CHEW ON THIS

2012 Report on the Oral Disease Burden in Colorado

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Chew On This

2012 REPORT ON THE ORAL DISEASE BURDEN IN COLORADO

I. EXECUTIVE SUMMARY

Oral health is essential to 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. Good oral health means being free of tooth decay and gum disease as well as free of chronic oral pain, oral cancer, and cleft lip and palate. Good oral health allows us to carry on the most basic human functions of chewing, swallowing, speaking, smiling, kissing, and singing.

Oral health is one of Colorado's new 10 "Winnable Battles," priority areas for the Colorado Department of Public Health and Environment. *Chew on This: 2012 Report on the Oral Disease Burden in Colorado* summarizes the most current data available on the oral disease burden in Colorado. It also highlights groups and regions in our state at high risk for oral health problems. This information can raise awareness of the need for monitoring the oral health burden in Colorado and guide efforts to prevent and treat oral diseases and enhance the quality of life of all Coloradans.

HIGHLIGHTS FROM THE REPORT

Colorado tracks various indicators of oral disease burden across the life span. The following includes highlights of results from recent data.

Describing the burden

Among infants and children:

- In 2009, 116 newborns in Colorado were diagnosed with cleft lip and/or cleft palates. The rate of these conditions was 16.9 per 10,000 live births.
- In 2011–2012, 40 percent of kindergarten children in Colorado had dental caries, as evidenced by cavities and/or fillings; 14 percent had untreated decay; and 2 percent needed urgent dental care due to pain or infection.
- In 2011–2012, 55 percent of third-grade children in Colorado had dental caries, as evidenced by cavities and/or fillings; 14 percent had untreated decay and 2 percent needed urgent dental care due to pain or infection.
- In 2010, about 18 percent of children aged 1-14 years in Colorado were reported to have fair/poor condition of teeth.
- The prevalence of a serious problem with child's teeth — including pain, cavities, broken or missing fillings, and teeth pulled because of cavities or bleeding gums — was 15 percent in 2010.
- Six percent of children aged 1–14 years in Colorado had to forego needed dental care in the past 12 months.

Among adults:

- 35.4 percent of all adults aged 18 years or older reported in 2010 that they had lost a permanent tooth due to decay or gum disease.
- 3.4 percent of all adults aged 18 years or older reported they had lost all their natural, permanent teeth. 13.4 percent of adults aged 65 years or older had lost all their natural, permanent teeth.

- In 2008, Colorado's overall incidence rate of oral cancer (cancer of the oral cavity and pharynx) was 14.0 cases per 100,000 population for males and 6.3 per 100,000 population for females. The mortality rate from oral cancer was 2.7 deaths per 100,000 males and 0.8 deaths per 100,000 females in Colorado in 2008. In Colorado, the 5-year relative survival rate for persons with oral cancer diagnosed at a localized stage is 75 percent. In contrast, the 5-year survival rate is only 57 percent once the cancer has spread to regional lymph nodes at the time of diagnosis and is just 30 percent for persons with distant metastasis.

Supporting good oral health

In 2010, the Colorado Child Health Survey asked parents whether a health care provider (such as a pediatrician, family physician, nurse practitioner, or nurse) ever provided dental care or dental advice.

- 58 percent reported that a provider explained cavity prevention strategies.
- 23 percent reported that a provider applied fluoride to the child's teeth.
- 38 percent reported that a provider helped to identify strategies to improve the child's teeth.
- 23 percent reported that a provider referred the child to a dentist.

In 2010, 92 percent of children aged 1–14 years were reported to have a regular source of dental care, according to the Colorado Child Health Survey.

Additional data related to strategies and systems that support good oral health describe room for improvement.

- In 2011–2012, 45 percent of third-grade children had **dental sealants**, exceeding the *Healthy People 2020* goal of 28.1 percent of children ages 6 to 9 years old.
- In 2010, only 3 percent of children aged 1 to 5 years in Colorado **visited a dentist by 12 months of age**, as recommended by the American Dental Association.
- 78 percent of children aged 0-18 years in Colorado had **dental insurance coverage**, according to the 2011 Colorado Health Access Survey.
- In 2010, 68 percent of adults aged 18 years and older in Colorado **visited a dentist or dental clinic for any reason within the past year**.
- In federal fiscal year 2010–2011, 50 percent of Early Periodic Screening, Diagnosis, and Treatment (EPSDT) Program clients aged 0–20 years who were eligible for at least 90 days received **preventive dental services** from the program.
- Only 56 percent of adults aged 18 years and older in Colorado had **dental insurance coverage**, according to the 2011 Colorado Health Access Survey.
- Overall, 72.4 percent of Colorado's population was receiving water that has been optimally fluoridated for the prevention of tooth decay, according to data from Colorado's **Water Fluoridation** Reporting System (WFRS), as of December 31, 2012.

Dental workforce

- 55 of Colorado's 64 counties had a licensed dentist.
- 47 of Colorado's 64 counties had an actively enrolled Medicaid dental provider at least one day during the federal fiscal year 2009-2010.

- Colorado's oral health workforce comprises 3,570 active licensed dentists and nearly as many active licensed dental hygienists (3,270). Additionally, 6,062 dental assistants are employed in the state. Between 2010 and 2020, employment is anticipated to grow by 12 percent for dentists and by more than 30 percent for dental hygienists and dental assistants.
- 47 service areas (census tracts or counties) in Colorado are designated as dental Health Professional Shortage Areas, because of the dentist-to-population ratio.

Health disparities

Poor outcomes are associated with socio-economic characteristics, increased age, and/or rural county of residence. Coloradans of Hispanic ethnicity have higher prevalence of some conditions, though it is unknown with the analysis presented in this report if findings by race/ethnicity reflect an underlying association with socio-economic characteristics, age, or rural county of residence.

- The prevalence of dental caries, as evidenced by cavities and/or fillings, was higher among children at schools with ≥75% of children eligible for the free and reduced price meal (FRL) program compared with children at schools with <25% of children eligible for the FRL program (53 percent vs. 23 percent for kindergarten and 73 percent vs. 41 percent for third grade).
- The prevalence of untreated decay was also higher among children at schools with ≥75% of children eligible for the FRL program compared with children at schools with <25% of children eligible for the FRL program (19 percent vs. 7 percent for kindergarten and 18 percent vs. 9 percent for third grade).
- In 2010, 26 percent of children aged 1-14 years whose household income was at or below 250% of the federal poverty level had teeth in fair or poor condition, compared to 13 percent of children living in higher-income households in Colorado.
- Children aged 1-14 years living in Colorado households at or below 250 percent of the federal poverty level had a lower prevalence of having a regular source of dental care (86 percent) compared with children in higher-income households (97 percent) in 2010.
- In 2010, children with no regular source of dental care had a higher prevalence of fair or poor condition of teeth (46 percent) compared with children who did have a regular source of dental care (18 percent).
- In 2010, 9 percent of children aged 1-14 years whose household income was at or below 250% of the federal poverty level did not get needed dental care, compared to 4 percent of children living in higher-income households in Colorado.
- In 2010, children without health insurance for medical care had a higher prevalence of foregoing needed dental care in the past 12 months (21%) compared with children with private insurance (4%).
- 7.5 percent of all adults aged 18-24 years reported in 2010 that they had lost a permanent tooth due to decay or gum disease, compared to 68 percent of Colorado adults aged 65 years and older. Colorado adults whose household income was at or below 250% of the federal poverty level and who lived in rural areas had higher prevalence of any tooth loss, compared to urban residents within the same age group and same income group.
- In 2010, 38 percent of Colorado adults who did not graduate high school reported that they had lost all their natural, permanent teeth, compared to 4 percent of college graduates. 28 percent of Colorado adults earning less than $15,000 had lost all their natural, permanent teeth, compared to 4 percent of Colorado adults whose household income was $50,000 or more a year.

II. INTRODUCTION

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 recent information available on the oral disease burden of people in Colorado. 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. It is hoped that this information will help raise awareness of the need for monitoring the oral health burden in Colorado and guide efforts to prevent and treat oral diseases and enhance the quality of life of all Coloradans.

Specifically, this report is organized to describe:

- Colorado geography and demographic characteristics;
- oral health status in Colorado for children and then for adults;
- behaviors that support good oral health;
- environment and systems that support good oral health; and
- current and collaborative initiatives in Colorado.

III. 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.[1] Issued in May 2000, the Surgeon General's 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 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. *Healthy People 2020*, a document that presents a comprehensive, nationwide health promotion and disease prevention agenda, provides one such set of indicators. 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, and still is, 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*.[2] 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* are:

- 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 and local 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.[3]

COLORADO'S ORAL HEALTH WINNABLE BATTLE

Colorado's Winnable Battles are ten public health and environmental priority issues that can affect the physical, environmental, and/or economic health of Coloradans, especially vulnerable populations. Colorado's Oral Health Winnable Battle is a focused effort, aligning national, state, and local efforts to significantly improve access to preventive oral health interventions. Goals are to increase by 2016 access to effective evidence-based oral health interventions and best practices:

- Increase to 75 percent or more the percentage of population served by community water systems receiving optimally fluoridated water to prevent tooth decay. 2012 baseline is 72.4 percent.
- Increase to 50 percent the percentage of Colorado third-graders who have dental sealants on permanent molars. 2011–2012 baseline is 45 percent.
- Increase to 4.6 percent the percentage of Colorado infants who get a dental checkup by age one year. 2010 baseline is 3.4 percent.

With active participation from both the public and private sectors, considerable progress can be made to improve Coloradan's oral health.

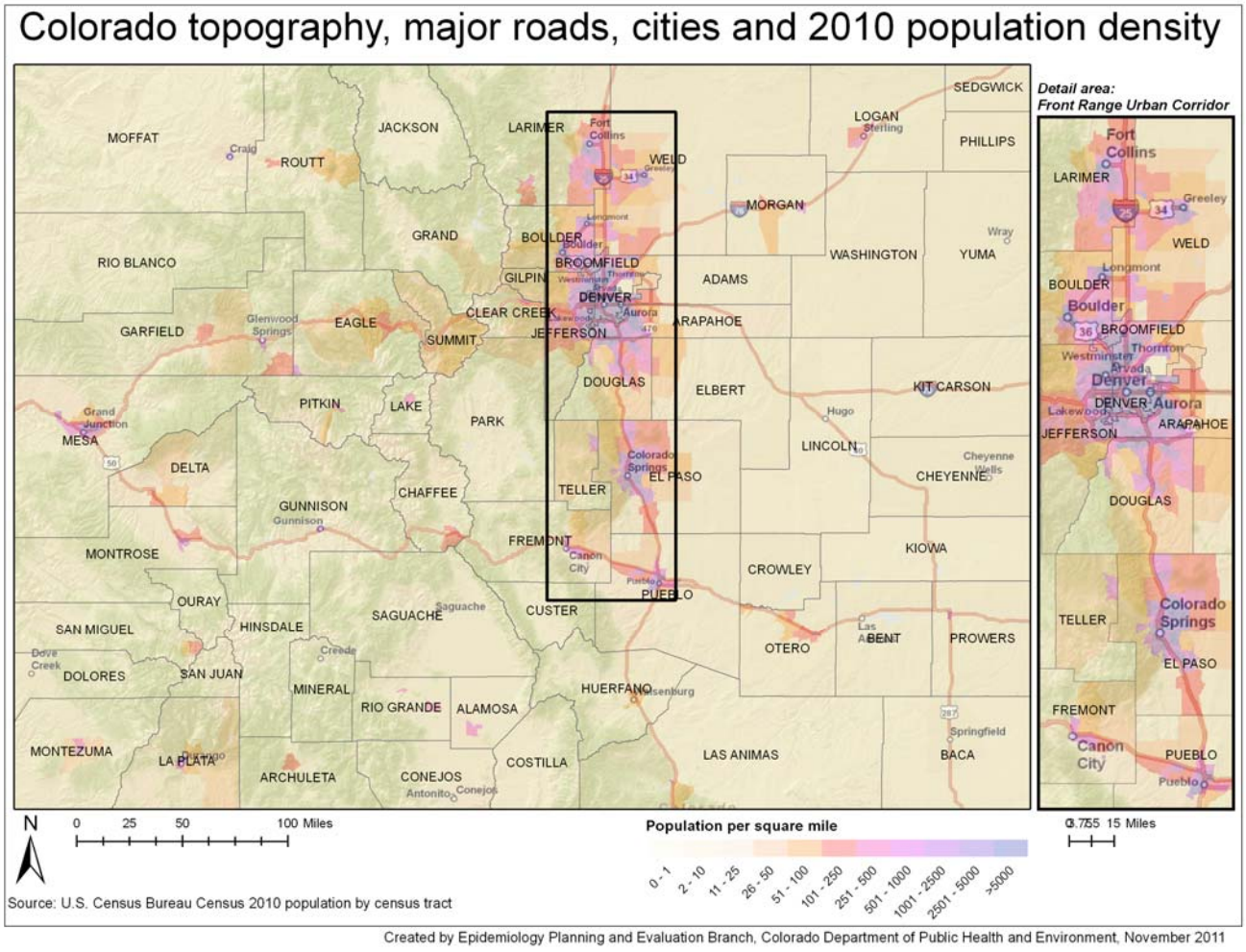
The *Healthy People 2020* oral health objectives for the nation, Colorado's Oral Health Winnable Battle goals, and the current status of each indicator for Colorado are summarized in Appendix A.

IV. GENERAL OVERVIEW OF COLORADO

a. Colorado Geography and Population Density

Geographically, Colorado is the eighth largest state in the United States, covering over 104,000 square miles, with a population density of 48.5 people per square mile, compared with the national average of 87.4.[4] Colorado is primarily a rural state with just over 5 million people, an increase of nearly 17 percent since the 2000 census, with over 80 percent of the state's population residing in 10 metropolitan counties on the eastern side of the Rocky Mountains, known as the "front range" (Figure 1).[5]

FIGURE 1: GEOGRAPHY AND POPULATION DENSITY, COLORADO, 2010

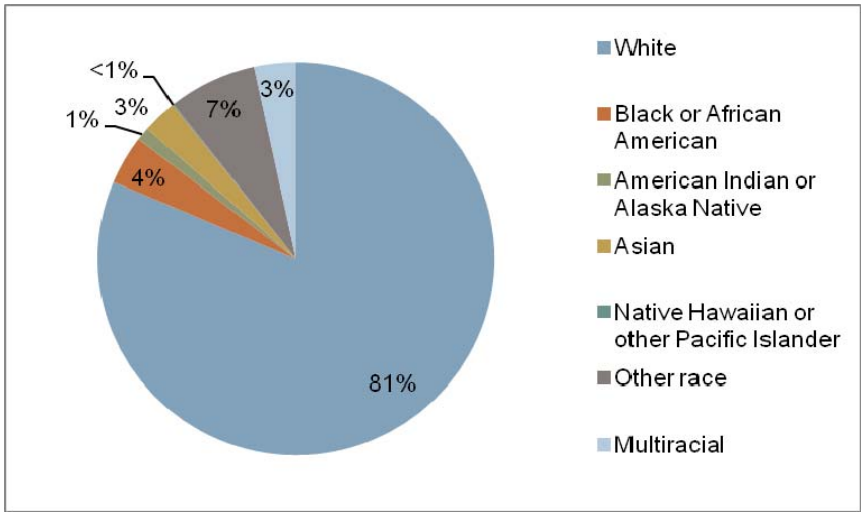


The population distribution and geography in Colorado present some unique obstacles to the provision of oral health. Twenty-three of Colorado's 64 counties are frontier (less than six people per square mile) and an additional 24 counties are rural. Also known as the "highest" state because of its average altitude, Colorado's numerous mountain passes often create geographical barriers in accessing oral health care services.

b. Colorado Population Statistics

The population in Colorado in 2010 was primarily White (81 percent), and the percentage of Black (4 percent), American Indian or Alaska Native (1 percent), Asian (3 percent), and Native Hawaiian or other Pacific Islander (1 percent) populations was fairly low (Figure 2). In comparison, the United States population in 2010 was 72 percent White, 13 percent Black, 1 percent American Indian or Alaska Native, 5 percent Asian, less than 1 percent Native Hawaiian and other Pacific Islander, and 3 percent multiracial.[6] The proportion of minorities has increased significantly in the last decade in Colorado, similar to the increase in the nation overall. In Colorado, Hispanic populations increased to over 20 percent, a 41 percent increase from 2000 to 2010. In the same period, Hispanic populations in the United States (16 percent in 2010) increased 43 percent.[7]

FIGURE 2: POPULATION DISTRIBUTION BY RACE, COLORADO, 2010



The percentage of families with children who were living in households in Colorado with incomes under 250% of the federal poverty level was 42.6 percent in 2010.[8] And Colorado's population is aging. Between 2010 and 2020, Colorado's population aged 65–74 years is forecast to increase by an annual average of 7 percent per year compared with the overall state at 1.8 percent per year and compared with the United States at 4.1 percent.

V. THE STATUS OF ORAL HEALTH IN COLORADO

Colorado tracks various indicators of oral health across the life span, using different data sources and methods. The birth defects registry in Colorado can tell us about cleft lip and cleft palate among infants. Head Start can tell us about preschool-aged children (ages 3–5 years). The Colorado Basic Screening Survey can tell us about dental caries and sealants in kindergartners and 3rd graders in public elementary schools. The Colorado Child Health Survey provides parent-reported information on children aged 1–14 years. The Colorado Behavioral Risk Factor Surveillance System provides self-reported oral health status among Colorado adults aged 18 years and older. The Pregnancy Risk Assessment Monitoring System provides data on several oral health indicators for pregnant women in Colorado. The Colorado Central Cancer Registry can tell us about oral cancers among Coloradans.

a. Oral Health Status Among Children

CLEFT LIP AND CLEFT PALATE AMONG INFANTS

While dental decay is the most common oral disease in children, cleft lip and/or cleft palate is one of the most common and visible congenital anomalies, affecting more than 130 newborns every year on average in Colorado — about 20 cases per 10,000 live births over this 15-year period (Table 1). Children born with craniofacial defects, such as cleft lip and palate, require surgical treatment of these defects and extensive reconstruction that involves many health specialists. Colorado Responds to Children with Special Needs (CRCSN) identifies children, up to age 3 years, who have been diagnosed as having a cleft lip and/or a cleft palate and may refer them to the Health Care Program for Children with Special Needs (HCP) in local public health agencies for assistance with accessing care in their communities.

