

California Department of Public Health

Status of Oral Health in California: Oral Disease Burden and Prevention 2017



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Acknowledgments

This report was funded by California General Fund (Oral Health Program); the federal Preventive Health and Health Services Block Grant, including the California Community Water Fluoridation Program and the California Epidemiologic Investigation Service (Cal-EIS) Fellowship Program; and the Title V Maternal and Child Health Services Block Grant.

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Table of Contents	
Acknowledgments	3
Executive Summary	9
Introduction	12
I. National and State Objectives for Oral Health	14
II. The Burden of Oral Disease and Disparities in California	18
Dental Caries.....	18
Special Population: Infants and Younger Children	20
Dental Caries: Adults.....	21
Tooth Loss.....	21
Periodontal Disease	22
Oral and Pharyngeal Cancers	22
Disparities.....	25
Racial/Ethnic Disparities: Children.....	25
Special Population: American Indian and Alaska-Native Children	26
Racial/Ethnic Disparities: Adults	28
Socioeconomic Status	28
Oral Health of Women.....	29
Special Population: Pregnant Women	29
Disabilities	34
Social Impact.....	35
Economic Impact.....	35
Oral Disease and Overall Health	36
III. Risk and Protective Factors for Oral Disease.....	37
Tobacco Use	37
Community Water Fluoridation	39
Topical Fluorides and Supplements	40
Dental Sealants	40
Oral Health Education	41
Early Detection of Oral Cancer.....	41
IV. Dental Services.....	43
Dental Visits.....	43
Emergency Department Dental Visits.....	45
Medi-Cal and Denti-Cal	47

Child Health and Disability Prevention Program (CHDP)	48
Children’s Health Insurance Program (CHIP)	49
Covered California	49
Local Health Departments and Community Clinics.....	49
Innovative Models of Care	50
Virtual Dental Home.....	50
Value-Based Purchasing Incentives for Providing High-Quality Dental Services	51
V. Access to Dental Services	51
VI. Dental Providers	55
Conclusion	57
References.....	58

List of Tables

Table 1.	Healthy People 2020 Oral Health Indicators: Target Levels and Current Status for United States and California	14
Table 2	Oral Health Indicators for Chronic Disease Surveillance, California and United States	17
Table 3.	Adults Aged 18 Years and Older Who Are Current Smokers in the United States and California, by Selected Characteristics	39
Table 4.	Proportion of Oral and Pharyngeal Cancers Detected at the Earliest Stage in the United States and California, by Selected Characteristics	42
Table 5.	Proportion of Persons Aged 18+ Years Who Visited a Dentist or Dental Clinic in the Previous 12 Months in 2008	44

List of Figures

Figure 1.	Dental Caries Experience in Children: California vs. HP 2020 Baseline and Targets	19
Figure 2.	Untreated Dental Decay in Children: California vs. HP 2020 Baseline and Targets	20
Figure 3.	Prevalence of Permanent Tooth Extraction due to Tooth Decay or Gum Disease among Adults in California by Age, 2012	21
Figure 4.	Oral and Pharyngeal Cancer Incidence Rates in California by County, 2007–2011	23
Figure 5.	Oral and Pharyngeal Cancer Mortality Rates in California by County, 2001–2011	24
Figure 6.	Oral Health of Kindergarten and Third Grade Children in California by Race and Ethnicity, 2004–2005	26
Figure 7.	Oral Health Status of American Indian Children 3–5 Years Old in California, 2010	27
Figure 8.	Oral Health Status of American Indian Children 6–9 Years Old in California, 2011–2012	27
Figure 9.	Prevalence of Permanent Tooth Extraction due to Tooth Decay or Gum Disease among Adults in California by Race, 2012	28
Figure 10.	Oral Health of Kindergarten and Third Grade Children in California by Eligibility for the Free/Reduced Price Lunch Program, 2004–2005	29
Figure 11.	Prevalence of Receipt of Dental Visit during Pregnancy in California by Prenatal Insurance, 2012	30
Figure 12.	Prevalence of Receipt of Dental Visit during Pregnancy in California by Race, 2012	31
Figure 13.	Prevalence of Receipt of Dental Visit during Pregnancy in California by Income, 2012	31
Figure 14.	Dental Visit During Pregnancy by Maternal and Infant Health Assessment (MIHA) Region, California, 2012	32

