majority of these practicing dentists were male (77%) and 94% were white. Only 7% of these dentists had a collaborative agreement with a dental hygienist.

Pediatric Dentistry

Pediatric dental specialists are available in fewer than 20 of Minnesota's 87 counties. Many of these dentist specialists practice at more than one location. Most pediatric practices are clustered in and around the 7-county Minneapolis/St. Paul metropolitan area with very few, if any, located in rural Minnesota. In Greater Minnesota, pediatric dentists are most likely to be located in the larger cities such as Duluth, Rochester, St. Cloud, and Mankato.

Dental Hygienist

Dental hygienists are licensed professionals who specialize in preventive dental care. While most hygienists work in dental offices, Minnesota law allows health care organizations or nonprofit organizations that serve uninsured or publicly insured patients to employ dental hygienists to perform certain functions in some settings without the dentist first examining the patient. To do so, the hygienist must have a collaborative agreement with a supervising dentist. Minnesota Statute 150A. 10, Subd.1a gives this limited authorization to dental hygienists.

Out of 4,608 dental hygienists, who renewed their licenses, 72% were actively practicing in MN. According to the Minnesota Board of Dentistry (MBD) license renewal data and survey of ORHPC data 2008-2009, majority of the hygienist were females (98%) and were white (97%).

In the process of preparation for licensure as a hygienist, 69% received associate degree while 30% had bachelor or higher degree. Based on license information, half of the hygienists were 45 years or older (53 percent). Data from the survey showed that 80% of the hygienist workforce was serving the 75% of the population living in metropolitan areas (Minneapolis-St. Paul, St. Cloud, Rochester, Duluth-Superior, Fargo, Grand Forks and La Crosse). Only seven percent hygienists were serving 12% of the population in the rural areas. When hygienists were asked about collaborative agreement, 20% were even did not know whether they were practicing under a collaborative agreement of not. Only 6% had collaborative agreement with a dentist.

Dental Assistants

Dental assistants are allied dental personnel who work under supervision of a licensed dentist. Dental assistants may or may not be licensed or registered. This means that their application to become a licensed dental assistant is voluntary and duties vary accordingly. Thirteen Minnesota community and technical colleges offer dental assistant programs approved by the MBD. In 2009-2009, 7,146 dental assistants renewed their licenses in the state. According to the MBD license renewal data and survey of ORHPC data 2008-2009, out of those who renewed their licenses, 88% were actively practicing in the state. Almost whole dental assistants workforce is female (99%) and most of them are white (96%). Almost three quarters of them work in the urban areas. Data also showed that dental assistants were younger (median age 34 years) compared to dentists (media age urban ages 55 years and rural areas 57 year) in the state.

Enhancing Workforce Models and Creating New Providers

In 2009, Minnesota's governor signed a bill into law creating a new "midlevel" dental provider type. Under the bill two new types of practitioner are now recognized – a Dental Therapist (DT) and an Advanced Dental Therapist (ADT). This mid-level dental practitioner will work under the supervision of a licensed dentist. The purpose of this provider type is to extend dental care to underserved communities and to address access issues such as limited availability of dental providers, dental providers not accepting populations on public programs, uninsured patients and people living in rural areas.

The Minnesota state legislature will receive a report from the Minnesota Board of Dentistry in January 2014 regarding the impact of the new dental therapists on the delivery and access to services. The first class of dental therapy students graduated in December 2011. As of March 2013, there are 25 licensed Dental Therapist in the state. Out of these 25, 16 are practicing and all of them have established at least one Collaborative Management Agreement.

Oral Health Financing

Medicare and Medicaid are both government-sponsored and taxpayer-funded programs established in 1965. Medicare is designed to help with long-term care for the elderly ages 65 and older, while Medicaid jointly administered and funded by Federal and State governments covers medical, dental, and long-term healthcare costs for people with limited income. It is often a program of last resort for those without access to other resources.⁷³

For Medicaid eligible individuals, ages 21 years and under, dental services are required to be provided according to a state established periodicity schedule such as Early and Periodic Screening, Diagnostic and Treatment (EPSDT) requirement. For EPSDT recipients services are not limited to emergency services but also include at a minimum, relief of pain and infections, restoration of teeth and maintenance of dental health.

In 2008, in a review of 16 states where dental utilization rates were 30% or less, CMS identified the following key barriers in children receiving adequate dental care.

- Limited availability of dental providers
- Low reimbursement rates
- Administrative burdens for providers
- Lack of clear information for beneficiaries about dental benefits
- Missed dental appointments
- Transportation
- Cultural and language competency
- Need for consumer education about the benefits of dental care⁷⁴

Medicaid and CHIP cover comprehensive dental benefits for children, but 30% of children with private health insurance are uninsured for dental care. In 2010, more than 80% of low-income children with health insurance – whether Medicaid or private insurance – had a dental visit within the past 12 months, compared to half of low-income, uninsured children.⁷⁵

According to CMS data for 2009, 16.8% population in the state was enrolled as Medicaid recipient which is nine percent increase from 2008 enrollees (15.4% of total population). The state's sharing of cost to Medicaid declined in 2009 (39%) compared to 2008 (49.6%).⁷⁶

Table 9: Minnesota Indicators for Medicaid Recipients Birth through under the Age of 21 Years

<i>Measures</i>	<i>FFY2010</i>		<i>FFY2011</i>	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Total individuals eligible for EPSDT for 90 continuous days	436,388		453,502	
Total eligible receiving any dental services [any service by or under the supervision of a dentist]	181,137	42	183,929	41
Total who did not receive dental services	255,251	58	269,573	59
Total eligible receiving a least one preventive dental services [by or under the supervision of a dentist]	162,986	33	164,432	36
Total eligible receiving dental treatment services [by or under the supervision of a dentist]	81,942	19	79,335	17
Total eligible (only children 6-9 years) receiving a sealant on a permanent molar tooth	14,273	17	13,590	15

Source: CMS 416 Report from the Department of Human Services. Reports are also publically available at <https://edocs.dhs.state.mn.us/lfserver/Public/DHS-6793-ENG>

The above table shows that the number of individuals eligible for EPSDT has increased by six percentage points. In 2010, percentage of eligibles receiving any dental services increased, whereas total eligibles receiving preventive dental service and dental treatment services showed a slight increase. The table shows that a vast majority of the population under 21 years of age is still not receiving dental services.