TABLE 1: SUMMARY OF COLORADO RESPONDS TO CHILDREN WITH SPECIAL NEEDS DATA* FOR CASES OF CLEFT LIP AND/OR CLEFT PALATE†, COLORADO, 1995–2009

Year	Total Cases	Rate per 10,000	Cases of Cleft Palate (without Cleft Lip)	Rate per 10,000	Cases of Cleft Lip (with or without Cleft Palate)	Rate per 10,000	Total Number of Live Births
1995§	101	18.6	37	6.81	64	11.78	54,310
1996§	100	17.93	44	7.89	56	10.04	55,779
1997	112	19.82	32	5.66	80	14.16	56,505
1998	127	21.33	51	8.56	76	12.76	59,550
1999	128	20.6	49	7.89	79	12.71	62,142
2000	140	21.4	57	8.71	83	12.69	65,429
2001	146	21.79	61	9.1	86	12.83	67,006
2002	131	19.15	54	7.89	81	11.84	68,420
2003	159	22.94	65	9.38	94	13.56	69,304
2004	151	22.05	60	8.76	90	13.14	68,475
2005	138	20.02	58	8.42	80	11.61	68,922
2006	138	19.51	45	6.36	93	13.15	70,737
2007	170	24.01	67	9.46	104	14.69	70,804
2008	128	18.28	48	6.85	80	11.42	70,028
2009	116	16.91	39	5.68	77	11.22	68,605
Total	1985	20.34	767	7.86	1223	12.53	976,016

Data source: Colorado Responds to Children with Special Needs (CRCSN) Program, Colorado Department of Public Health and Environment

*Data as of February 2011. The number of cases reported may differ than those reported in other documents because the data reported here is based on confirmation by medical record review rather than surveillance case reporting alone.

† ICD-9 Codes include 749, 749.0, 749.1 and 749.2

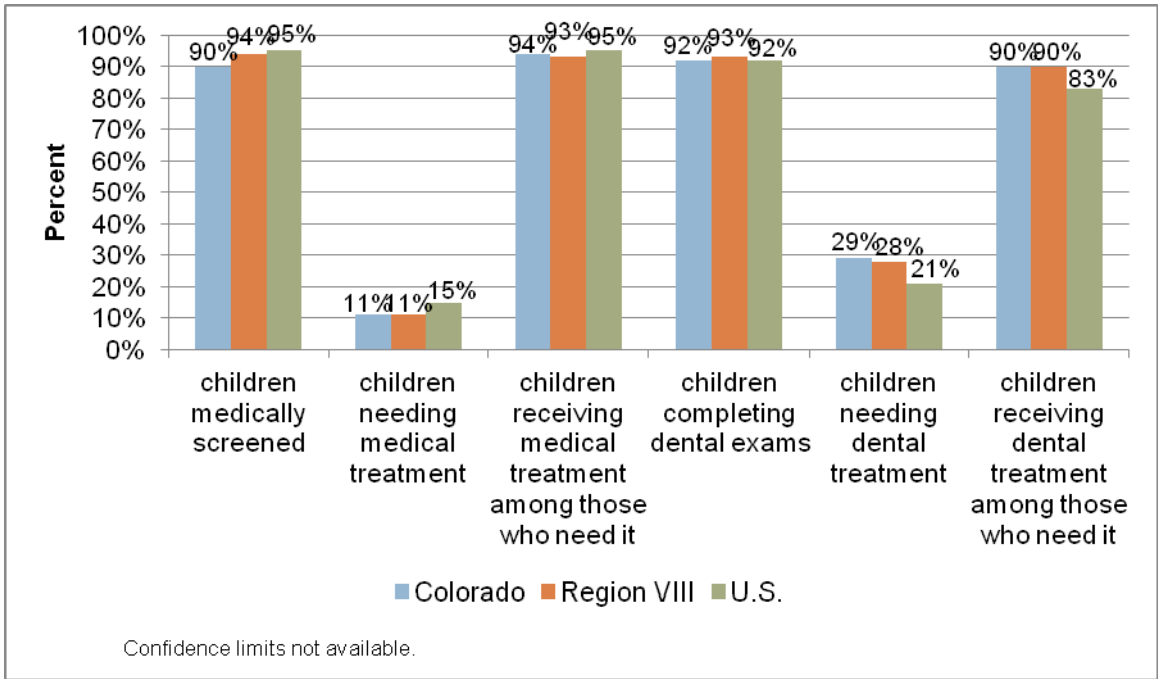
§ Not all cases in 1995 and 1996 underwent medical review.

DENTAL NEEDS AND SERVICES AMONG PRESCHOOL-AGED CHILDREN IN COLORADO'S HEAD START PROGRAM

Tooth decay can begin early in a child's life. The increase of tooth decay in preschool children has emerged as an important issue in oral health. Dental caries in children aged 2–5 years have increased over the past decade in the United States.[9] Rampant decay is often found among low-income toddlers and preschoolers. Head Start, serving children aged 5 years and younger, in addition to pregnant women, is one program that

can identify oral disease early and increase the school readiness of young children from families with low incomes. In Colorado, 8,808 children aged 3–5 years were enrolled in Head Start in 2009–2010. Head Start Program Performance Standards state that programs, in collaboration with parents, must determine each child's oral health status within 90 days of entry into the program. In Colorado and in the United States, 92 percent of children in Head Start had a dental exam in 2009–2010 (Figure 3). A higher proportion of children in Head Start needed dental treatment in Colorado compared with the United States (29 vs. 21 percent, respectively). In Colorado, 90 percent of Head Start children with dental issues received necessary dental treatment, whereas, nationally, the percentage was 83 percent. Comparing Colorado's proportions for dental needs and services with those for medical services among the Head Start population, a higher proportion of children needed dental care vs. medical care (29 vs. 11 percent, respectively) and a lower proportion of children received needed dental care vs. needed medical care (90 vs. 94 percent, respectively).

FIGURE 3: COLORADO, REGION VIII AND NATIONAL MEDICAL AND DENTAL SERVICES COMPARISON, COLORADO HEAD START MEDICAL AND DENTAL SERVICES, 2009–2010



Data source: Centers for Medicare and Medicaid Services and Colorado Department of Health Care Policy and Financing

ORAL HEALTH OF CHILDREN IN KINDERGARTEN AND THIRD GRADE

Dental caries (tooth decay) is a disease in which acids produced by bacteria on the teeth lead to loss of minerals from the enamel and dentin, the hard substances of teeth. Nationally, dental caries is one of the most common childhood diseases — five times more common than asthma and seven times more common than hay fever among children aged 5–17 years.[10] Unchecked, dental caries can result in loss of tooth structure, inadequate tooth function, unsightly appearance, pain, infection, and tooth loss.

Every three to five years the Colorado Department of Public Health and Environment (CDPHE) conducts a Children's Oral Health Screening (also known as the Basic Screening Survey (BSS)), a statewide oral health assessment of children in kindergarten and third grade within Colorado's public elementary schools. Indicators of the oral health of children available from this screening include caries experience (presence of cavities and/or fillings), untreated decay (active, unfilled cavities), urgent need for dental care (reported pain or a significant dental infection that requires immediate care) and dental sealants on at least one permanent molar, a protective measure to prevent tooth decay. This in-mouth screening survey provides robust data about the oral disease burden among children in kindergarten and third grade; however, the percent of children with untreated decay is assumed to be an under estimation because radiographs (x-rays) are not taken.

Burden among Children in Kindergarten: About forty percent (39.7%) of the children screened had caries experience, defined as untreated decay or fillings in their primary and/or permanent teeth, while 13.8% had untreated decay at the time of the screening (10.7% had untreated decay in 1–2 quadrants, and 3.1% had untreated decay in 3–4 quadrants). About two percent (1.5%) of the children needed urgent dental care because of pain or infection.

Burden among Children in Third Grade: Fifty-five percent (55.2%) of the children screened had caries experience, defined as untreated decay or fillings in their primary and/or permanent teeth, while 14.4% had untreated decay at the time of the screening (12.0% had untreated decay in 1–2 quadrants, and 2.4% had untreated decay in 3–4 quadrants).[3] About two percent (1.5%) of the children needed urgent dental care because of pain or infection. Forty-five percent (44.9%) of the children had a dental sealant on at least one permanent molar. The prevalence of untreated decay was significantly higher among children without sealants (20.4%) compared with children with sealants (7.1%).

Burden by School Socioeconomic Status: For both kindergarten and third grade, children at schools with the highest percent of children eligible for the free or reduced price meal (FRL) program had a higher prevalence of caries experience compared with children at schools with a lower percent of children eligible for the FRL program. More than half of kindergarten children (53.1%) and nearly three-quarters of third grade children (73.4%) in schools with ≥75% of children eligible for the FRL program had caries experience.

The prevalence of untreated decay was also higher among children at schools with ≥75% of children eligible for the FRL program compared with children at schools with <25% of children eligible for the FRL program (18.9% vs. 6.8% for kindergarten and 18.1% vs. 8.9% for third grade).

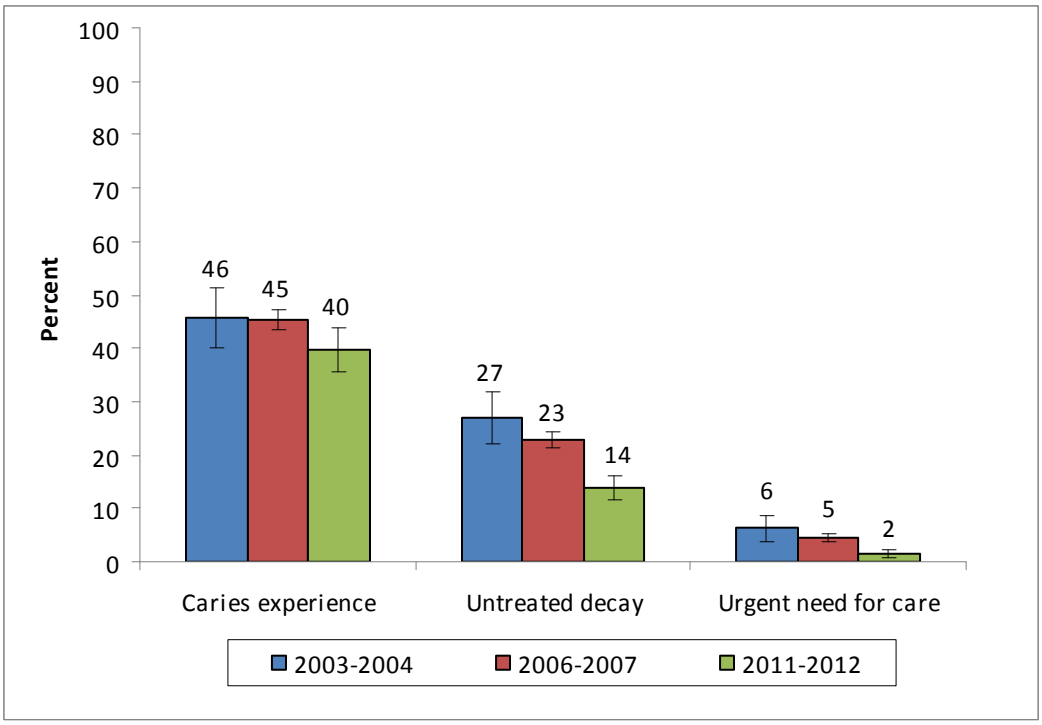
The prevalence of dental sealants was not significantly different across schools by FRL program eligibility.

Burden by Race and Ethnicity: Among both kindergarten and third grade children, Hispanic children had a higher prevalence of caries experience compared with Black or White children. Among children in kindergarten, the prevalence of caries experience was 55.0% among Hispanic children, 38.0% among Black children, and 31.9% among White children. Among children in third grade, the prevalence of caries experience was 69.5% among Hispanic children, 56.4% among Black children, and 48.1% among White

children. Among children in kindergarten, the prevalence of untreated decay was higher among Hispanic children (18.5%) compared with Black (16.8%) or White (11.4%) children.

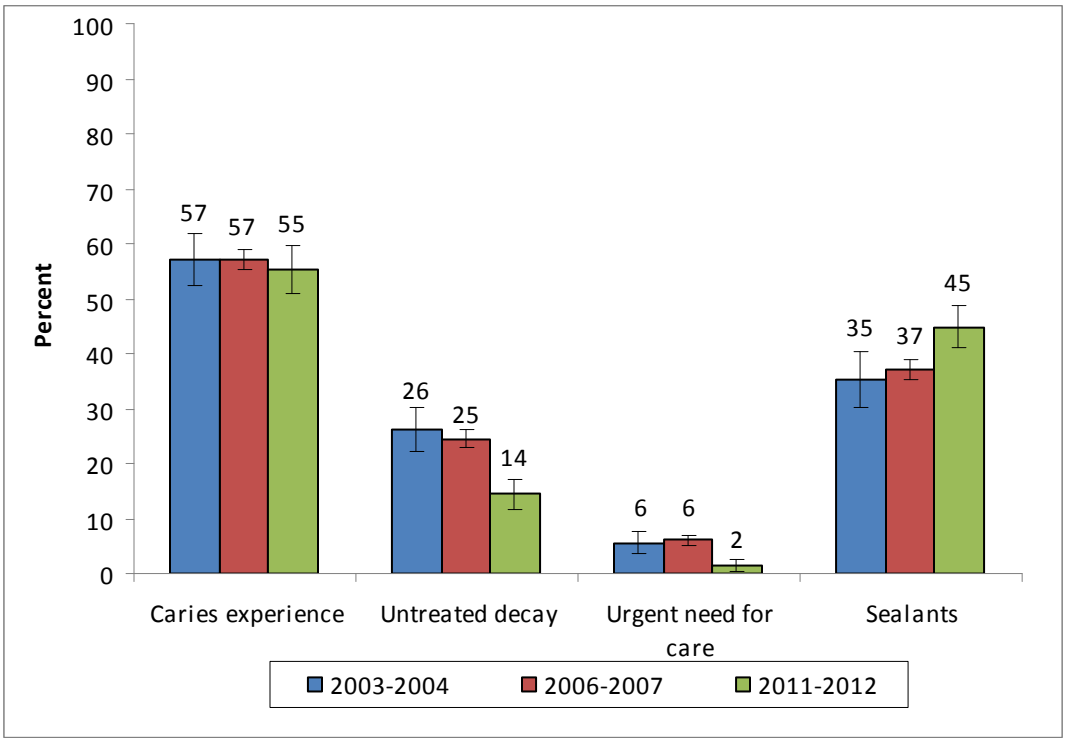
Trends in Results of Dental Screening (Figures 4 and 5): For both children in kindergarten and children in third grade, the overall prevalence of caries experience did not significantly change since the 2003–2004 screening, but the prevalence of untreated decay and the prevalence of urgent need for dental care decreased significantly. The prevalence of untreated decay decreased from 27% in 2003–2004 to 14% in 2011–2012 and the prevalence of urgent need for dental care decreased from 6% in 2003–2004 to 2% in 2011–2012 among children in kindergarten. The prevalence of untreated decay decreased from 26% in 2003–2004 to 14% in 2011–2012 and the prevalence of urgent need for dental care decreased from 6% in 2003–2004 to 2% in 2011–2012 among children in third grade. These trends are similar to national trends in untreated decay.[1] Among children in third grade, the prevalence of dental sealants increased from 35% in 2003–2004 to 45% in 2011–2012.

FIGURE 4. RESULTS OF DENTAL SCREENING AMONG CHILDREN IN KINDERGARTEN — COLORADO CHILDREN'S ORAL HEALTH SCREENING, 2003–2004, 2006–2007, AND 2011–2012



[1] http://www.cdc.gov/nchs/data/hpdata2010/hp2010_final_review_focus_area_21.pdf and http://www.cdc.gov/nchs/data/databriefs/db104.pdf

FIGURE 5. RESULTS OF DENTAL SCREENING AMONG CHILDREN IN THIRD GRADE — COLORADO CHILDREN'S ORAL HEALTH SCREENING, 2003–2004, 2006–2007, AND 2011–2012



Significant trends by the percent of students in the school eligible for the FRL program included the following (Figures 6 and 7):

- The prevalence of caries experience decreased among children in kindergarten at schools with <25% of children eligible for the FRL program (from 35% in 2003–2004 to 23% in 2011–2012) and among children in kindergarten at schools with ≥75% of children eligible for the FRL program (from 73% in 2003–2004 to 53% in 2011–2012).
- Among children in kindergarten, the prevalence of untreated decay decreased among both children at schools with <25% and ≥75% of children eligible for the FRL program (from 20% in 2003–2004 to 7% in 2011–2012 and from 48% in 2003–2004 to 19% in 2011–2012, respectively).
- Among children in third grade, the prevalence of untreated decay decreased from 2003–2004 to 2011–2012 among children at schools with <25% of children eligible for the FRL program (from 18% to 9%) and ≥75% of children eligible for the FRL program (from 41% to 18%).
- The prevalence of dental sealants increased among children in third grade at schools with ≥75% of children eligible for the FRL program (22% in 2003–2004 and 44% in 2011–2012). Similarly, when looking at schools with ≥50% of children eligible for the FRL program, prevalence of dental sealants increased from 24% in 2003–2004 to 40% in 2011–2012 among children in third grade.