Figure 15.	Percent of Pregnant Women in California Whose Medical Provider Talked about Health of Teeth and Gums, 2012	33
Figure 16.	Percent of Pregnant Women in California Whose Medical Provider Suggested They See a Dentist, 2012	34
Figure 17.	Percent of Californians Aged 5–17 Years Who Missed One or More Days of School due to a Dental Problem in the Past Year by Race, 2007	36
Figure 18.	Five-Year Relative Survival for Oral and Pharyngeal Cancer in California by Stage at Diagnosis, 2002-2011	42
Figure 19.	Percent of Children and Teens in California Who Have Had a Dental Visit in the Last Year by Percent of Federal Poverty Level, 2011–2012	45
Figure 20.	Preventable Dental Emergency Department (ED) Visits in California by County, 2012	46
Figure 21.	Age-Adjusted Rates of Preventable Dental Emergency Department Visits per 100,000 in California by County, 2012	47
Figure 22.	Current Supply of Dentists by County of Record, 2013	52
Figure 23.	Current Supply of Registered Dental Hygienists (RDHs) by County of Record, 2013	53
Figure 24.	Dental Health Professional Shortage Areas, 2014	54
Figure 25.	Distribution of Dentists in California by Race/Ethnicity, 2013	55
Figure 26.	Distribution of Dental Hygienists in California by Race/Ethnicity, 2013	56

Executive Summary

“Status of Oral Health in California: Oral Disease Burden and Prevention 2017” is a comprehensive review of oral health and disease in the state. It is intended to serve as a foundation for the Oral Health Program in the California Department of Public Health and the establishment of a new state oral health plan for California. The purpose of the report is to provide an overview of California’s oral health status and capacity to address disease burden in the state. This report summarizes the most recent data that describe oral health status, disparities, risk and protective factors, and dental services in California. In many cases, the most recent California-specific data are more than 10 years old or are not available, highlighting the need for surveillance and evaluation as critical components of an overall state oral health program.

Highlights of the report include:

- Tooth decay is the most common chronic condition experienced by children—far more common than asthma or hay fever. [11] In California, 54 percent of kindergarteners and 70 percent of third graders have experienced dental caries (tooth decay), and nearly one-third of children have untreated tooth decay (2004 data – most recent available). [6]
- In California, Latino children and poor children experience more tooth decay and untreated tooth decay than other children. [3, 6, 26, 35]
- African-American adults in California have a higher prevalence of tooth extraction due to decay or gum disease, [32] and higher mortality rates from oral cancers than adults of other racial/ethnic groups. [33, 34]
- Fewer than half of pregnant women in California are receiving dental care during their pregnancies; women whose healthcare providers recommended a dental visit during pregnancy are nearly twice as likely to have dental care as women who did not get this recommendation. [49]
- California children miss 874,000 days of school each year due to dental problems. [58]
- There is a strong link between smoking and oral disease, yet only 1 in 10 smokers report being advised to quit by their dental providers. [63, 64, 65, 66]
- In California, 64 percent of the population receives fluoridated water from their community drinking water system, far short of the federal Healthy People 2020 target of 79.6 percent. [72]
- California’s northernmost counties have substantially higher rates of emergency room visits for preventable dental conditions than other areas of the state. [83]