Chapter 8: Conclusion

This is the first burden of oral disease document for the state of Minnesota, presenting insight into the oral health profile for the state with baseline estimates and data trends based on the availability of data. The data presents existing disparities and identifies service gaps.

Caries experience of Minnesota children remains high and remarkable disparities continue to reflect in the burden of oral disease. This is further compounded by a skewed distribution of dental workforce in the state, with more dentists practicing in the urban areas, leaving a gap of service for vulnerable populations.

The absence of data on service coverage and disease estimates in pockets of the population is brought to the forefront by this report. Data is missing on dental caries experience or untreated caries among ages 2-4, 6-8, adolescents, and in the adult population, particularly among institutionalized elderly. Other areas where limited statewide data are available include pharyngeal and other oral cancers, burden of disease among migrant and native populations. Detailed information on sealant coverage in school age children, oral birth defects, and oral health of pregnant women is also limited.

However, despite these limitations, good preventive strategies and dental treatment services exist in the state, particularly in the form of water fluoridation and dental services for the non-minority populations and along the urban corridors, where notably more dental professionals practice.

This burden of disease report presents the most current information on the oral health status in Minnesota. It is intended to provide information for decision making, policy development and implementation of preventive strategies to address oral health needs of the vulnerable populations in particular.

Appendix A: Acronyms

ACS	American Cancer Society
ADT	Advance Dental Therapist
ASTDD	Association of State and Territorial Dental Directors
BDIS	Birth Defects Information System
BRFSS	Behavioral Risk Factor Surveillance System
BSDH	Bachelor of Science in Dental Hygiene
BSS	Basic Screening Survey
CDC	Centers for Disease Control and Prevention
CHSDA	Contract Health Service Delivery Area
CMS	Centers for Medicare and Medicaid Services
CODA	Commission of Dental Accreditation
DHHS	Department of Health and Human Services
DHS	Department of Human Services
DT	Dental Therapist
ECC	Early Childhood Caries
ED	Emergency Department
EPSDT	Early Periodic Screening, Diagnosis, and Treatment
ER	Emergency Room
FRL	Free or reduced lunch program
HHS	Health and Human Services
HIV	Human immunodeficiency virus
HP	Healthy People
HPSA	Health Professional Shortage Areas
HPV	Human Papilloma Virus
HRSA	Health Resources and Services Administration
IOM	Institute of Medicine
LHI	Leading Health Indicator
MBD	Minnesota Board of Dentistry
MCSS	Minnesota Cancer Surveillance System
MDH	Minnesota Department of Health
MOHSAG	Minnesota Oral Health Data Advisory Group
MSS	Minnesota Student Survey
NHANES	National Health and Nutrition Examination Survey
NIH	National Institutes of Medicine
NRC	National Research Council
OH	Oral Health
OHP	Oral Health Program
ORHPC	Office of Rural Health and Primary Care
PRAMS	Pregnancy Risk Assessment Monitory System
RCT	Randomized control trial
SEER	Surveillance, Epidemiology, and End Results
SNOM	School Nurse Organization of Minnesota
UMN	University of Minnesota
US	United States
WFRS	Water Fluoridation Reporting System
YRBS	Youth Risk Behavior Surveillance System

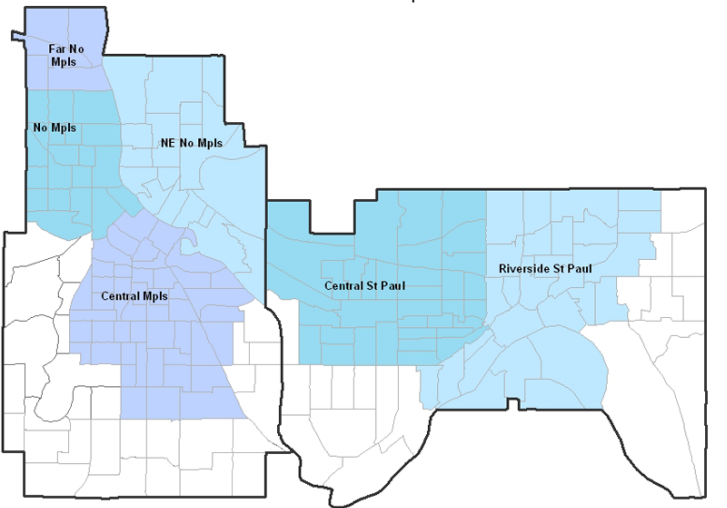
Appendix B: Maps

B1: Minnesota Dental Health Professional Shortage Areas by County (identified by mustard color)



Source: Minnesota Department of Health, Office of Rural Health and Primary Care, May 2012

B2: Minneapolis-Saint Paul Health Professional Shortage Area (identified by blue color)



Source: Minnesota Department of Health, Office of Rural Health and Primary Care, September 2010

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