FIGURE 6. RESULTS OF DENTAL SCREENING AMONG CHILDREN IN KINDERGARTEN BY PERCENT OF STUDENTS IN THE SCHOOL WHO WERE ELIGIBLE FOR FREE OR REDUCED PRICE MEAL PROGRAM (FRL) — COLORADO CHILDREN'S ORAL HEALTH SCREENING, 2003–2004, 2006–2007, AND 2011–2012

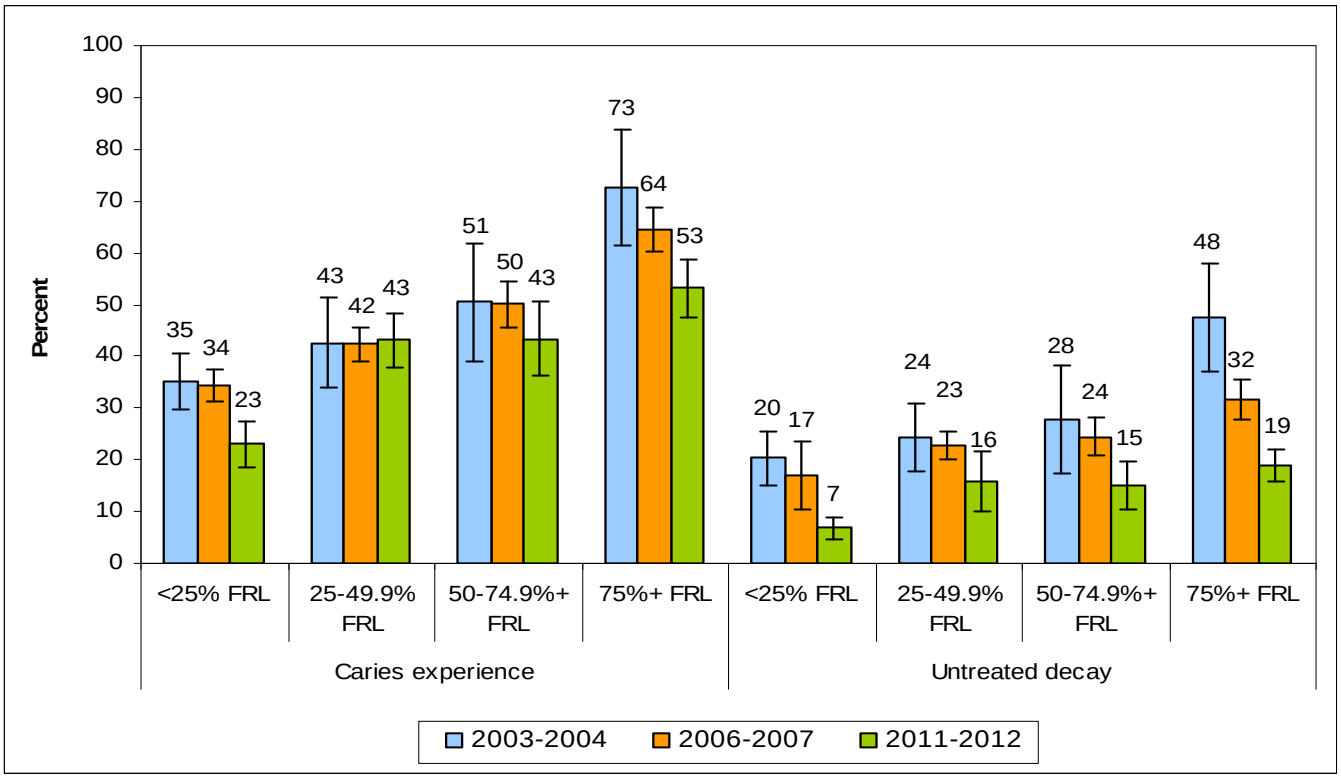
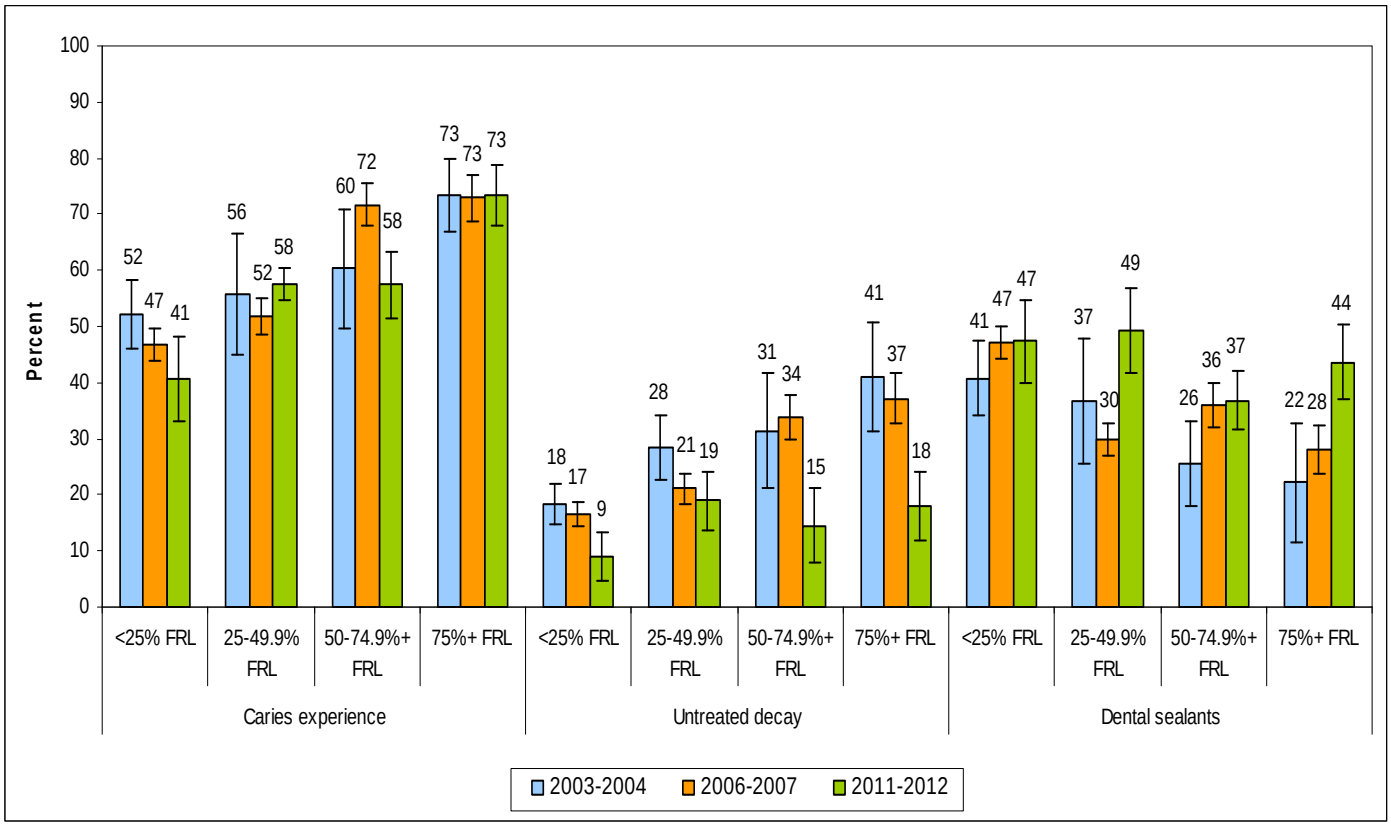


FIGURE 7. RESULTS OF DENTAL SCREENING AMONG CHILDREN IN THIRD GRADE BY PERCENT OF STUDENTS IN THE SCHOOL WHO WERE ELIGIBLE FOR FREE OR REDUCED PRICE MEAL PROGRAM (FRL) — COLORADO CHILDREN'S ORAL HEALTH SCREENING, 2003–2004, 2006–2007, AND 2011–2012

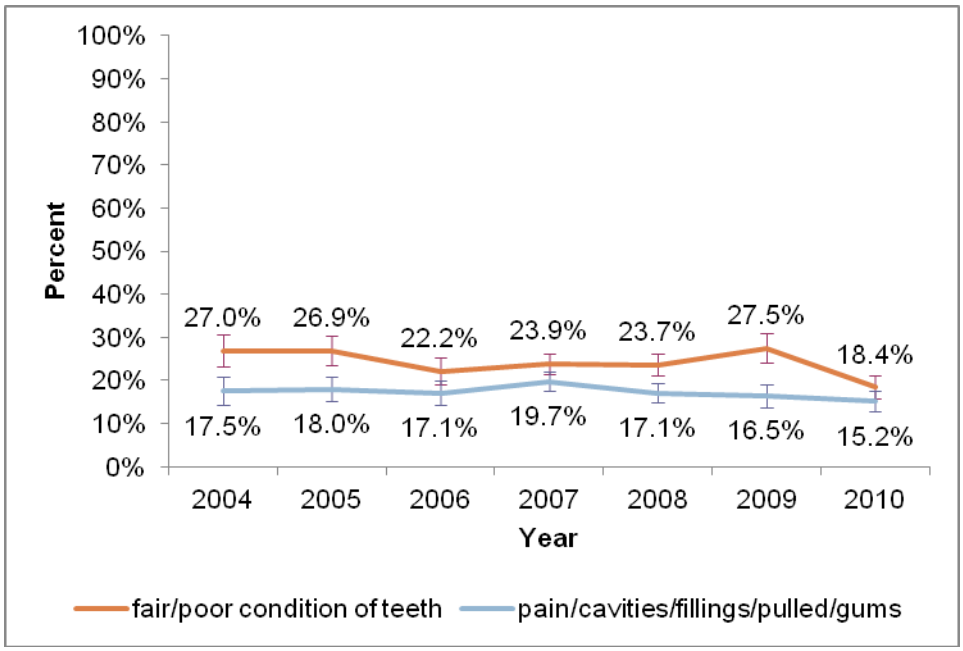


ORAL HEALTH OF CHILDREN AGED 1–14 YEARS

Colorado data on the health of children are collected via the Colorado Child Health Survey (CHS), which is a call-back survey to the Colorado Behavioral Risk Factor Surveillance System (BRFSS) survey for parents of children aged 1–14 years.

The percentage of children aged 1–14 years whose parents reported their teeth to be in fair/poor condition has decreased significantly since 2004. In 2010, about 18 percent of children were reported to have fair/poor condition of teeth; this was the first time the reported prevalence has fallen below 20 percent since 2004, when the prevalence was 27 percent. Also in 2010, about 15 percent of children aged 1–14 years were reported to have a serious dental problem such as pain, cavities, broken or missing fillings, teeth pulled because of cavities or bleeding gums as the main problem with their teeth. The prevalence of these serious oral health problems has been stable (i.e., no significant change) from 2004 to 2010 (Figure 8).

FIGURE 8: CHILDREN AGED 1–14 YEARS WITH FAIR OR POOR CONDITION OF TEETH AND SERIOUS ORAL HEALTH PROBLEMS, COLORADO, 2004–2010

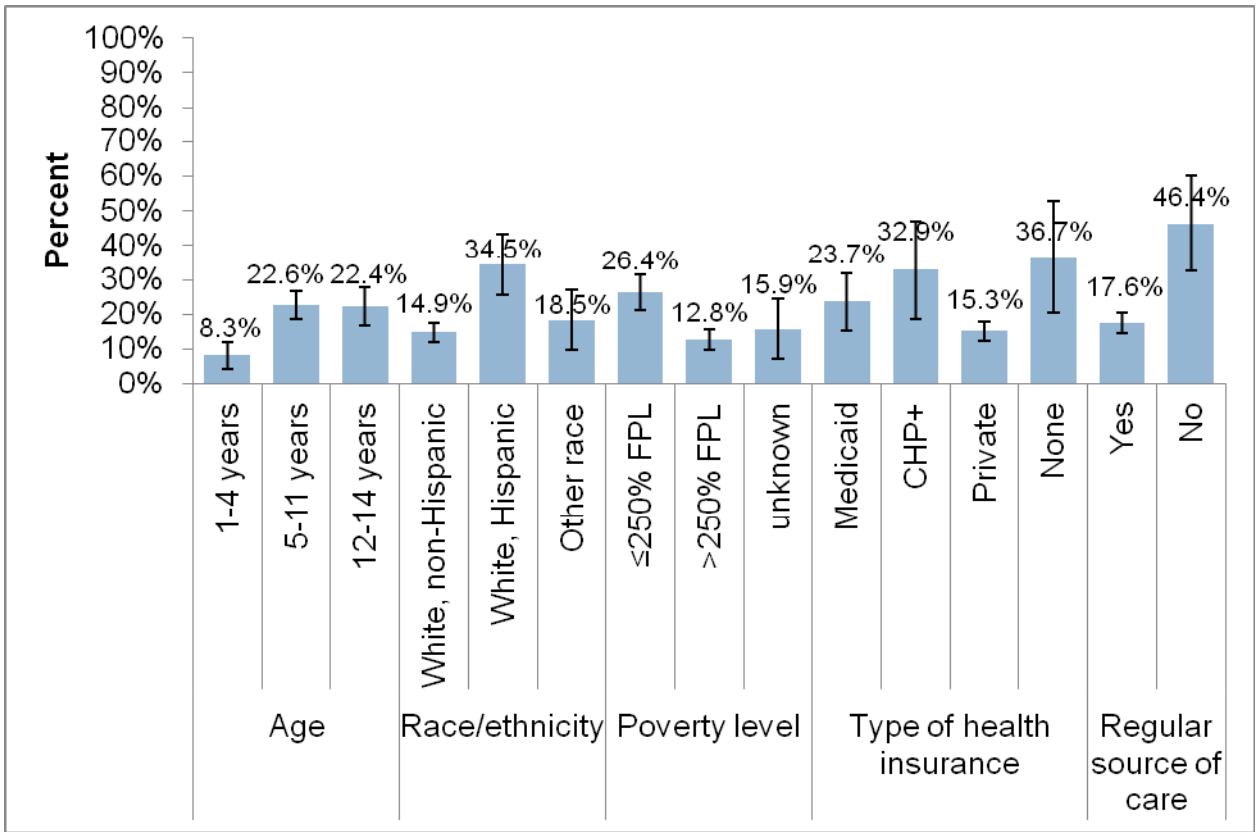


Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment

Several demographic and other characteristics and conditions were associated with children having teeth in fair or poor condition (Figure 9). Children aged 5–11 and 12–14 years had a higher prevalence of fair or poor condition of teeth (23 percent and 22 percent, respectively) compared with children aged 1–4 years (8 percent). White, Hispanic children had a higher prevalence of fair or poor condition of teeth (35 percent) compared with White, non-Hispanic children (15 percent). Children in households at or below 250 percent of the federal poverty level had a higher prevalence of fair or poor condition of teeth (26 percent) compared with children in higher-income households (13 percent). Children who did not have health care coverage and children who were covered by Child Health Plan Plus (CHP+), the state program providing coverage to low-income pregnant women and children who do not qualify for Medicaid, had higher prevalence of fair or poor condition of teeth (37 percent and 33 percent, respectively) compared with children who were reported to have some other type of insurance coverage besides CHP+ or Medicaid (i.e., private health insurance; 15 percent); the prevalence among children on Medicaid did not differ significantly from these other groups. Children with no regular source of dental care had a higher prevalence of fair or poor condition of teeth (46 percent) compared with children who did have a regular source of dental care (18 percent).

Children who had gone without needed dental care in the past 12 months also had higher prevalence of fair or poor condition of teeth compared with children who did not forego needed care (62 vs. 16 percent; data not presented). The prevalence of fair or poor condition of teeth did not differ by urban or rural residency.

FIGURE 9: CHILDREN AGED 1–14 YEARS WITH FAIR OR POOR CONDITION OF TEETH BY DEMOGRAPHIC FACTORS, COLORADO, 2010

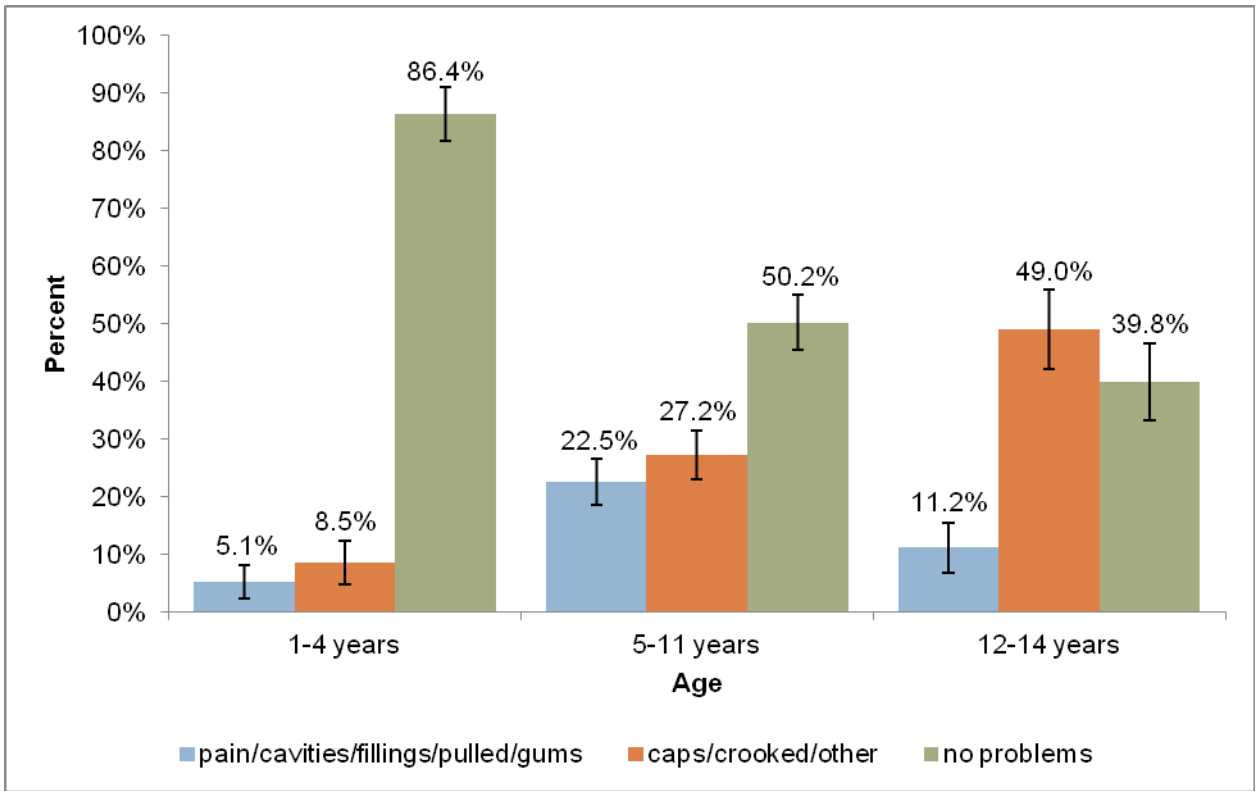


Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment
FPL: federal poverty level
CHP+: Child Health Plan Plus

The prevalence of a serious problem with child's teeth — including pain, cavities, broken or missing fillings, teeth pulled because of cavities or bleeding gums — was 15 percent in 2010. This prevalence varied by age (Figure 10). Children aged 5–11 years had a higher prevalence of having one of these problems with their teeth (23 percent) compared with children aged 1–4 years (5 percent) and children aged 12–14 years (11 percent).

Children who had fair or poor condition of teeth had higher prevalence of a serious problem with their teeth (32 percent) compared with children who had good, very good or excellent condition of teeth (11 percent). Children who had gone without needed dental care in the past 12 months had higher prevalence of a serious problem with their teeth (33 percent) compared with children who either did not need dental care or received needed dental care (14 percent). Children who saw a dentist for preventive care in the past 12 months had higher prevalence of a serious problem with their teeth (17 percent) compared with children who did not see the dentist in the past year (8 percent). The prevalence of a serious problem with child's teeth did not differ by race/ethnicity, poverty level, urban or rural residency, health insurance, or having a regular source of dental care.