- In 2016, approximately 51 percent of the 11.1 million children (ages 0-20) in California had dental insurance coverage through Medi-Cal/Denti-Cal, (California's Medicaid program); [88] In 2015, 44 percent of beneficiaries enrolled for at least 90 continuous days received at least 1 dental service through the program. [89]
- A new innovative model of providing dental care has the potential to expand preventive services and routine care for underserved populations. The virtual dental home system of care which expands the use of telehealth connected teams provides for improved quality of care and oral health outcomes. [101, 102, 103]
- There are 53 dental Health Professional Shortage Areas (HPSAs) in California. Approximately 5 percent of Californians (1,760,361 people) live in a dental HPSA. [109, 110]

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3. IOM (Institute of Medicine) and NRC (National Research Council). 2011. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: The National Academies Press.
 6. Dental Health Foundation, "Mommy, It Hurts to Chew" The California Smile Survey: An Oral Health Assessment of California's Kindergarten and 3rd Grade Children, Oakland, CA: Dental Health Foundation, 2006. http://www.centerfororalhealth.org/imagel/lib_PDF/dhf_2006_report.pdf
 11. Centers for Disease Control and Prevention, Hygiene-related Diseases: Dental Caries (Tooth Decay). Available at: http://www.cdc.gov/healthywater/hygiene/disease/dental_caries.html . Accessed February 23, 2015
 26. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. HP2020 Objective Data Search, Oral Health, OH-1.1. Available at: <http://www.healthypeople.gov/2020/data-search/Search-the-Data?nid=4992>. Accessed February 5, 2015.
 32. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Questionnaire. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2012. Available at: <http://apps.nccd.cdc.gov/brfss/page.asp?yr=2012&state=CA&cat=OH#OH>. Accessed February 23, 2015
 33. California Cancer Registry, Data and Mapping Tool. Available at: <http://www.cancer-rates.info/ca/index.php>. Accessed February 23, 2015.
 34. Morris CR, Ramirez CN, Cook SN, Parikh-Patel A, Kizer KW, Bates JH, Snipes KP. Cancer Stage at Diagnosis, 2013. Sacramento, CA: California Department of Public Health, California Cancer Registry, June 2013. Available at: http://www.ccrca.org/pdf/Reports/CCR_Cancer_Stage_at_Diagnosis_2013.pdf. Accessed February 23, 2015.
 35. Dye BA, Li X, Thornton-Evans G. Oral Health Disparities as Determined by Selected Healthy People 2020 Oral Health Objectives for the United States, 2009-2010. NCHS Data Brief No. 104. Hyattsville, MD. National Center for Health Statistics, 2012. Available at: <http://www.cdc.gov/nchs/data/databriefs/db104.pdf>. Accessed February 23, 2015.
 49. California Department of Public Health, Maternal, Child and Adolescent Health Division, Maternal and Infant Health Assessment. (MIHA, 2005-2007). Prevalence of dental problems during pregnancy by maternal characteristics; Reasons women stated for not having a dental visit during pregnancy, by maternal characteristics, among women with no dental visit. (MIHA, 2012). Sacramento, CA: California Department of Public Health.
 58. Pourat N and Nicholson G. Unaffordable Dental Care Is Linked to Frequent School Absences. Los Angeles, CA: UCLA Center for Health Policy Research, 2009. Available at: <http://healthpolicy.ucla.edu/publications/Documents/PDF/Unaffordable%20Dental%20Care%20Is%20Linked%20to%20Frequent%20School%20Absences.pdf>. Accessed February 23, 2015
 63. U.S. Department of Health and Human Services. The Health Consequences of Smoking: 50 Years of Progress. 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, 2014. Printed with corrections, January 2014. Available at: <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/50-years-of-progress-by-section.html>. Accessed February 23, 2015.

64. Tomar SL, Asma S. Smoking-attributable periodontitis in the United States: Findings from NHANES III. National Health and Nutrition Examination Survey. J Periodonol. 2000 May;71(5): 743-51.
65. Nociti FH, Casati MZ, Duarte PM. Current perspective of the impact of smoking on the progression and treatment of periodontitis. Periodontology 2000 2015. 67: 187-210.
66. American Academy of Periodontology. Position Paper: Tobacco Use and the Periodontal Patient. J Periodontol Nov 1999: 1419-27. Available at: <http://www.joponline.org/doi/pdf/10.1902/jop.1999.70.11.1419>. Accessed on February 23, 2015.
72. Centers for Disease Control and Prevention, Community Water Fluoridation. Available at: <http://www.cdc.gov/fluoridation>. Accessed February 23, 2015.
83. California Department of Public Health, Office of Statewide Health Planning and Development (OSHPD). Emergency Department Data Nonpublic Files 2012. Sacramento, CA: OSHPD, 2013
88. California Department of Health Care Services. Available at http://www.dhcs.ca.gov/dataandstats/statistics/Documents/Fast_Facts_Nov_2016.pdf. Accessed April 6, 2017.
89. Centers for Medicare and Medicaid Services. Annual EPSDT Participation Report, 2015 CMS Form 416. <https://www.medicare.gov/medicaid/benefits/epsdt/index.html>. Accessed April 6, 2017.
101. Glassman P, Harrington M, Mertz E, Namakian M. The Virtual Dental Home: Implications for Policy and Strategy. J Calif Dent Assoc. 2012 July;40(7): 605-611.
102. Policy Brief: The Virtual Dental Home: Improving the Oral Health of Vulnerable and Underserved Populations Using Geographically Distributed Telehealth-Enabled Teams, Updated August 2014. University of the Pacific Arthur A. Dugoni School of Dentistry. San Francisco, CA. Available at: http://www.dental.pacific.edu/Documents/community/special_care/acrobat/VirtualDentalHome_PolicyBrief_Aug_2014.pdf.
103. Glassman P, Harrington M, Namakian M, Subar P. The Virtual Dental Home: Bringing Oral Health to Vulnerable and Underserved Populations. CDA Journal July 2012 40(7): 569-577. Available at: http://www.dental.pacific.edu/Documents/community/special_care/acrobat/02_Glassman_VirtualDentalHome_Description_July2012.pdf. Accessed February 26 2015.
109. U.S. Department of Health and Human Services, Health Resources and Services Administration, Health Workforce, Dental HPSA Designation Overview. Available at: <http://bhpr.hrsa.gov/shortage/hpsas/designationcriteria/dentalhpsaoverview.html> Accessed February 26 2015.
110. California Department of Public Health, Office of Statewide Health Planning and Development. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-factsheet.pdf>

Introduction

Oral health is an essential and integral component of overall health throughout life, and it is about much more than just healthy teeth. Oral health refers to the health of the entire mouth, including the teeth, gums, hard and soft palates, linings of the mouth and throat, tongue, lips, salivary glands, chewing muscles, and upper and lower jaws. Not only does good oral health mean being free of tooth decay and gum disease, it also means being free of chronic oral pain, oral cancer, birth defects such as cleft lip and palate, and other conditions that affect the mouth and throat.

Despite the vital relationship of oral health to overall health, there are many challenges to achieving optimal oral health in the United States. In 2000, the US Surgeon General, David Satcher, issued a comprehensive report, *Oral Health in America*, [1] that described “a silent epidemic” of poor oral health among the nation’s most vulnerable citizens—poor children, the elderly, and many racial/ethnic minority groups. The issue of poor oral health was further examined in two reports issued by the Institute of Medicine in 2011, *Advancing Oral Health in America* [2] and *Improving Access to Oral Health Care for Vulnerable and Underserved Populations*. [3] Despite some improvements in oral health care since the Surgeon General’s report was issued, these reports revealed that millions of Americans continue to lack access to basic oral health care for a variety of social, economic, and geographic reasons.