FIGURE 10: MAIN PROBLEM WITH CHILD'S TEETH BY AGE — CHILDREN AGED 1–14 YEARS, COLORADO, 2010



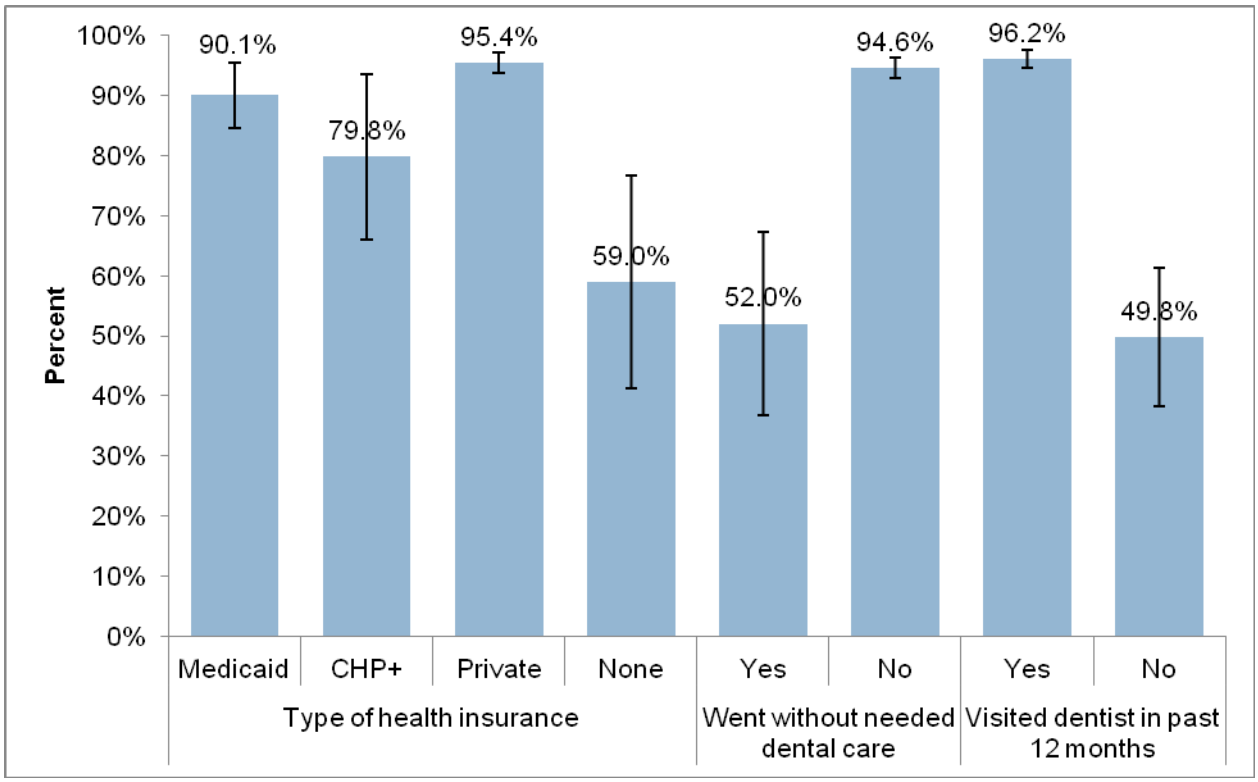
Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment

Because not having a regular source of dental care and forgoing needed dental care were associated with worse oral health status, it is important to identify factors associated with having a regular source of dental care and with forgoing needed dental care. Overall, 92 percent of children aged 1–14 years were reported to have a regular source of care, and 6 percent of children aged 1–14 years had to forego needed dental care in the past 12 months.

The prevalence of having a regular source of care varied by health insurance and dental care utilization (Figure 11). Colorado children covered by Medicaid or private health insurance had higher prevalence of having a regular source of dental care (90 percent and 95 percent, respectively) compared with children who had no health insurance (59 percent). Children who did not have to go without needed dental care had a higher prevalence of having a regular source of dental care (95 percent) than children who had to forego needed dental care (52 percent). Children who visited a dentist for preventive care in the past 12 months had a higher prevalence of having a regular source of care (96 percent) compared with children who did not visit a dentist (50 percent).

Children in households at or below 250 percent of the federal poverty level had a lower prevalence of having a regular source of dental care (86 percent) compared with children in higher-income households (97 percent; data not presented). The prevalence of having a regular source of care did not differ significantly by age, race/ethnicity, or urban or rural residency.

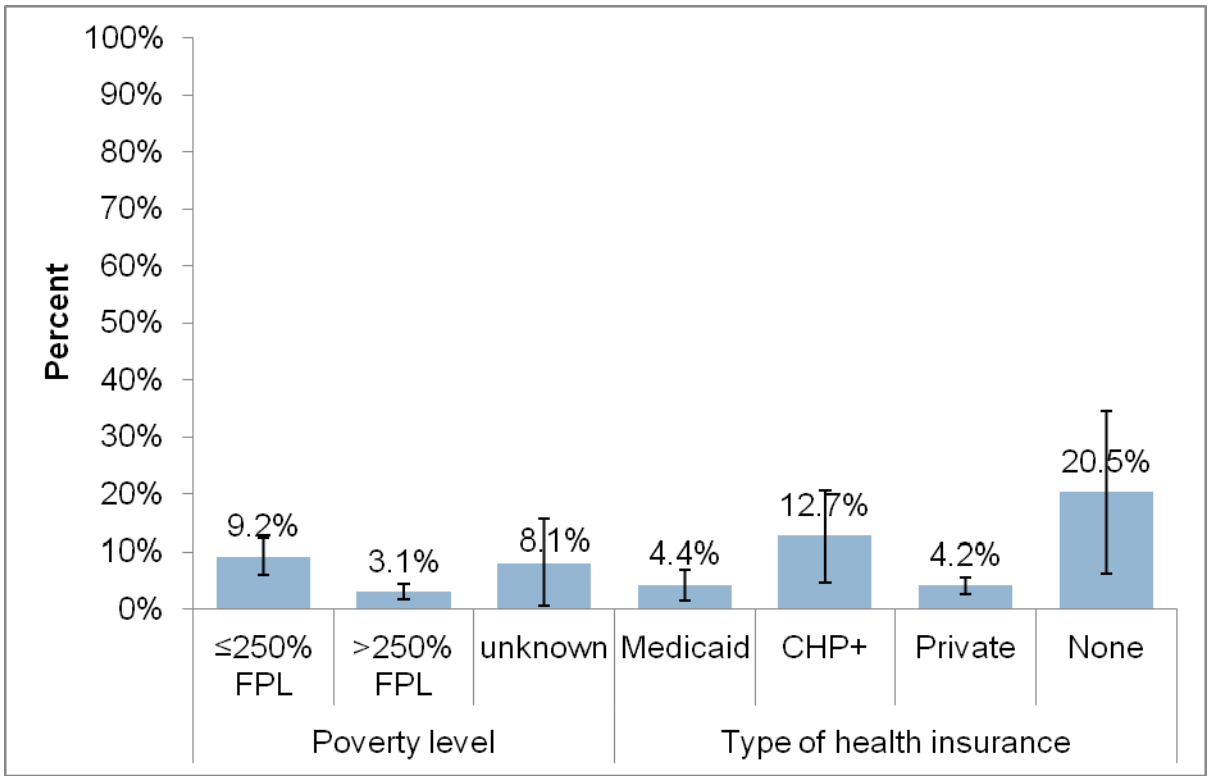
FIGURE 11: PREVALENCE OF HAVING A REGULAR SOURCE OF DENTAL CARE BY HEALTH INSURANCE AND DENTAL CARE UTILIZATION — CHILDREN AGED 1–14 YEARS, COLORADO, 2010



Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment
CHP+: Child Health Plan Plus

The prevalence of foregoing needed dental care varied by poverty level and health insurance (Figure 12). Children without health insurance for medical care had a higher prevalence of foregoing needed dental care in the past 12 months (21 percent) compared with children with private insurance (4 percent). Similarly, children in households with income at or below 250% of the federal poverty level had a higher prevalence of forgoing needed dental care (9 percent) compared with children in higher-income households (3 percent). The prevalence of foregoing needed dental care did not differ significantly by age, race/ethnicity, or urban or rural residency.

FIGURE 12: PREVALENCE OF FOREGOING NEEDED DENTAL CARE IN THE PAST 12 MONTHS BY POVERTY LEVEL AND HEALTH INSURANCE — CHILDREN AGED 1–14 YEARS, COLORADO, 2010



Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment
FPL: federal poverty level
CHP+: Child Health Plan Plus

In 2010, the CHS asked parents whether a health care provider (such as a pediatrician, family physician, nurse practitioner, or nurse) ever provided dental care or dental advice.

- 58 percent reported that a provider explained cavity prevention strategies.
- 23 percent reported that a provider applied fluoride to the child's teeth.
- 38 percent reported that a provider helped to identify strategies to improve the child's teeth.
- 23 percent reported that a provider referred the child to a dentist.

Assessing these four indicators by age, race/ethnicity, poverty level, health insurance, and urban or rural residency, the only statistically significant difference was that a higher proportion of children covered by Medicaid had been referred to a dentist by their health care provider than children with private health insurance (27 vs. 21 percent, respectively).

b. Oral Health Status Among Adults

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.

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. Colorado does not currently have state-specific data on the prevalence of gingivitis and destructive periodontitis.

TOOTH LOSS

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. As teeth are lost, a person's ability to chew and speak decreases, and interference with social functioning can occur. 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.

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 a higher prevalence of tooth loss than men of the same age group. Blacks tend to have a higher prevalence of tooth loss than 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, the prevalence of any tooth loss due to decay or gum disease among adults aged 18 years and older (35.4 percent) and the prevalence of having lost all natural teeth due to decay or gum disease among adults aged 65 years and older (13.4 percent) were both better than the corresponding national prevalence (43.7 percent and 16.9 percent, respectively) (Table 2). In Colorado, the prevalence of having lost all natural teeth was 3.4 percent among all adults aged 18 years and older. The prevalence of any tooth loss increased with age, with lower education levels, and with lower household income levels in both Colorado and the United States. More than two-thirds of Coloradans aged 65 years and older had lost one or more teeth due to decay or gum disease. In Colorado, the prevalence of any tooth loss was higher among Black, non-Hispanics (47.1 percent) and Hispanics (40.3 percent) compared with White, non-Hispanics (33.3 percent).

Among adults aged 65 years and older, Hispanics in Colorado had a higher prevalence of having lost all natural teeth (22.4 percent) compared with White, non-Hispanics in Colorado (12.2 percent), White, non-Hispanics in the United States (16.2 percent), and Hispanics in the United States (14.3 percent). As in the United States, socio-economic oral health disparities can be seen among Colorado's population: lower household income and less education were both associated with higher prevalence of having lost all natural teeth. The prevalence among adults aged 65 years and older who had an education level of less than high school was 38.4 percent.

TABLE 2: ADULTS AGED 18+ WHO HAVE LOST ANY PERMANENT TEETH AND ADULTS AGED 65+ WHO HAVE LOST ALL THEIR PERMANENT TEETH, UNITED STATES AND DC AND COLORADO, 2010

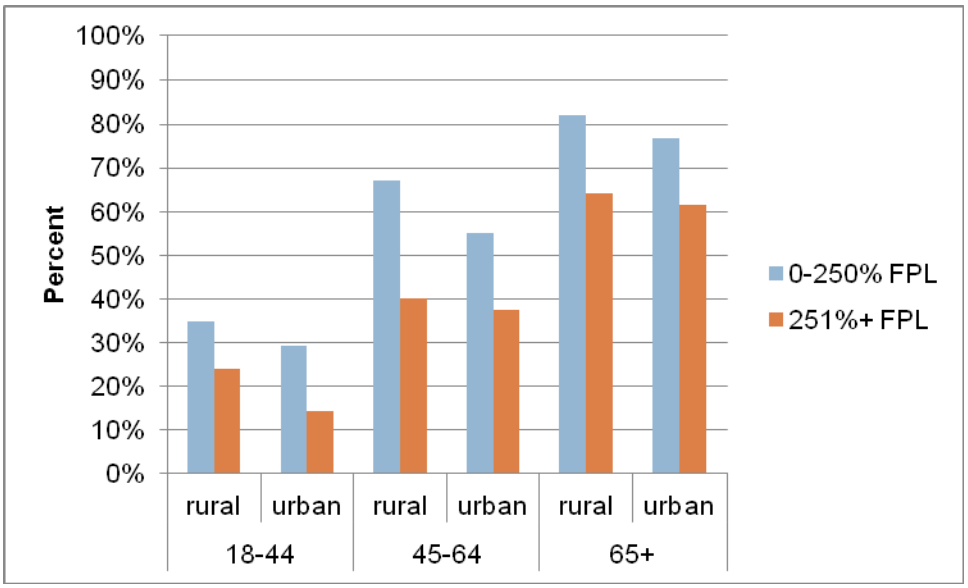
	Any Tooth Loss* (%)		Lost All Natural Teeth* (%)	
	Aged 18+ Years		Aged 65+ Years	
	U.S. and DC	Colorado	U.S. and DC	Colorado
TOTAL	43.7	35.4	16.9	13.4
Age (years)				
18-24	13.1	7.5	--	--
25-34	26.6	25.6	--	--
35-44	32.1	25.9	--	--
45-54	46.4	37.7	--	--
55-64	59.7	49.8	--	--
65+	75.6	67.5	--	--
65-74	--	--	14.2	10.3
75+	--	--	19.9	17.5
Race or Ethnicity				
White, non-Hispanic	42.2	33.3	16.2	12.2
Black, non-Hispanic	58.4	47.1	24.5	DSU
Hispanic (all races)	42.1	40.3	14.3	22.4
Other	40.7	39.4	13.2	DSU
Multiracial	40.8	34.6	20.7	DSU
Sex				
Female	43.7	35.3	18.1	14.6
Male	43.0	35.5	15.4	11.8
Education Level				
Less than high school	66.0	50.6	38.4	38.4
High school graduate or GED	54.2	43.6	21.5	21.4
At least some college	44.5	37.3	13.3	10.9
College graduate	30.9	26.3	5.5	4.0
Income Level				
Less than $15,000	65.4	51.1	36.4	27.7
$15,000-24,999	59.7	50.2	24.2	23.6
$25,000-34,999	57.6	45.7	16.0	13.7
$35,000-44,999	48.1	44.0	12.2	9.5
$50,000+	32.3	26.2	5.6	3.7

Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment and Behavioral Risk Factor Surveillance System, Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.
DSU = data statistically unreliable
* Includes only tooth loss due to decay or gum disease.

Adults who reported that they were current smokers, had been diagnosed with diabetes, had activity limitations due to physical, mental, or emotional problems, or had fair or poor general health had higher prevalence tooth loss compared with their counterparts (data not presented). Adults who resided in rural

areas of the state had higher prevalence of tooth loss compared with adults who resided in urban areas (communities of 25,000 or more people as defined by the U.S. Census Bureau). Adults who had lower household income levels had higher prevalence of tooth loss compared with adults in higher-income households (above 250% of the federal poverty level). The pattern of higher prevalence of any tooth loss among Colorado adults with lower income within each subgroup defined by age and residency indicates that poverty was a stronger indicator of tooth loss than rural/urban residency (Figure 13).

FIGURE 13: ANY PERMANENT TOOTH LOSS BY AGE, URBAN OR RURAL RESIDENCY, AND POVERTY LEVEL, COLORADO, 2010



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment
FPL: federal poverty level

ORAL AND PHARYNGEAL CANCERS

Cancer of the oral cavity and pharynx (oral cancer) is the fourth most common cancer in Black men and the seventh most common cancer in White men in the United States.[11] An estimated 36,540 new cases of oral cancer and 7,880 deaths from these cancers occurred in the United States in 2010.[12] The age-adjusted incidence rate of oral cancer in the United States in 2007 was 10.7 cancers per 100,000 persons (adjusted using the U.S. population in 2000 as the standard). 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 (16.1 per 100,000) than among women (6.0 per 100,000), as was the mortality rate (4.1 per 100,000 vs. 1.6 per 100,000).

In 2008, Colorado's overall incidence rate of oral cancer was 14.0 per 100,000 for males and 6.3 per 100,000 for females (Table 3). The Colorado incidence rates for males of all races, White, non-Hispanic males and both males and females of Black race were lower compared to the United States during the same time period.

TABLE 3: ORAL CANCER - NUMBER OF DIAGNOSED CANCERS AND AVERAGE ANNUAL AGE-ADJUSTED INCIDENCE RATES PER 100,000 BY SEX, GEOGRAPHIC AREA, RACE/ETHNICITY, AND TIME PERIOD, USA 2003-2007 AND COLORADO 2003-2007 AND 2008

	USA[1] 2003-2007			Colorado 2003-2007				Colorado 2008		
	N	Rate		N	Rate			N	Rate	
Male										
All Races	105737	16.0		1419	13.7	▽		332	14.0	
White, non-Hispanic	85950	16.6		1245	14.4	▽		294	15.2	
White, Hispanic	5631	10.5	○	109	11.1		○	25	9.0	○
Black	9955	16.5		48	10.4	▽	○	7	5.8	○
Female										
All Races	47345	6.1		651	5.7			161	6.3	
White, non-Hispanic	38186	6.3		570	6.0			142	6.7	
White, Hispanic	2528	4.0	○	54	4.5		○	17	5.7	
Black	4279	5.5	○	12	2.2	▽	○	2	1.9	

1 USA rates are from NAACCR; USA rates for "White, Hispanic" category include Hispanics of any race.
▲ Rate is significantly higher than corresponding rate in column to the left.
▽ Rate is significantly lower than corresponding rate in column to the left.
● Rate is significantly higher than White, non-Hispanic rate for this sex, geographic area and time period.
○ Rate is significantly lower than White, non-Hispanic rate for this sex, geographic area and time period.

The mortality rate from oral cancer was 2.7 deaths per 100,000 males and 0.8 deaths per 100,000 females in Colorado in 2008. The average annual age-adjusted oral cancer mortality rates for males overall, and White, non-Hispanic males were lower in Colorado than in the United States during the same time period (Table 4).

TABLE 4: ORAL CANCER - NUMBER OF DEATHS AND AVERAGE ANNUAL AGE-ADJUSTED MORTALITY RATES PER 100,000 BY SEX, GEOGRAPHIC AREA, RACE/ETHNICITY, AND TIME PERIOD, USA 2003-2007 AND COLORADO 2003-2007 AND 2008

	USA[1] 2003-2007			Colorado 2003-2007			Colorado 2008		
	N	Rate		N	Rate		N	Rate	
Male									
All Races	26658	3.9		269	3.0	▽	57	2.7	
White, non-Hispanic	20445	3.8		222	2.9	▽	51	2.9	
White, Hispanic	1186	2.5	○	28	3.4		3	0.9	
Black	4072	6.3	●	17	5.7		*	*	
Female									
All Races	12505	1.4		181	1.6		21	0.8	▽
White, non-Hispanic	10276	1.5		161	1.7		17	0.8	▽
White, Hispanic	437	0.8	○	11	1.2		3	1.5	
Black	1623	1.6	●	4	1.0		*	*	

1 USA mortality data based on all 50 states combined.
*Fewer than 3 events in this category.
▲ Rate is significantly higher than corresponding rate in column to the left.
▽ Rate is significantly lower than corresponding rate in column to the left.
● Rate is significantly higher than White, non-Hispanic rate for this sex, geographic area and time period.
○ Rate is significantly lower than White, non-Hispanic rate for this sex, geographic area and time period.

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,[13] although survival varies widely by stage of disease when diagnosed. In Colorado, the 5-year relative survival rate for persons with oral cancer diagnosed at a localized stage is 75 percent. In contrast, the 5-year survival rate is only 57 percent once the cancer has spread to regional lymph nodes at the time of diagnosis and is just 30 percent for persons with distant metastasis.[14]

Some groups experience a disproportionate burden of oral cancer. Nationally, Black males are much more likely than Whites to die from oral cancer. 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.[15] The use of tobacco, including smokeless tobacco[16,17] and cigars[18] 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.[19, 20, 21, 22, 23, 24] Radiation from sun exposure is a risk factor for lip cancer.[25]

The average annual rate of early detection in Colorado during 2003-2005 was 40.5 percent. The early detection rate worsened over the 2006-2008 time period, to 38.9 percent. Over both time periods Hispanics and Blacks, compared to Whites, were diagnosed generally at later stage when survival is not as good. Stage improvements were seen for Blacks over the two time periods but early detection among Hispanics worsened, leaving both groups still behind the value for Whites. Also noticeable was the persistently higher distant stage percentages for Blacks, a stage where five-year survival is only about 30 percent (Table 5).

TABLE 5 ORAL CANCER - STAGE OF DISEASE AT DIAGNOSIS BY RACE/ETHNICITY AND TIME PERIOD, COLORADO, 2003-2005 AND 2006-2008

	Cases N	In situ %	Localized %	Regional %	Distant %	Unknown %	Percent "Early" Detection[1]	
All Races								
2003-05	1195	1.9	36.9	43.2	14.0	4.0	40.5	
2006-08	1430	2.7	34.5	44.3	14.1	4.5	38.9	
White, non-Hispanic								
2003-05	1050	2.0	37.8	43.0	13.2	3.9	41.4	
2006-08	1257	2.7	35.3	43.8	13.4	4.7	39.9	
White, Hispanic								
2003-05	91	1.1	34.1	44.0	16.5	4.4	36.8	
2006-08	117	1.7	29.9	49.6	16.2	2.6	32.5	
Black								
2003-05	26	0.0	19.2	34.6	38.5	7.7	20.8	○
2006-08	35	2.9	25.7	37.1	31.4	2.9	29.4	

1 "Early" detection is percent in situ + localized of staged cases (unknown stage excluded).
○ Rate is significantly lower than White, non-Hispanic rate for this sex, geographic area and time period.

Based on 2004-2008 age-specific rates, the cumulative lifetime risk of oral cavity cancers in Colorado is 1 in 58 for males, and 1 in 136 for females.

Reductions have been seen in oral cancer incidence rates over the past 30 years and have largely been attributed to reduced smoking prevalence; however an emerging topic in oral cancer is a link between oral cancer and Human Papilloma Virus (HPV). Research is showing that cases of oral cancer in non-smokers

and non-drinkers are associated with HPV. This is of particular interest in both the U.S. and Colorado, because the incidence of oral cancers specifically associated with HPV is increasing faster than the overall oral cancer incidence.[26, 27, 28]

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.[29]

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.[30, 31] Women are less likely than men at each age group to have severe periodontal disease. Both Black and White women have a substantially lower incidence rate of oral and pharyngeal cancers than do Black 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.

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.[32, 33] 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.[34]

According to 2010 Pregnancy Risk Assessment Monitoring System (PRAMS) survey data in Colorado, nearly one quarter of pregnant women (23.0 percent) reported needing to see a dentist for a problem during their pregnancy. The need to see a dentist was higher among pregnant women on Medicaid, 32.0 percent, compared with 18.5 percent of pregnant women not on Medicaid. However, fewer pregnant women on Medicaid reported going to see a dentist compared with pregnant women not on Medicaid (for related data, see *Preventive Visits* section).

PEOPLE WITH DISABILITIES

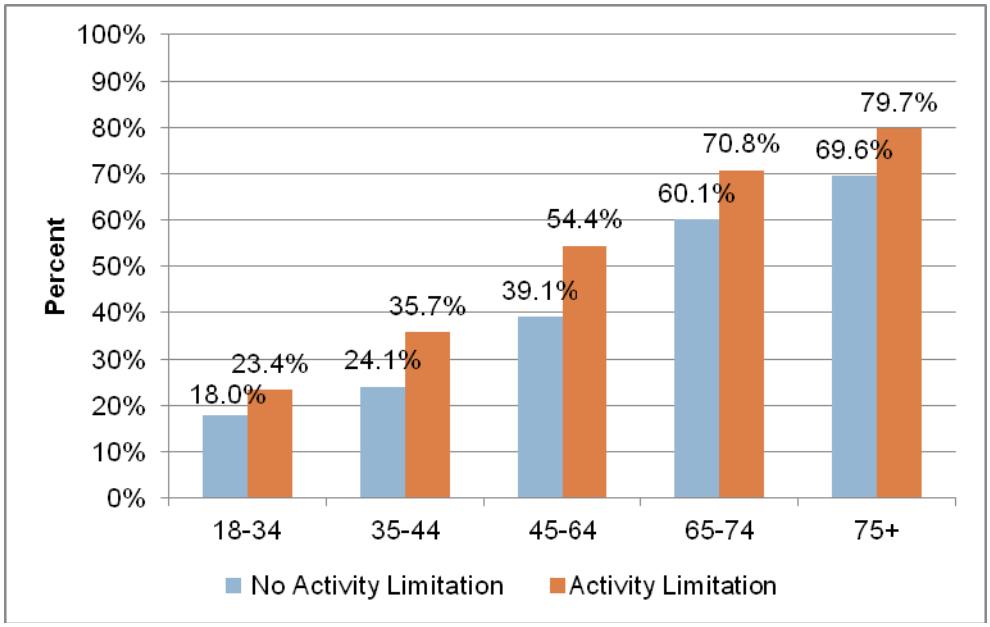
The oral health problems of people with disabilities are complex. These problems may be due to underlying congenital anomalies as well as to an inability to receive the personal and professional health care needed to maintain oral health. More than 54.4 million persons are defined as disabled under the Americans with Disabilities Act, including 5.4 million children younger than 15 years of age and 18.1 million adults aged 65 and older.[35]

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; yet, overall, their caries rates are higher than those of people without disabilities.[36]

One type of disability measure is activity limitation defined as being limited in any way in any activities because of physical, mental, or emotional problems. The prevalence of any tooth loss increased with age for adults with and without activity limitation. The prevalence of any tooth loss was consistently higher among adults who reported activity limitation within every age group (Figure 14).

FIGURE 14: ANY TOOTH LOSS IN ADULTS AGED 18+ BY AGE AND ACTIVITY LIMITATION — COLORADO, 2010



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

ORAL HEALTH DISPARITIES ASSOCIATED WITH RACE AND SOCIOECONOMIC FACTORS

In general, gains in oral health status have not been evenly distributed across all racial and ethnic groups in the U.S. population:

- White, non-Hispanic adults tend to experience fewer dental caries, receive needed treatment for it, and have less extensive tooth loss.
- Black adults are more likely than other racial/ethnic groups to have gum disease.
- Compared with Whites, Blacks are more likely to develop oral or pharyngeal cancer, are less likely to have it diagnosed at early stages, and experience a worse 5-year survival rate.

In Colorado, adults who are Black; White, Hispanic; or multiracial had a higher prevalence of tooth loss compared with White, non-Hispanic adults. A greater percentage of White, non-Hispanic adults had visited the dentist within the past year compared to adults of other racial/ethnic backgrounds. A larger percentage of Colorado's White, non-Hispanic population had dental insurance compared with Colorado's adults reporting Hispanic ethnicity. While the annual average age-adjusted incidence of oral cancer among Colorado's Black

and Hispanic populations in 2003–2007 was lower than among the White, non-Hispanic populations, Blacks and Hispanics were less likely to have their cancer detected early compared to White, non-Hispanics. Mortality rates were not statistically different by race/ethnicity.

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 children from low-income families in the United States are more likely to be untreated than caries among those living above the federal poverty level. Nationally, 50 percent of poor children aged 2–11 years have one or more untreated decayed primary teeth, compared with 31 percent of children living in households with income above the federal poverty level.[37] In the United States, poor adolescents aged 12–17 years in each racial/ethnic group have a higher percentage of untreated decay in their permanent teeth than does the corresponding non-poor adolescent group.

The national pattern is similar in adults, with the proportion of untreated decayed teeth being higher among the poor than the non-poor. At every age, a higher proportion of U.S. residents at the lowest income level than at the higher income levels have periodontitis. Adults with some college (15%) have 2 to 2.5 times less destructive periodontal disease than do adults with high school (28%) or with less than high school (35%) levels of education.[38] Overall, a higher percentage of Americans living below the poverty level are edentulous (have lost all their natural teeth) than are those living above the poverty level.[39] Among persons aged 65 years and older, 39 percent of persons with less than a high school education were edentulous in 1997, compared with 13 percent of persons with at least some college.[40] People living in rural areas could potentially have a higher disease burden because of difficulties in accessing preventive and treatment services.

In Colorado, oral health disparities related to socioeconomic characteristics exist for children and adults. As mentioned previously, a higher proportion of children in elementary schools where 75 percent or more of the students receive free or reduced price meals had both caries experience and untreated decay compared with children in elementary schools where less than 25 percent or 25–49.9% of the students receive free or reduced lunch. Children aged 1–14 years in Colorado whose household income was at or below 250% FPL had a higher prevalence of teeth in fair or poor condition. Also, a larger proportion of these children went without needed dental care, in comparison to children in households with higher income. A larger proportion of Colorado adults aged 18 years and older had tooth loss, if their household income was at or below 250% FPL, compared with adults with higher household income.

VI. INDIVIDUAL BEHAVIORS THAT SUPPORT GOOD ORAL HEALTH

a. Use of Dental Services

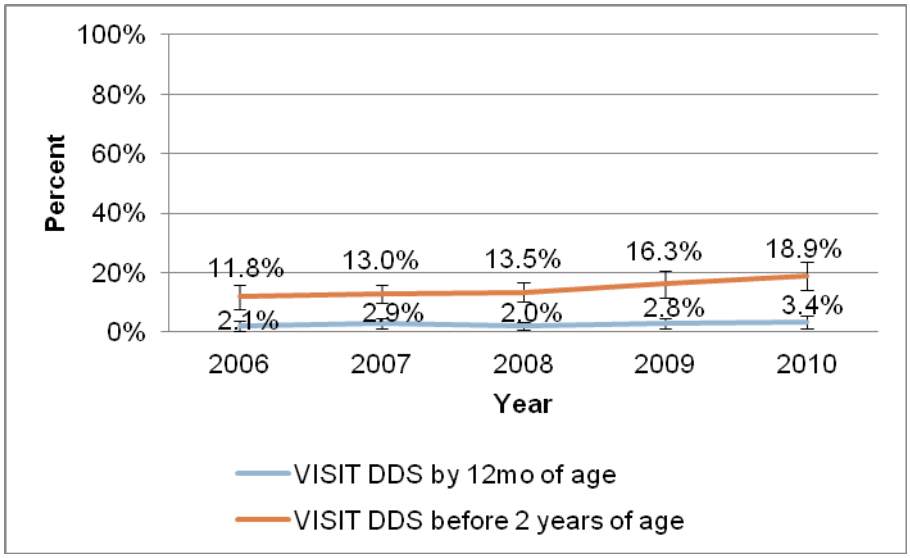
PREVENTIVE VISITS

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 (e.g., healthful diet and not smoking) play an important role in preventing oral diseases. Regular preventive dental care can reduce the development of disease and facilitate early diagnosis and treatment.

Children

To promote good oral health practices, as well as to check for tooth decay and other problems, the American Dental Association recommends that children visit the dentist as soon as they get their first tooth, with at least one dental visit before 12 months of age. In Colorado, the prevalence of children aged 1–5 years having gone to the dentist by 12 months of age is low, just over 3 percent in 2010, and has not changed significantly since 2006 (Figure 15). Expanding to children aged 2–6 years reveals slightly higher prevalence in having first visited the dentist before 2 years of age. The change in prevalence from 2006 to 2010 was not statistically significant.

FIGURE 15: CHILDREN AGED 1–5 YEARS WHO HAD FIRST VISITED THE DENTIST BY AGE 1 YEAR AND CHILDREN AGED 2–6 YEARS WHO HAD FIRST VISITED THE DENTIST BY AGE 2 YEARS — COLORADO, 2006–2010

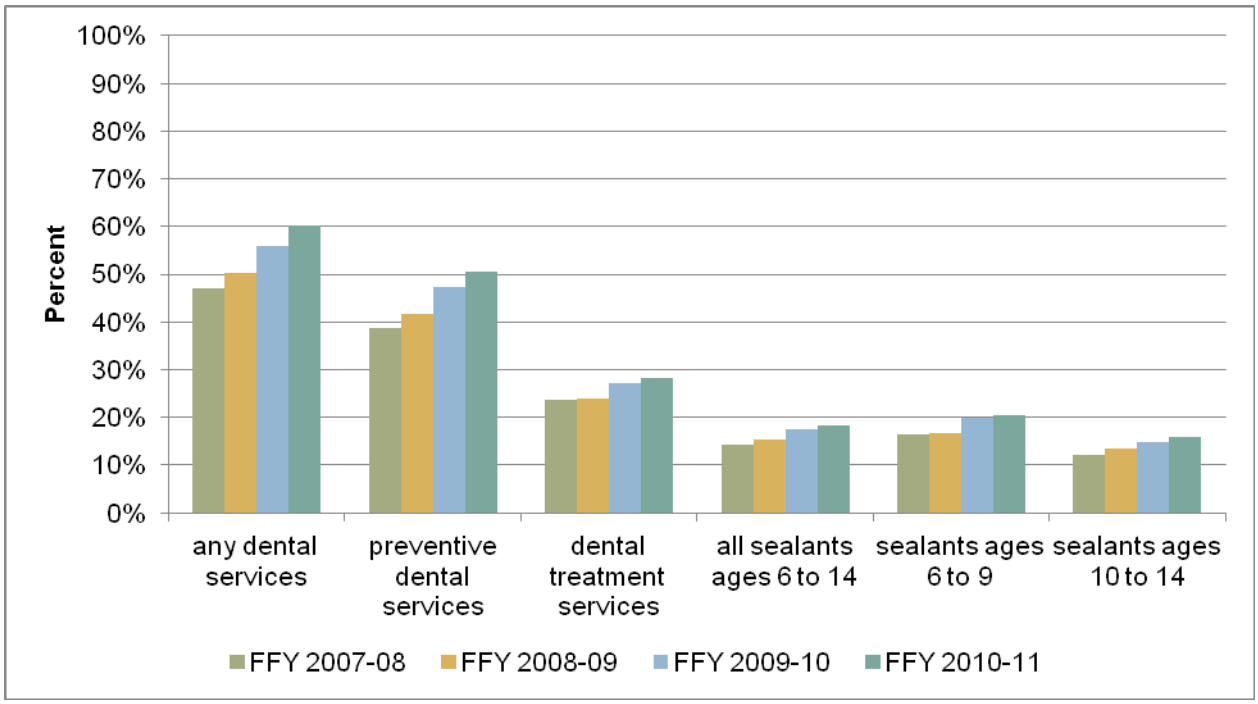


Data source: Child Health Survey, Health Statistics Section, Colorado Department of Public Health and Environment

Overall, 80 percent of children aged 1–14 years were reported to have seen a dentist for preventive care in the past 12 months, according to the 2010 Colorado Child Health Survey. A higher percentage of children in households with income at or above 250% FPL were reported to have seen a dentist for preventive care at least once in the past 12 months (84 percent), compared with 75 percent of children in households with income below 250% FPL and 68 percent of children whose household income was unknown. Children covered by Medicaid or some "other" type of insurance were reported to have seen a dentist for preventive care at least once in the past 12 months more often than children with no coverage. Older children (children who were aged 5–11 or 12–14 years compared with children aged 1–4 years) were more often reported to have seen a dentist for preventive care at least once in the past 12 months. In 2010, parents who visited a dentist in the last 2 years were almost twice as likely to take their children to the dentist by the age of 3 years compared with parents who visited a dentist less frequently (odds ratio (OR)=1.7; 95% confidence interval: 1.2–2.5).

The Early Periodic Screening, Diagnosis, and Treatment (EPSDT) Program is the child health component of Medicaid designed to meet the needs of low-income children. Dental 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.[41] In Colorado, during federal fiscal year 2010-11, an estimated 361,131 individuals aged 0–20 years were eligible for EPSDT for at least 90 days. A total of 217,280 eligible children received any dental services from the program during that same year, yielding a rate of utilization of 60.2 percent. About 50 percent of eligible children received preventive dental services from the program. Other dental services were likewise underutilized, but the percent of eligible clients receiving services has been increasing since federal fiscal year 2007-08 (Figure 15).[42]

FIGURE 16: UTILIZATION OF DENTAL SERVICES AMONG EPSDT CLIENTS ELIGIBLE FOR AT LEAST 90 DAYS, COLORADO, FEDERAL FISCAL YEARS 2007–2008 THROUGH 2010–2011



Data source: Colorado Department of Health Care Policy and Financing (HCPF)

Adults

Many adults suffer from unmet dental needs and may not understand that good oral health is essential to general health and well-being. Adults who do not receive regular professional care can develop oral diseases that eventually require complex treatment and may lead to tooth loss and health problems. People who have lost all their natural teeth are less likely to seek periodic dental care than those with teeth, which, in turn, decreases the likelihood of early detection of oral cancer or soft tissue lesions from medications, medical conditions, tobacco use, and poor-fitting or poorly maintained dentures.

Colorado is slightly below the national median prevalence of adults who have visited the dentist or dental clinic within the past year for any reason (Table 6). Females reported visiting a dental clinic in the past year

more often than males and White, non-Hispanics reported visiting the dentist within the past year more often than persons of any other race/ethnicity. Higher levels of education and household income were also associated with higher reporting of visiting the dentist in the past year.

TABLE 6: VISITED THE DENTIST OR DENTAL CLINIC WITHIN THE PAST YEAR FOR ANY REASON AMONG ADULTS AGED 18+, COLORADO AND THE UNITED STATES, 2010

	Visited dentist or dental clinic w/in past year for any reason (%)	
	Aged 18+ Years	
	U.S. and DC	Colorado
***Healthy People 2020* Target**	49.0*	
TOTAL	69.9	68.0
Age (years)		
18-24	71.8	64.8
25-34	65.6	58.7
35-44	72.0	68.7
45-54	72.2	70.5
55-64	73.7	73.7
65+	69.1	73.2
65-74	--	--
75+	--	--
Race or Ethnicity		
White, non-Hispanic	73.0	71.8
Black, non-Hispanic	62.3	DSU
Hispanic (all races)	61.9	59.4
Other	69.2	55.0
MultiRacial	64.5	DSU
Sex		
Female	72.4	70.4
Male	68.0	65.7
Education Level		
Less than high school	48.1	44.3
High school graduate or GED	62.2	59.6
At least some college	70.6	65.0
College graduate	82.7	79.6
Income Level		
Less than $15,000	46.3	43.5
$15,000-24,999	52.4	46.5
$25,000-34,999	62.7	54.5
$35,000-44,999	70.2	66.0
$50,000+	83.3	79.2

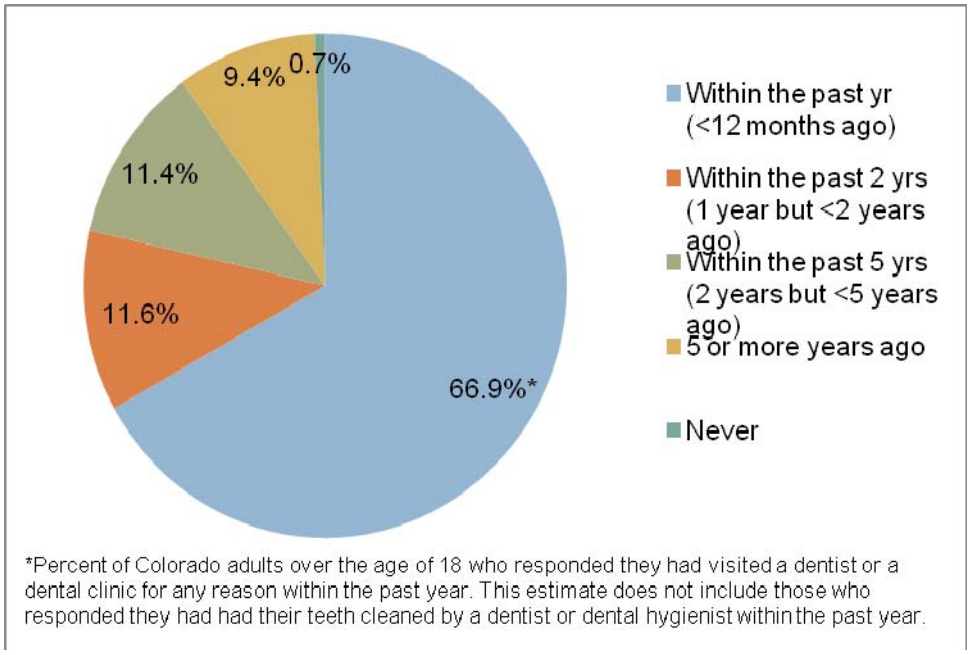
Data source: Behavioral Risk Factor Surveillance System, Centers for Disease Control and Prevention

*The *Healthy People 2020* objective OH-7 is to "increase the proportion of children, adolescents, and adults who used the oral health care system in the past 12 months" and the corresponding target is 49.0 percent for all age groups. Measures not directly comparable to *Healthy People 2020* target as data reported are for adults aged 18+ years only.