The California Department of Public Health (CDPH) has the following programs dedicated to oral health:

- The California Oral Health Program was established to address the burden of oral disease and to provide leadership, build capacity and infrastructure for development, implementation, and evaluation of best practices in oral disease prevention under the leadership of the state dental director.
- The Community Water Fluoridation Initiative, which provides scientific and technical expertise to communities to increase drinking water fluoridation in compliance with California law requiring fluoridation contingent upon available funding (California Health and Safety Code §116/409-116415).
- The VDH delivers oral health services in locations where people live, work, play, go to school and receive educational and social services for underserved, high risk populations. It uses telehealth technology to link allied dental personnel in the community with dentists in dental offices and clinics. The California Expansion of Innovative Oral Health Workforce Model Program funded by the Health Resources and Services Administration (HRSA) will use the experience and expertise developed in the creation and demonstration of the Virtual Dental Home (VDH) system to spread the model to three additional sites. Training and technical assistance will be provided to build sustainable mechanisms that can be replicated throughout the state. In addition, a Value-Based Incentive (VBI) system will be piloted in one of the sites to identify payment mechanisms that move payment for

oral health services from “volume to value” by basing payments on the health outcomes of the populations served.

- The Perinatal Infant Oral Health Quality Improvement Program is designed to improve the oral health of high-risk pregnant women and infants through systems level change by: increasing awareness among primary care providers and the public about the importance of oral health care during pregnancy and early childhood; increasing access to quality oral health care; development of dental standards and performance measures; expanding the dental provider network; and utilizing Medi-Cal/Denti-Cal data to track the number of beneficiaries that access covered dental services.
- The Maternal, Child, and Adolescent Health (MCAH) Branch helps to meet the oral-health needs of pregnant women, mothers, children, and adolescents, especially within low-income families.

In 2014, the California State Legislature authorized funding for CDPH to address the burden of oral disease statewide by establishing the Oral Health Program. This program includes a state dental director and a research scientist. The dental director will guide and support the development of a state oral health plan in collaboration with a coalition of stakeholders. The goal will be identifying strategies to reduce the burden of dental disease. CDPH will use *California Wellness Plan* [4] objectives for dental health to guide program goals, priorities, and outcomes that align with those of the Let’s Get Healthy California Task Force (LGHCTF), [5] National Prevention Strategy, Centers for Medicare and Medicaid Services (CMS), National Quality Strategy, and the Department of Health Care Services (DHCS).

“*Status of Oral Health in California: Oral Disease Burden and Prevention 2017*” serves as a foundation to inform the development of the state oral health plan by describing:

- The burden of oral disease in California
- The accessibility of dental services in California
- California’s oral health surveillance capacity

This report summarizes the most current information available on the burden of oral disease in California. Primary sources of state-specific data are the Behavioral Risk Factor Surveillance System (BRFSS), the California Health Interview Survey (CHIS), the California Cancer Registry (CCR), and the Office of Statewide Health Planning and Development (OSHPD). Data are also presented from the California Smile Survey, conducted in 2004–2005 among kindergarten and third-grade children in randomly selected schools throughout California. [6] Although this survey is over 10 years old, it remains the most recent data available for childhood oral-health indicators.

Comparisons are made with national data whenever possible and to the federal Healthy People 2020 (HP 2020) [7] objectives, when appropriate.

I. National and State Objectives for Oral Health

Oral Health in America: A Report of the Surgeon General emphasized the importance of oral health in the daily lives of Americans. [1] Issued in May 2000, the report 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. A key theme of the report was that oral health is essential to general health and well-being and can be achieved, yet barriers hinder some Americans' ability to attain optimal oral health. It concluded with a framework for action, calling for a national oral health plan to improve quality of life and eliminate oral health disparities.