DSU = data statistically unreliable

In 2010, one-third (33 percent) of Colorado adults aged 18 years or older reported that they had not visited the dentist or dental clinic in the previous year, 10 percent reported they hadn't visited a dentist or dental clinic in the past five years, and less than 1 percent indicated they had never visited a dentist or dental clinic (Figure 17). A smaller percentage of adults living within 250% of federal poverty level reported having been to the dentist within the past year compared with those living above 250% of federal poverty level (50 percent compared with 76 percent, respectively). Fewer Blacks and Hispanics reported visiting a dentist in the past year compared with Whites (56 and 57 percent compared with 71 percent, respectively). A smaller percentage of adults aged 18–34 years reported having been to the dentist in the past year compared with older age groups (60 percent compared with 68–74 percent, respectively). A greater percentage of females visited the dentist within the past year (70 percent compared with 64 percent of males), as did a greater percentage of Colorado's urban population (69 percent compared with 58 percent of Colorado's rural population). Fewer current smokers visited the dentist within the past year compared with Coloradans who never smoked or had quit (48 percent and 71 percent, respectively). Colorado adults diagnosed with diabetes did not report visiting the dentist in the past year more than those without diabetes. Eighty percent of adults with dental insurance visited the dentist in the past year, but only 51 percent of those without dental insurance did so. When asked about visits to both dental and health care providers in the past year, more adults who accessed dental care reported having also had a routine check-up by a health care provider compared to adults who had not been in to the dentist in over a year or had never been to the dentist. Among adults who reported they had never seen a health care provider for a routine check-up, 87 percent said they had seen a dental provider, with almost half reporting having seen a dental provider within the last year.

FIGURE 17: TIME SINCE LAST VISIT TO THE DENTIST OR DENTAL CLINIC FOR ANY REASON AMONG ADULTS AGED 18+, COLORADO, 2010



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

Pregnant Women

The Colorado Pregnancy Risk Assessment Monitoring System surveys women who had a recent live birth. In 2010, this survey indicated that 55 percent of women had their teeth cleaned in the 12 months before pregnancy. About 39 percent of women on Medicaid reported having their teeth cleaned in the 12 months before pregnancy compared with 63 percent of women who were not on Medicaid. Looking at dental care seeking behaviors during pregnancy, 45 percent of Colorado women reported visiting a dentist or dental clinic during their most recent pregnancy. Less than one third of women on Medicaid (32 percent) and just over half of women not on Medicaid (52 percent) reported visiting a dentist during their most recent pregnancy.

VII. ENVIRONMENT AND SYSTEMS THAT SUPPORT GOOD ORAL HEALTH

a. Community Water Fluoridation

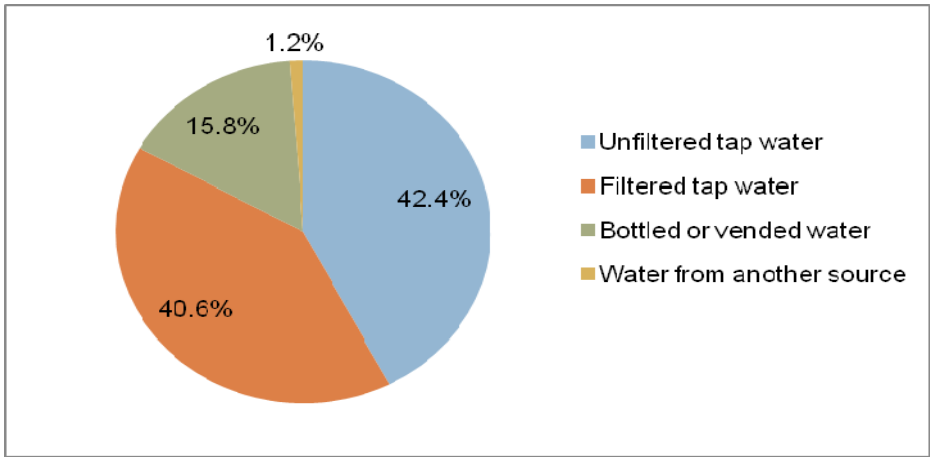
Community water fluoridation is the process of adjusting the natural fluoride concentration of a community's water supply to a level that is best for the prevention of dental caries. In the United States, community water fluoridation has been the basis for the primary prevention of dental caries for over 65 years and has been recognized as one of 10 great achievements in public health of the 20th century.[43] It is an ideal public health method because it is effective, proven to be safe, inexpensive, requires no behavior change by individuals, and does not depend on access or availability of professional dental 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.[44]

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." Overall, 72.4 percent of Colorado's population was receiving water that has been optimally fluoridated for the prevention of tooth decay, according to data from Colorado's Water Fluoridation Reporting System (WFRS), as of December 2012.

Not only does community water fluoridation effectively prevent dental caries, it is one of very few public health prevention measures that offers significant cost savings to almost all communities.[45] It has been estimated that about every $1 invested in community water fluoridation saves approximately $38 in averted costs, that is, treatment savings achieved through averted tooth decay. The cost per person of instituting and maintaining a water fluoridation program in a community decreases with increasing population size. In Colorado, a cost savings study found that existing community water fluoridation systems saved $149.8 million in 2003 and an additional $46.6 million could be saved annually if fluoridation programs were implemented in other water systems.[46] Community water fluoridation reduces decay by approximately 25%, regardless of other sources of fluoride.[47] As a result of the public health success of community water fluoridation, it is important to know the proportion of Coloradans whose water source is a community system and whether or not they drink water from it. In Colorado, 88 percent of the adult population reported their main source of water came from city, county or town water systems, according to 2009 BRFSS. About 71 percent of Colorado adults living in rural areas reported their main source of water was a community system, compared with 91 percent of urban adults.

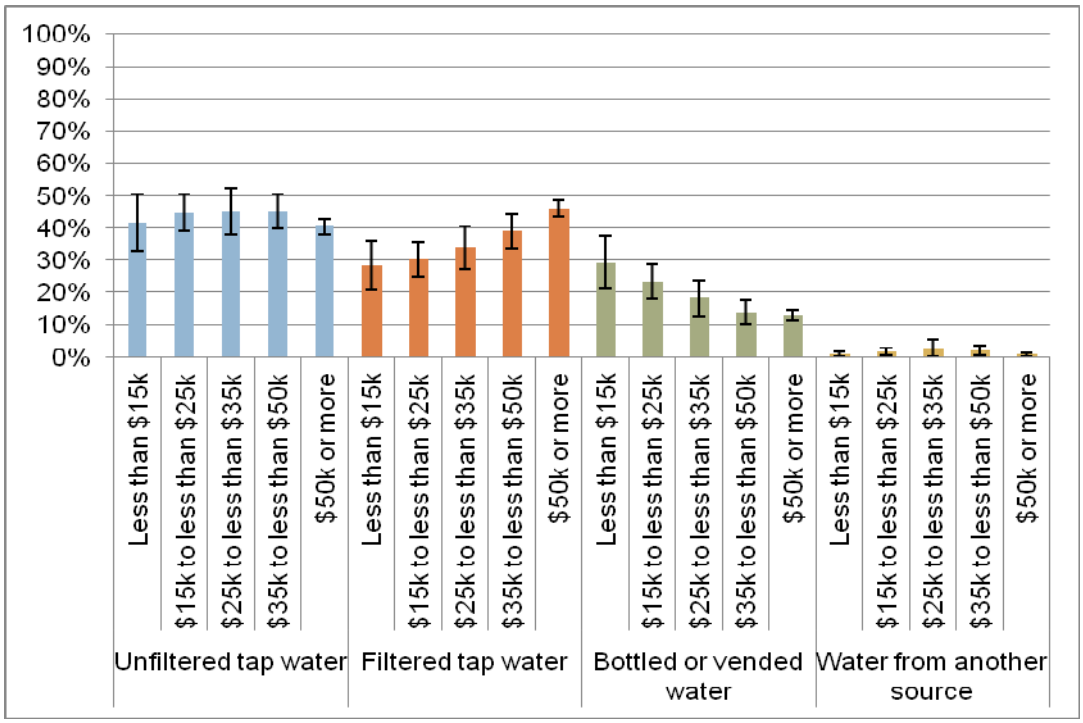
In addition to knowing the population served by fluoridated community water systems in Colorado, it is important to know the source of the water that people actually drink. In 2009, 83 percent of Coloradans aged 18 years and older consumed tap water, either filtered or unfiltered, as their main source of at-home drinking water, according to the Colorado BRFSS (Figure 18). A larger percentage of older adults reported drinking unfiltered tap water, compared to younger adults. A larger percentage of younger adults reported drinking filtered tap water, bottled or vended water, compared to older adults. The 42 percent of Coloradans drinking unfiltered tap water as their main source of drinking water at home did not vary much for subgroups defined by their household income level. A larger percentage of higher-income households reported drinking filtered water, and a larger percentage of lower-income households reported drinking bottled or vended water (Figure 19). A larger percentage of White, non-Hispanic adults in Colorado reported drinking filtered tap water than Hispanic Coloradans, However, a larger percentage of Hispanic adults reported drinking bottled or vended water than White, non-Hispanic adults, the two largest subpopulations for which there are reliable estimates. There was no significant difference in drinking water source by rural/urban geography.

FIGURE 18: MAIN SOURCE OF AT-HOME DRINKING WATER, COLORADO, 2009



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

FIGURE 19: MAIN SOURCE OF AT-HOME DRINKING WATER BY INCOME, COLORADO, 2009



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

b. Access to Dental Services

Those least likely to receive preventive and restorative dental services are often the most vulnerable populations, such as the low income, the least educated, racial and ethnic minorities, immigrants, the elderly, persons with HIV, the developmentally and medically disabled, and the uninsured. Access barriers include lack of dental insurance and limited availability of dental providers accepting publicly funded programs, as well as lack of knowledge about the importance of oral health as it relates to general health and well-being.

DENTAL INSURANCE

In Colorado, the 2010 BRFSS asked about dental insurance coverage; 39 percent of adults did not have dental insurance. Similar estimates were obtained through two telephone surveys of randomly selected households in Colorado. The 2008-09 Colorado Household Survey (COHS), administered from November 2008 to March 2009, estimated 38.5 percent of adults aged 18 years and older were without dental insurance. The 2011 Colorado Health Access Survey (CHAS), administered from May to August 2011, found an even higher 43.9 percent of adults estimated to be without dental coverage. These same surveys found that dental insurance coverage among Colorado children aged 0-18 years was slightly better, with an estimated 25.6 percent of children without coverage according to data from the 2008-2009 COHS and 22.1 percent according to the CHAS.[48] (Based on the Colorado Child Health Survey, 8 percent of parents reported in 2010 that their child did not have a regular source of dental care.) According to the Colorado BRFSS, the prevalence of dental insurance was lowest among adults aged older than 65 years, Hispanics, and adults with the lowest levels of education and income (Table 7).

TABLE 7: DENTAL INSURANCE AMONG ADULTS AGED 18 YEARS AND OLDER — COLORADO, 2010

TOTAL	60.8
Age (years)	
18-34	58.6
35-44	69.9
45-64	64.4
65-74	41.7
75+	27.5
Race or Ethnicity	
White, non-Hispanic	62.4
Black, non-Hispanic	61.3
Hispanic (all races)	50.4
Other	61.2
Multiracial	62.8
Sex	
Female	60.6
Male	61.0
Education Level	
Less than high school	37.4
High school graduate or GED	52.4
At least some college	58.2
College graduate	69.1
Income Level	
Less than $15,000	21.4
$15,000-24,999	24.8
$25,000-34,999	44.2
$35,000-44,999	57.9
$50,000+	77.5
Residency	
Urban	63.4
Rural	45.7

Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

DENTAL MEDICAID AND CHP+

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. Nationally, projected federal expenditures for Medicaid totaled $8.7 billion in 2012, or 7.8 percent of the $111.4 billion spent on dental services nationally.[49]

During federal fiscal year 2009-2010, an estimated 422,754 children were eligible for Medicaid and 65,417 children were enrolled in CHP+.[50] Fifty-five of Colorado's 64 counties had a licensed dentist and 47 counties had an actively enrolled Medicaid dental provider at least one day during the year. Colorado had a total of 3,611 licensed dentists and 1,540 dental providers were actively enrolled as Medicaid providers. During the same time, a total of 1,000 active, Medicaid-enrolled dentists had at least one paid claim, with 690 of these provider claims totaling greater than $10,000.[51] Surveys of dentists in the state indicate that the top reasons for not accepting Medicaid are that reimbursements are too low, there are too many no-shows and the paperwork is too time-consuming.[52]

c. Dental Workforce and Capacity

DENTAL WORKFORCE

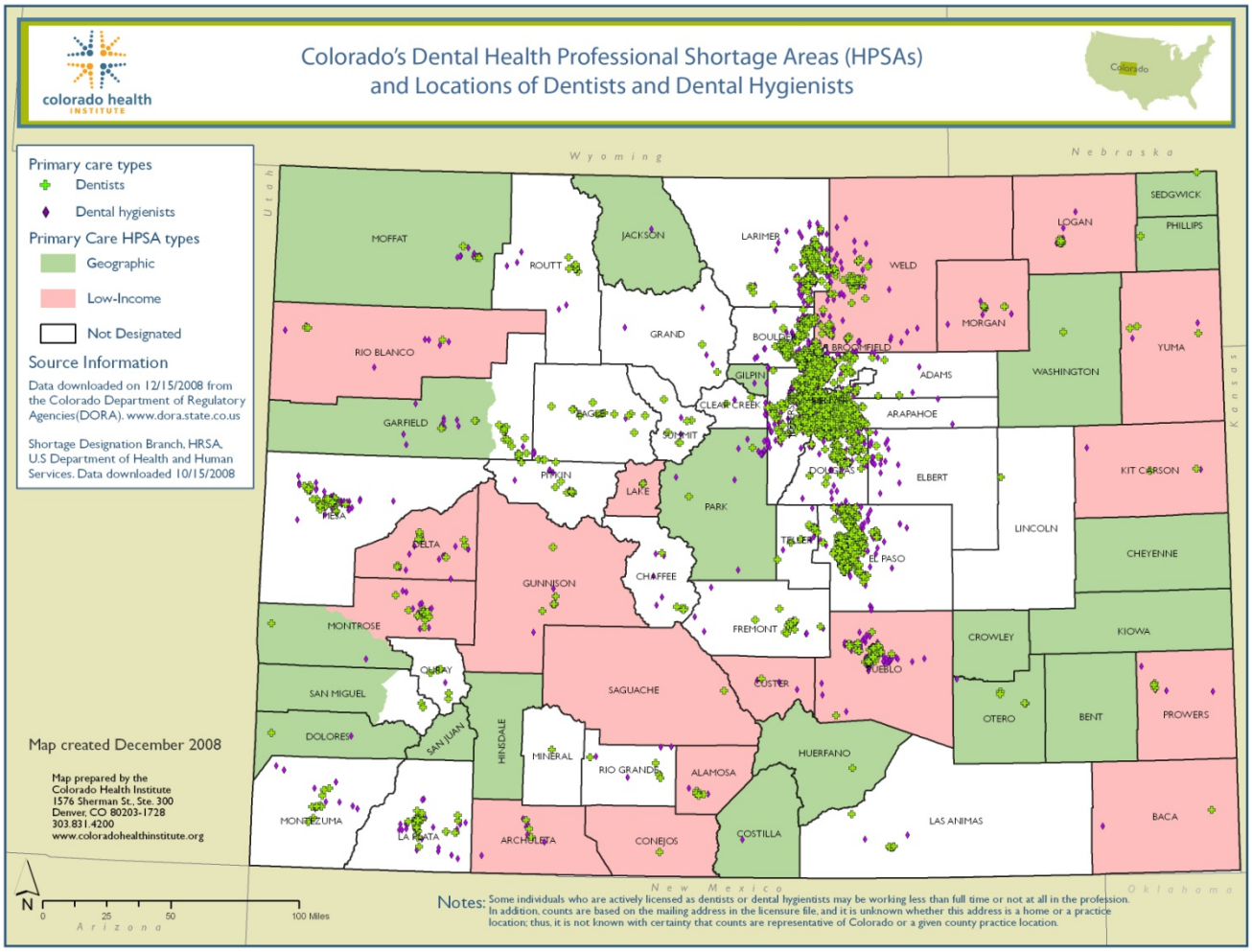
Dentists and dental hygienists are licensed to provide oral health care in Colorado. Dentists are licensed professionals who specialize in the diagnosis, treatment and prevention of oral disease. They are authorized to prescribe drugs, administer anesthetics and perform surgeries relating to the proper practice of dentistry.

The role of dental hygienists is to deliver preventive, educational and clinical services supporting the prevention and control of oral disease. In Colorado, dental hygienists may practice without the supervision of a dentist, thought it is not clear how widespread unsupervised practice is. Unsupervised licensed dental hygienists in Colorado may administer prophylaxis, topical anesthesia, fluoride, pit/fissure sealants and place perio-dressings. Dental hygienists are not permitted to diagnose patients but may identify dental abnormalities for immediate referral to a dentist.

Colorado's oral health workforce comprises 3,570 active licensed dentists and nearly as many active licensed dental hygienists (3,270) (Figure 19).[53] Additionally, 6,062 dental assistants are employed in the state. This workforce is concentrated in the urban counties (Figure 20). Between 2010 and 2020, employment is anticipated to grow by 12 percent for dentists and by more than 30 percent for dental hygienists and dental assistants.[54]

In addition to the oral health workforce, primary care providers such as pediatricians, family physicians, physician assistants and nurse practitioners increasingly are receiving training to conduct routine oral health exams and assessments during well-child visits and apply fluoride varnish to prevent cavities in high-risk children.

FIGURE 20: DENTAL HEALTH PROFESSIONAL SHORTAGE AREAS AND LOCATIONS OF DENTISTS AND DENTAL HYGIENISTS, COLORADO, 2008



Data source: Collaborative Scopes of Care Advisory Committee. Final report of findings. 2008. Available at: http://www.coloradotrust.org/attachments/0000/9371/CollaborativeScopesCare_final_report.pdf

DENTAL WORKFORCE EDUCATION

Colorado has one dental school that enrolls 80 students annually.[55] Traditionally, Colorado has depended on dentists migrating into the state to supply its dental health workforce since the University of Colorado School of Dental Medicine supplies only one-quarter of the new dentists entering practice in the state annually.[56] Colorado has four dental hygiene programs that collectively accept 116 students each year.[57]

DENTAL WORKFORCE DIVERSITY

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 care workforce.

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.[58] Data on the race/ethnicity of dental care providers were derived from surveys of professionally active dentists conducted by the American Dental Association.[59] 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.

Surveys of Colorado's oral health providers indicate that dentists are largely male (79% male in urban areas and 88% male in rural areas) and White (85% and 90% in urban and rural areas, respectively). Three percent of urban dentists and 7 percent of rural dentists were Hispanic, although nearly 20 percent of the state's population is Hispanic. In contrast to dentists, nearly all dental hygienists (99%) are female.[60] Approximately 4 percent of dental hygienists were Hispanic.[61]

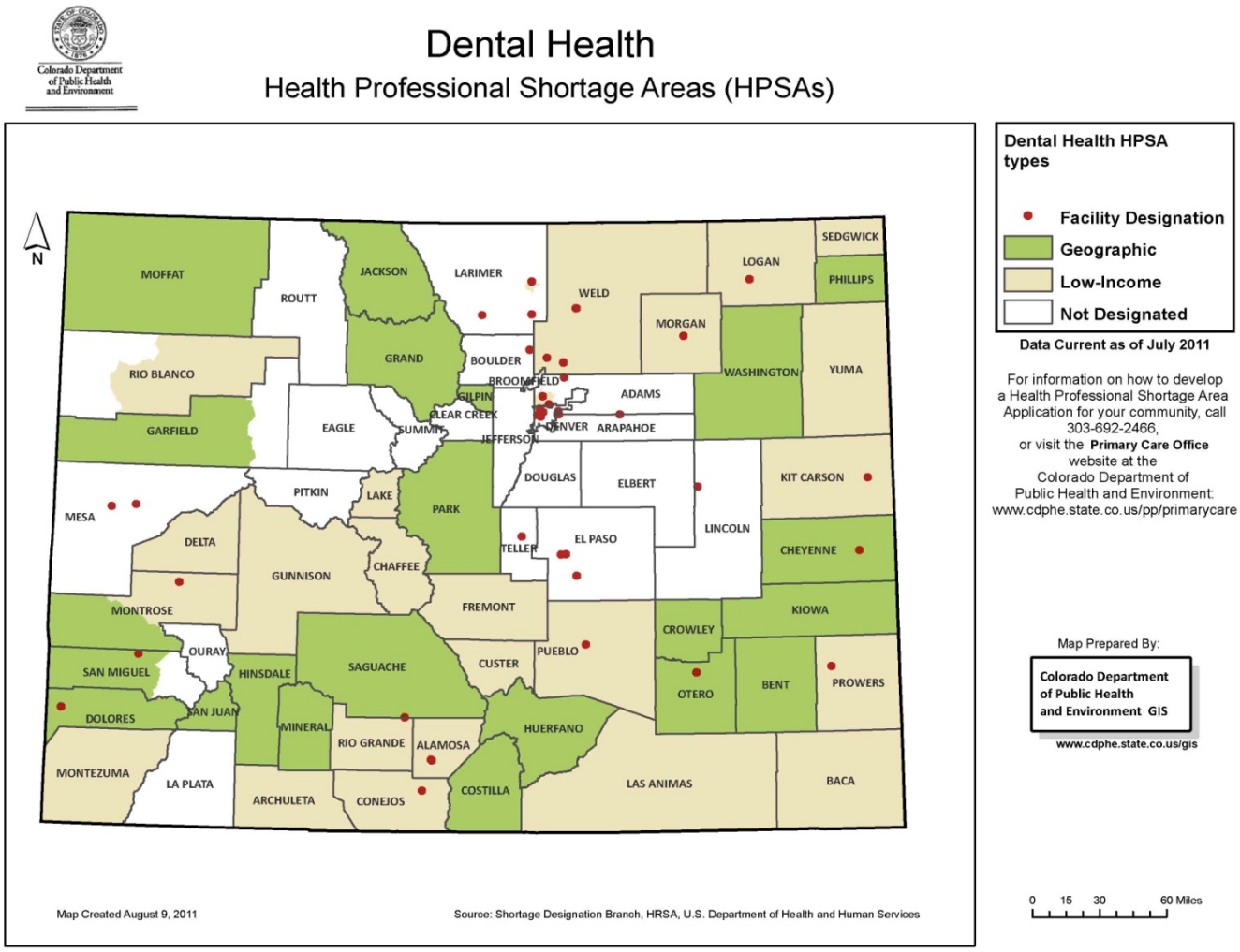
Data from the urban and rural dentist surveys support the idea that dentists are more likely to practice in a location similar to the place where they grew up. Few dentists practicing in urban locations (23%) grew up in a rural area; most (77%) grew up in an urban or suburban area. Conversely, more than half (53%) of rural dentists grew up in a rural area, while fewer than half (47%) grew up in an urban or suburban area. These findings suggest that recruitment programs designed to address dentist shortages in particular geographic areas may be more successful when targeting dentists who grew up in a similar setting. Of dental hygienists, 19 percent who grew up in a rural community reported practicing in a rural area.

HEALTH PROFESSIONAL SHORTAGE AREAS

The Colorado Primary Care Office collaborates with the federal Division of Shortage Designation to designate counties and/or specific census tracts as dental Health Professional Shortage Areas (HPSAs). For an area to be designated, one of the following criteria must be met: 1) a dentist-to-population ratio of 1:5,000 or greater for a geographic area; or 2) a dentist-to-population ratio of 1:4,000 or greater in areas where more than 20 percent of the population has incomes at or below 100 percent of the federal poverty level, more than half the population has no fluoridated water, or where greater than 20 percent of the population is at or below 200 percent of the federal poverty level.

Forty-seven service areas in Colorado have a dental HPSA designation (Figure 21).[62] Geographic designations look at all residents in the service area, while low-income designations look at residents below 200 percent of the federal poverty level.

FIGURE 21: HEALTH PROFESSIONAL SHORTAGE AREAS, COLORADO, 2011



Data source: Primary Care Office, Colorado Department of Public Health and Environment

THE COLORADO HEALTH SERVICE CORPS

The Colorado Health Service Corps is a state/federal/private partnership that seeks to improve access to health care professionals in underserved Colorado communities by repaying the educational loans of dentists and dental hygienists who agree to practice in dental HPSAs.

Participants receive loan repayment of up to $35,000 per year for dentists and up to $7,500 per year for dental hygienists in return for practicing full time in a public or nonprofit clinic. The commitment lasts for three years, which is designed to entice providers to remain in these underserved communities after they have met their service requirement.[63]

OTHER COMMUNITY ORAL HEALTH RESOURCES

Community Health Centers

Community health centers, also known as federally qualified health centers (FQHCs), provide a substantial

portion of primary systemic, oral and behavioral health care services to low-income and uninsured Colorado residents. By federal mandate, FQHCs must be located in urban and rural areas designated by the federal government as medically underserved areas (MUAs), medically underserved populations (MUPs) or HPSAs to receive federal grants and cost-based reimbursement. If FQHCs do not provide the full range of basic primary health services, they are required to arrange for such care through other local partners. Of Colorado's 15 FQHCs, 14 operate a total of 43 dental clinic sites around the state.[64]

Community-Funded Safety Net Clinics and Rural Health Clinics

Community-funded safety net clinics (CSNCs) and some rural health clinics (RHCs) may also provide access to oral health care. CSNCs include faith-based clinics and those staffed by volunteer clinicians or family practice residents that offer free or low-cost/sliding-fee primary care services to low-income, uninsured families and individuals. CSNCs and RHCs are affiliated with a statewide membership organization known as ClinicNET. ClinicNET currently lists 25 affiliated community-funded safety net clinics and 45 rural health centers throughout the state.[65] Many of these organizations operate multiple clinical sites or programs.

The availability of oral health care varies by CSNC. While some oral health clinics provide a full complement of diagnostic, preventive and restorative services within an integrated care setting, others rely primarily on partnerships with other community providers to which they refer children for oral health care. For example, very few RHCs offer on-site oral health services; they do, however, refer patients with oral health care needs to community dentists and other oral health providers.

Because CSNCs are not federally supported clinics, they do not have access to the same cost-based reimbursement and federal grant funding as FQHCs.[66] They rely on other sources of revenue, including Medicaid, CHP+ and Colorado Indigent Care Program reimbursement from the state, patient fees, private donations and foundation grants.

In addition to the nonprofit programs, the oral health safety net includes private dentists who provide charity care or discounted services to low-income patients. Programs such as the Old Age Pension Dental Assistance Program, administered by the health department, and the Delta Dental of Colorado Fund enlist a variety of dental providers to provide oral health care to low-income patients.

Colorado School-Based Health Centers

School-based health centers (SBHCs) are clinics operated within a public school, charter school or state-sanctioned General Educational Development (GED) building. They provide primary and mental health services, with some also offering expanded behavioral and oral health services. Most SBHCs are located in schools with a high concentration of low-income children. SBHCs receive federal, state and local funding and in-kind contributions in addition to limited patient revenues. School-based dental sealant programs are a leading evidence-based intervention (for high risk children) and can prevent more than 70 percent of tooth decay in the treated teeth.[67] Correspondingly, increasing the proportion of SBHCs with an oral health component is a Healthy People 2020 oral health objective. The goal is to increase by 10 percent the number of SBHCs that provide an oral health component that includes dental sealants, dental care, and/or topical fluoride. For Colorado, this goal means an additional two of the existing centers would need to add this component.

In the 2009-10 school year, oral health providers supplied 2,865 visits in SBHCs supported through the School-Based Health Center Program at CDPHE.

d. Preventive Services and Health Promotion

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.[68] For communities that do not receive fluoridated water and persons at high risk of dental caries, additional fluoride methods for the individual or community might be needed. Examples of such community methods include fluoride mouth rinse or tablet programs, which typically are conducted in schools. Individual methods include professionally applied topical fluoride gels or varnish for persons at high risk of caries.

In Colorado during federal fiscal year 2009-2010, a total of 394 providers billed for fluoride varnish according to the Health Resources and Services Administration (HRSA) paid claims. Forty-one of Colorado's 64 counties reported at least one fluoride varnish claim, with the vast majority of those claims (81 percent) coming from 15 urban counties, where 86 percent of Colorado's population resided in 2009.[69]

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. Decay among school-aged children can still occur 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.[70]

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 is 28.1 percent for children ages 6 to 9 years and 21.9 percent for adolescents ages 13 to 15 years. The most recent estimates of the proportion of third-grade children with dental sealants on one or more molars are presented above. (See section entitled *Oral Health in Kindergarten and 3rd Grade Children*).

The *Be Smart and Seal Them* school sealant program has continued to grow, increasing the number of participating *eligible* schools from 120 out of 390 schools in 2006-2007 (31% participation rate) to 230 out of 459 schools in the 2010-2011 school year (50% participation rate). Eligible schools are defined as schools with fifty percent or more participation in the free and reduced lunch program.

In the 2010-2011 school year, ten state sealant programs served 230 schools in Colorado. The program targets schools where over half of the students are on the free or reduced lunch program, as these are generally high-risk children who lack access to care. During 2010-2011, children in these low income schools accounted for 88.1% of all children served by the program. In total, 5,443 children were screened and 3,806 children (69.9%) received at least one sealant. On average, these children who received sealants had three teeth sealed. The estimated cost per tooth sealed was $46.81. Through the efforts of the state sealant programs, an estimated 2,169 cavities were averted, resulting in a $169 per cavity averted cost savings.

TOBACCO USE PREVENTION AND CESSATION

Tobacco use has a devastating effect on the health and well-being of the public. More than 443,000 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.[71] 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.[72] The evidence is sufficient to consider smoking a causal factor for adult periodontitis;[73] one-half of the cases of periodontal disease in this country may be attributable to cigarette smoking.[74] 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.[75, 76]

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

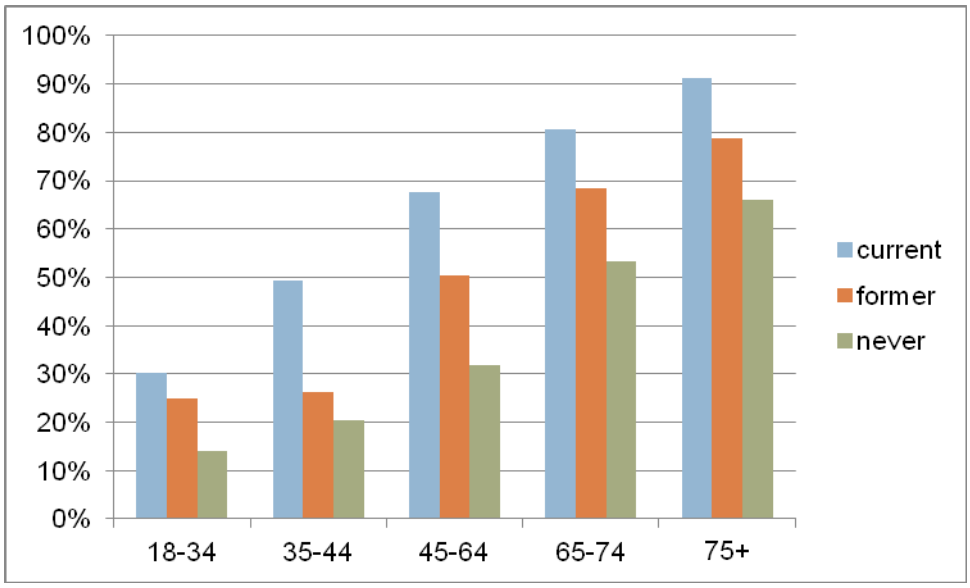
- preventing the initiation of tobacco use among young people;
- promoting quitting among young people and adults;
- eliminating nonsmokers' exposure to secondhand tobacco smoke; and,
- identifying and eliminating the disparities related to tobacco use and its effects among different population groups.

The dental office provides an excellent venue for providing tobacco intervention services. More than one-half of adult smokers see a dentist each year.[77] 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.[78] 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.

In 2010, an estimated 16.0 percent of Colorado adults 18 years and older were current smokers, according to the Colorado BRFSS. According to the 2009 Youth Risk Behavior Survey, the prevalence of smoking among adolescents (9th through 12th graders) was 17.7 percent. Tobacco users are at increased risk for poor oral health outcomes. Tooth loss was more prevalent in Colorado adults who are current smokers (49.9 percent) compared to Coloradan adults who had never smoked (26.2 percent). The prevalence of tooth loss in former smokers (48.1 percent) was also significantly higher than for never-smokers. Colorado adults who are current

smokers had significantly more tooth loss compared to never-smokers across all age groups (Figure 22). In addition, 47.6 percent of current smokers reported visiting the dentist in the past year, significantly less frequently than both former smokers and those who had never smoked (70.5 and 70.6 percent, respectively).

FIGURE 22: ANY TOOTH LOSS IN ADULTS AGED 18+ BY AGE AND SMOKING STATUS, COLORADO, 2010



Data source: Behavioral Risk Factor Surveillance System, Health Statistics Section, Colorado Department of Public Health and Environment

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.[79] 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 the 2010 Colorado Child Health Survey, support of schools providing oral health or dental care education remained high in Colorado. In 2010, 95 percent of the parents supported such education in schools.

Statewide, coordinated efforts are being made to improve access to oral health education and services throughout the state.

VIII. REFERENCES

[1] U.S. Department of Health and Human Services. 2000. Oral Health in America: A Report of the Surgeon General. Rockville, MD: National Institute of Dental and Craniofacial Research. Available at: http://www.nidcr.nih.gov/AboutNIDCR/SurgeonGeneral/default.htm.

[2] U.S. Department of Health and Human Services. *National Call to Action to Promote Oral Health*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Dental and Craniofacial Research; 2003. NIH Publication No. 03-5303.

[3] See endnote 2.

[4] Data from U.S. Census Bureau. Available at: http://quickfacts.census.gov/qfd/states/08000.html.

[5] Data from U.S. Census Bureau. Available at: http://2010.census.gov/2010census/data/embedstate.html?state=**CO**.

[6] See endnote 4.

[7] Data from U.S. Census Bureau. Available at: http://2010.census.gov/2010census/data/embedstate.html.

[8]Data from U.S. Census Bureau, 2010 American Community Survey (ACS) 1-year Public Use Microdata Sample (PUMS) dataset. Available at: http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t.

[9] Dye BA, Tan S, Smith V, et al. Trends in oral health status: United States, 1988–1994 and 1999–2004, Vital Health Stat. 2007 Apr;11(248):1-92.

[10] See endnote 1.

[11] Ries LAG, Eisner MP, Kosary CL, Hankey BF, Miller BA, Clegg L, et al. (Eds). SEER Cancer Statistics Review, 1975–2001, National Cancer Institute: Bethesda, MD; National Cancer Institute; 2004. Available at: http://seer.cancer.gov/csr/1975_2001/.

[12] American Cancer Society. *Cancer Facts and Figure* 2010, Atlanta:2010

[13] See endnote 8.

[14] Colorado Department of Public Health and Environment. Colorado Central Cancer Registry. Cancer in Colorado, 1997-2007: Incidence, Mortality and Survival. 2009. Available at: http://www.cdphe.state.co.us/pp/cccr/1997-2007/index.html.

[15] Blot WJ, McLaughlin JK, Winn DM, Austin DF, Greenberg RS, Preston-Martin S. Smoking and drinking in relation to oral and pharyngeal cancer. *Cancer Res* 1988;48(11):3282–7.

[16] U.S. Department of Health and Human Services. *The Health Consequences of Using Smokeless Tobacco: A Report of the Advisory Committee to the Surgeon General*. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service; 1986. NIH Publication No. 86-2874.

[17] International Agency for Research on Cancer (IARC). IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 89, Smokeless tobacco and some related nitrosamines. Lyon, France: World Health Organization, International Agency for Research on Cancer; 2005 (in preparation).

[18] Shanks TG, Burns DM. Disease consequences of cigar smoking. In: Shopland D, Cigars: Health effects and trends. Smoking and Tobacco Control Monograph 9. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1998.

[19] McLaughlin JK, Gridley G, Block G, et al. Dietary factors in oral and pharyngeal cancer. J Natl Cancer Inst 1988;80(15):1237–43.

[20] De Stefani E, Deneo-Pellegrini H, Mendilaharsu M, Ronco A. Diet and risk of cancer of the upper aerodigestive tract--I. Foods. *Oral Oncol* 1999;35(1):17–21.

[21] Levi F. Cancer prevention: Epidemiology and perspectives. *Eur J Cancer* 1999;35(14):1912–24.

[22] Morse DE, Pendrys DG, Katz RV, et al. Food group intake and the risk of oral epithelial dysplasia in a United States population. *Cancer Causes Control* 2000;11(8):713-20.

[23] Phelan JA. Viruses and neoplastic growth. *Dent Clin North Am* 2003;47(3):533–43.

[24] Herrero R. Chapter 7: Human papillomavirus and cancer of the upper aerodigestive tract. *J Natl Cancer Inst Monogr* 2003; (31):47–51.

[25] Silverman SJ, Jr. *Oral Cancer,* 4th edition. Atlanta, GA: American Cancer Society, 1998.

[26] Ernster JA, Sciotto CG, O'Brien MM, Finch JL, Robinson LJ, Willson T, Mathews M. Rising incidence of oropharyngeal cancer and the role of oncogenic human papilloma virus. Laryngoscope. 2007;117:2115-2128.

[27] Ryerson AB, Peters ES, Coughlin SS, Chen VW, Gillison ML, Reichman ME, et al. Burden of potentially human papillomavirus-associated cancers of the oropharynx and oral cavity in the US, 1998-2003. Cancer. 2008;113(10 suppl):2901-2909.

[28] Pannone G, Santoro A, Papagerakis S, Lo Muzio L, De Rosa G, Bufo P. The role of human papillomavirus in the pathogenesis of head and neck squamous cell carcinoma: an overview. Infectious Agents and Cancer. 2011;6:4.

[29] Redford M. Beyond pregnancy gingivitis: Bringing a new focus to women's oral health. *J Dent Educ* 1993;57(10):742–8.
[30] See endnote 26.
[31] See endnote 1.
[32] Amar S, Chung KM. Influence of hormonal variation on the periodontium in women. *Periodontol 2000*:1994;6:79–87.
[33] Mealey BL. Periodontal implications: medically compromised patients. *Ann Periodontol* 1996;1(1):256–321.
[34] Gaffield ML, Gilbert BJ, Malvitz DM, Romaguera R. Oral health during pregnancy: An analysis of information collected by the pregnancy risk assessment monitoring system. *J Am Dent Assoc* 2001;132(7):1009–16.
[35] Brault MW. *Americans with Disabilities: 2005.* Washington, DC: U.S. Census Bureau; 2008. Current Population Reports: P70-117
[36] See endnote 1.
[37] See endnote 1.
[38] U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. *Healthy People 2010,* 2nd edition. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office; 2000.
[39] See endnote 1.
[40] See endnote 38.
[41] Centers for Medicare & Medicaid Services. National Health Expenditure Projections 2011-2021. Updated Summer 2009. Available at: http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/Proj2011PDF.pdf.
[42] Data from the Colorado Department of Health Care Policy and Financing (HCPF). Adopted from the CMS 416: EPSDT Participation Report. 2011.
[43] Centers for Disease Control and Prevention. Achievements in public health, 1900–1999: Fluoridation of drinking water to prevent dental caries. *MMWR* 1999;48(41):933–40.
[44] See endnote 1.
[45] Griffin SO, Jones K, Tomar SL. An economic evaluation of community water fluoridation. *J Public Health Dent* 2001;61(2):78–86.
[46] O'Connell JM, Brunson D, Anselmo T, Sullivan PW. Costs and savings associated with community water fluoridation programs in Colorado. *Prev Chronic Dis* [serial online] 2005. Available at: http://www.cdc.gov/pcd/issues/2005/nov/05_0082.htm.
[47] Centers for Disease Control and Prevention. Fluoridation Basics. 2012. Available at: http://www.cdc.gov/fluoridation/benefits/background.htm.
[48]Colorado Household Survey. 2008-09. (Colorado Department of Health Care Policy and Financing) and Colorado Health Access Survey. 2011. (The Colorado Trust), Denver, CO. The Colorado Health Institute is responsible for analysis and interpretations of data.
[49] See endnote 41.
[50] Data from Association of State & Territorial Dental Directors (ASTDD) Synopsis Questionnaire. Colorado. 2011.
[51] Data from the Colorado Department of Health Care Policy and Financing (HCPF). Report on Oral Health to the Health Resources and Services Administration (HRSA) FFY 2009-2010.
[52] Colorado Health Institute. The practice of dentistry in Colorado. 2010. Available at: http://www.coloradohealthinstitute.org/~/media/Documents/workforce/2010/UrbanRuralDentist.ashx.
[53] Colorado Department of Regulatory Agencies. Licensee database request: Dentists, Dental hygienists. 2011. Available at: https://www.doradls.state.co.us/lic_database_req.php;

[54] Colorado Department of Labor and Employment. Labor Market Information: Dental assistants. 2010. Available at: http://lmigateway.coworkforce.com/lmigateway/vosnet/drills/occupation/occdrill.aspx?session=occdetail_lms&geo=08010000000&faqq=26.
[55] University of Colorado Anschutz Medical Campus, School of Dental Medicine. 2011. Available at: http://www.ucdenver.edu/academics/colleges/dentalmedicine/ProgramsAdmissions/Pages/ProgramsAdmissions.aspx.
[56] Colorado Health Institute. Oral Health Workforce in Colorado. 2009. Available at: http://www.coloradohealthinstitute.org/Publications/2009/07/Oral-Health-Workforce-in-Colorado-Synthesis-of-survey-findings-and-implications-for-policy.aspx.
[57] Colorado Northwestern Community College. Dental hygiene program, application procedures. 2011. Available at: http://www.cncc.edu/cms/content/dental-hygiene-application-procedure; Community College of Denver. Dental hygiene program, admissions information. 2011. Available at:

http://www.ccd.edu/ccd.nsf/html/WEBB87JNJ5-admissions+information; Pueblo Community College. Dental hygiene program, admissions information. 2011. Available at: http://www.pueblocc.edu/Academics/AreasStudy/HealthProfessions/DentalHygiene/Student_Info/Admission.htm; Career College-Aurora. Personal communication with Admissions Office. November 21, 2011.

[58] See endnote 35.

[59] American Dental Association. *Distribution of Dentists in the United States by Region and State*, 1997. Chicago, IL: American Dental Association Survey Center;1999.

[60] Colorado Health Institute. The practice of dentistry in Colorado. 2010. Available at: http://www.coloradohealthinstitute.org/~/media/Documents/workforce/2010/UrbanRuralDentist.ashx; Colorado Health Institute. Oral Health Workforce in Colorado. 2009. Available at: http://www.coloradohealthinstitute.org/Publications/2009/07/Oral-Health-Workforce-in-Colorado-Synthesis-of-survey-findings-and-implications-for-policy.aspx.

[61] Colorado Health Institute. 2006 Dental Hygienist Survey Public Codebook and Variable Frequencies Report. 2008. Available at: http://www.coloradohealthinstitute.org/Projects/Completed-Projects/2006-Colorado-Dental-Hygienist-Workforce-Survey.aspx.

[62] Primary Care Office, Colorado Department of Public Health and Environment. Data as of November 3, 2011.

[63] Colorado Office of Primary Care. Colorado Health Service Corps. 2011. Available at: http://coloradohealthservicecorps.org/apply/.

[64] Colorado Community Health Network. Health Centers. 2011. Available at: http://www.cchn.org/health_centers.php.

[65] ClinicNET *ClinicNET Position Paper*. 2011. Available at: http://www.clinicnet.org/file.php/36642/CNPosPaper_final3_revised.pdf.

[66] Rural health centers receive cost-based reimbursement for most services provided. Because they are not required to provide oral health services, however, RHCS do not receive cost-based reimbursement for such services.

[67] See endnote 1.

[68] Centers for Disease Control and Prevention. Recommendations for using fluoride to prevent and control dental caries in the United States. *MMWR* Recomm Rep 2001;50(RR-14):1–42.

[69] State Demography Office, Colorado Department of Local Affairs.

[70] See endnote 1.

[71] Centers for Disease Control and Prevention. Annual smoking-attributable mortality, years of potential life lost, and economic costs—United States, 1995–1999. *MMWR* 2002;51(14):300–3.

[72] U.S. Department of Health and Human Services. *The health consequences of smoking: A report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2004. Available at: http://www.cdc.gov/tobacco/data_statistics/sgr/2004/pdfs/chapter6.pdf

[73] See endnote 72.

[74] Tomar SL, Asma S. Smoking-attributable periodontitis in the United States: Findings from NHANES III. *J Periodontol* 2000;71:743–51.

[75] Christen AG, McDonald JL, Christen JA. The impact of tobacco use and cessation on nonmalignant and precancerous oral and dental diseases and conditions. Indianapolis, IN: Indiana University School of Dentistry; 1991.

[76] American Academy of Periodontology. Position paper: Tobacco use and the periodontal patient. *J Periodontol* 1999;70:1419–27.

[77] Tomar SL, Husten CG, Manley MW. Do dentists and physicians advise tobacco users to quit? *J Am Dent Assoc* 1996;127(2):259–65.

[78] Fiore MC, Bailey WC, Cohen SJ, et al. Treating tobacco use and dependence. Clinical practice guideline. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service; 2000. Available at: http://www.surgeongeneral.gov/tobacco/treating_tobacco_use.pdf.

[79] Kressin NR, De Souza MB. Oral health education and health promotion. In: Gluck GM, Morganstein WM (eds). *Jong's Community Dental Health*, 5th ed. St. Louis, MO: Mosby; 2003:277–328.

APPENDIX A

Healthy People 2020 and Colorado Winnable Battles

The table below summarizes the subset of the 17 oral health objectives from the *Healthy People 2020* where Colorado collects data in a similar manner that we can make fair comparisons to the *Healthy People 2020* target. All 17 objectives and 33 indicators from *Healthy People 2020* are listed in Appendix A; this comprehensive table provides the related Colorado data indicators that are related but not directly comparable to the definition used by Health People 2020. Colorado is using this more comprehensive data to monitor progress toward the Colorado targets under the 17 objectives.

The Colorado Department of Public Health and Environment (CDPHE) named oral health one of Colorado's 10 Winnable Battles – health and environmental threats that can be reduced during the next five years.

Table A. Oral Health Objectives from *Healthy People 2020* and Colorado Winnable Battles - Comparison of Colorado Baseline Status with Colorado Current Status, *Healthy People 2020* Targets, and Colorado 2020 Targets

***Healthy People 2020* Objective* [Objective Number and Description]**	**Colorado Baseline Status† (%)**	**Colorado Current Status§ (%)**	***Healthy People 2020* Target* (%)**	**Colorado-equivalent of *Healthy People 2020* Target¶ (%)**
Oral Health of Children and Adolescents				
OH-1 Reduce the proportion of children and adolescents who have dental caries experience in their primary or permanent teeth				
OH-1.1 Young children, aged 3 to 5 years	45.7Δ (2003–2004)	39.7 Δ (2011–2012)	30.0¶¶	40.9
OH-1.2 Children, aged 6 to 9 years	57.2††† (2003–2004)	55.2††† (2011–2012)	49.0¶¶	51.5
OH-1.3 Adolescents, aged 13 to 15 years	N/A	N/A	48.3	N/A
OH-2 Reduce the proportion of children and adolescents with untreated dental decay				
OH-2.1 Young children, aged 3 to 5 years	26.9 Δ (2003–2004)	13.8 Δ (2011–2012)	21.4¶¶	20.6
OH-2.2 Children, aged 6 to 9 years	26.1††† (2003–2004)	14.4††† (2011–2012)	25.9¶¶	22.1
OH-2.3 Adolescents, aged 13 to 15 years	N/A	N/A	15.3	N/A

Oral Health of Adults				
OH-3 Reduce the proportion of adults with untreated dental decay				
OH-3.1 Adults, aged 35 to 44 years	N/A	N/A	25.0	N/A
OH-3.2 Adults, aged 65 to 74 years (coronal caries)	N/A	N/A	15.4	N/A
OH-3.3 Adults, aged 75 years and older (root surface caries)	N/A	N/A	34.1	N/A
OH-4 Reduce the proportion of adults who have ever had a permanent tooth extracted because of dental caries or periodontal disease				
OH-4.1 Adults, aged 45 to 64 years	44.9 (2004)	42.9 (2010)	68.8	38.6
OH-4.2 Reduce the proportion of older adults aged 65 to 74 years who have lost all of their natural teeth	15.4 (2004)	10.3 (2010)	21.6	9.3
OH-5 Reduce the proportion of adults aged 45 to 74 years with moderate or severe periodontitis	N/A	N/A	11.4	N/A
OH-6 Increase the proportion of oral and pharyngeal cancers detected at the earliest stage (localized stage)	36.9** (2003–2005)	34.5** (2006–2008)	35.8	38.0
Access to Preventive Services				
OH-7 Increase the proportion of children, adolescents, and adults who used the oral health care system in the past year	Child – N/A Adolescents – N/A Adult –72.3†† (2004)	Child – 79.7§§ Adolescents – N/A Adult – 68.0†† (2010)	49.0¶¶	Child – 87.7 Adolescents – N/A Adult – 73.6
OH-8 Increase the proportion of low-income children and adolescents who received any preventive dental service during the past year	N/A	75.4*** (2010)	29.4¶¶	82.9
OH-9 Increase the proportion of school-based health centers with an oral health component				
OH-9.1 Includes dental sealants	N/A	28.6 (10/35) (2009–2010)	26.5	31.5
OH-9.2 Includes dental care	23.5	37.1	11.1	40.8

	(4/17) (2002–2003)	(13/35) (2009–2010)		
OH-9.3 Includes topical fluoride	N/A	37.1 (13/35) (2009–2010)	32.1	40.8
OH-10 Increase the proportion of local health departments and Federally Qualified Health Centers that have an oral health component				
OH-10.1 Federally Qualified Health Centers with an oral health care program	62.5 (10/16) (2004)	93.3 (14/15) (2010)	83.0	Maintain programs
OH-10.2 Local health departments with oral health prevention or care programs	13.3% (2/15) (2004)	23.6% (13/55) (2010)	28.4	26.0
OH-11 Increase the proportion of patients who receive oral health services at Federally Qualified Health Centers each year	15.4 (2004)	17.4 (2010)	33.3	33.1
Oral Health Interventions				
OH-12 Increase the proportion of children and adolescents who have received dental sealants on their molar teeth				
OH-12.1 Children, aged 3 to 5 years	N/A	N/A	1.5	N/A
OH-12.2 Children, aged 6 to 9 years	35.2††† (2003–2004)	44.9††† (2011–2012)	28.1¶¶	40.7†††
OH-12.3 Adolescents, aged 13 to 15 years	N/A	N/A	21.9	N/A
OH-13 Increase the proportion of the U.S. population served by community water systems with water optimally fluoridated for the prevention of tooth decay	70.0§§§ (2010)	72.4§§§ (2012)	79.6	79.6
OH-14 (Developmental) Increase the proportion of adults who receive preventive interventions in dental offices				
OH-14.1 (Developmental) Received information on reducing tobacco use or smoking cessation in the past year	N/A	N/A	No target	N/A

OH-14.2 (Developmental) Received an oral and pharyngeal cancer screening in the past year	26.5 (2004)	N/A	No target	N/A
OH-14.3 (Developmental) Tested of referred for glycemic control in the past year	N/A	N/A	No target	N/A
Monitoring, Surveillance Systems				
OH-15 (Developmental) Increase the number of States and the District of Columbia that have a system for recording and referring infants and children with cleft lips and cleft palates to craniofacial anomaly rehabilitative teams				
OH-15.1 (Developmental) System for recording cleft lips and cleft palates	Yes	Yes	No target	Maintain system
OH-15.2 (Developmental) System for referral for cleft lips and cleft palates to rehabilitative teams	Yes	Yes	No target	Maintain system
OH-16 Increase the number of States and the District of Columbia that have an oral and craniofacial health surveillance system	Yes	Yes	51	Maintain system
Public Health Infrastructure				
OH-17 Increase health agencies that have a dental public health program directed by a dental professional with public health training				
OH-17.1 Increase the proportion of States and local health agencies that serve jurisdictions of 250,000 or more persons with a dental public health program directed by a dental professional with public health training	-- (1 state + 1 local agencies) (2005)	16.7 % (1/1 state + 0/5 local agencies) (FY 2009-10)	25.7	Maintain programs
OH-17.2 Increase the number of Indian Health Service Areas and Tribal health programs that serve jurisdictions of 30,000 or more persons with a dental public health program directed by a dental professional with public health training	N/A	N/A	12	N/A
Colorado Department of Public Health and Environment's Oral Health Winnable Battle Metrics				
Colorado Oral Health Winnable Battle Metric	**Colorado Baseline Status†**	**Colorado Current Status§**	***Healthy People 2020* Target* (%)**	**Colorado Winnable Battle**

	(%)	(%)		2016 Target¶ (%)
Increase the percent of children aged 1–5 years who first went to the dentist by 12 months of age	2.1 (2006)	3.4 (2010)	N/A	4.6
Increase the percent of children in third grade who have dental sealants on permanent molars	35.2 (2003–2004)	44.9 (2011–2012)	28.1¶¶	39.0
Increase the percent of the population served by community water systems who receive optimally fluoridated water	70.0 (2010)	72.4 (2012)	79.6	75.0

* U.S. Department of Health and Human Services. HealthyPeople.gov. Available at http://www.healthypeople.gov/2020/default.aspx
† The Impact of Oral Disease on the Health of Coloradans 2004. Colorado Department of Public Health and Environment. Available at http://www.cdphe.state.co.us/pp/oralhealth/impact.pdf
§ Chew on This: 2012 Report on the Oral Disease Burden in Colorado. Colorado Department of Public Health and Environment.
¶ Colorado 2020 target determined using the same target-setting method as *Healthy People 2020* with the Colorado current status measure as the baseline
Δ Data are specific to kindergarten children in Colorado public elementary schools (Basic Screening Survey)
**Colorado Central Cancer Registry, Colorado Department of Public Health and Environment
†† Percent of adults who visited the dentist or dental clinic within the past year for any reason (Behavioral Risk Factor Surveillance System)
§§ Percent of children aged 1-14 years who saw a dentist for preventive care at least once in the past 12 months (Child Health Survey)
¶¶ Measures not directly comparable to HP2020 target due to differences in definitions
*** Percent of children aged 1-14 years and ≤250%FPL who saw a dentist for preventive care at least once in the past 12 months (Child Health Survey)
††† Data are specific to third-grade children in Colorado public elementary schools (Basic Screening Survey)
§§§ Colorado Annual Summary Report, Water Fluoridation Reporting System (WFRS)
N/A = not applicable or not available