One essential component of an oral health plan would be a set of measurable and achievable objectives using key indicators of oral disease burden, oral health promotion, and oral disease prevention. HP 2020 is the comprehensive, nationwide health promotion and disease prevention agenda and is designed to serve as a roadmap for improving the health of all people in the United States during the second decade of the 21st century. HP 2020 includes 17 objectives related to improving oral health. These objectives represent the ideas and expertise of diverse individuals and organizations concerned about the nation's oral health. In addition, an oral health measure (OH-7: Oral health care system use in the past year by children, adolescents, and adults) is included as an HP 2020 Leading Health Indicator (LHI), a select subset of objectives that focus on high priority health issues. [8]

National objectives on oral health, such as those in HP 2020, provide measurable targets for the nation. The Surgeon General's *National Call to Action to Promote Oral Health* [9] called for the development of plans at state and community levels, with attention to planning, evaluation, and accountability. HP 2020 oral health objectives, targets, and baselines for the United States and California (where data are available) are summarized in Table 1.

Table 1. Healthy People 2020 Oral Health Indicators: Target Levels and Current Status for United States and California

Healthy People 2020 Objective		U.S. Target HP 2020 (%)	U.S. Baseline (various years) (%)	California Baseline (various years) (%)
OH-1	Dental caries experience			
	Young children, aged 3–5 (primary teeth)	30	33.3 ^a	53.6 ^k
	Children, aged 6–9 (primary and permanent teeth)	49	54.4 ^a	70.9 ^l
	Adolescents, aged 13–15 (permanent teeth)	48.3	53.7 ^a	
OH -2	Untreated dental decay in children			
	Young children, aged 3–5 (primary teeth)	21.4	23.8 ^a	27.9 ^k
	Children, aged 6–9 (primary and permanent teeth)	25.9	28.8 ^a	28.7 ^l
	Adolescents, aged 13–15 (permanent teeth)	15.3	17 ^a	

Healthy People 2020 Objective		U.S. Target HP 2020 (%)	U.S. Baseline (various years) (%)	California Baseline (various years) (%)
OH-3	Untreated dental decay in adults			
	Adults aged 35–44 (overall dental decay)	25	27.8 ^a	
	Adults aged 65–74 (coronal caries)	15.4	17.1 ^a	
	Adults aged 75 and older (root surface)	34.1	37.9 ^a	
OH-4	Permanent tooth extraction because of dental caries or periodontal disease			
	Adults aged 45–64	68.8	76.4 ^a	49.5 ^m
	Adults aged 65–74 (lost all natural teeth)	21.6	24 ^a	8.7 ^m
OH-5	Moderate or severe periodontitis, adults aged 45–74	11.5	12.8 ^b	
OH-6	Oral and pharyngeal cancers detected at the earliest stage	35.8	32.5 ^c	23.2 ⁿ
OH-7	Oral health care system use in the past year by children, adolescents, and adults	49	44.5 ^d	
OH-8	Low-income children and adolescents who received any preventive dental service during past year	33.2	30.2 ^d	
OH-9	School-based health centers (SBHC) with an oral health component			44.0 ^o
	Includes dental sealants	26.5	24.1 ^e	
	Oral health component that includes dental care	11.1	10.1 ^e	
	Includes topical fluoride	32.1	29.2 ^e	
OH-10	Local health departments (LHDs) and Federally Qualified Health Centers (FQHCs) that have an oral health component			
	FQHCs with an oral health component	83	75 ^f	
	LHDs with oral health prevention or care programs	28.4	25.8 ^g	
OH-11	Patients who receive oral health services at FQHCs each year	33.3	17.5 ^f	18.5 ^p
OH-12	Dental sealants			
	Children, aged 3–5 (primary molars)	1.5	1.4 ^a	
	Children, aged 6–9 (permanent 1st molars)	28.1	25.5 ^a	27.6 ^l
	Adolescents, aged 13–15 (permanent molars)	21.9	19.9 ^a	
OH-13	Population served by optimally fluoridated water systems	79.6	72.4 ^h	63.7 ^q
OH-14	Adults who receive preventive interventions in dental offices (developmental)^r			
	Tobacco and smoking cessation information in	N/A	N/A	

Healthy People 2020 Objective		U.S. Target HP 2020 (%)	U.S. Baseline (various years) (%)	California Baseline (various years) (%)
	past year			
	Oral and pharyngeal cancer screening in past year	N/A	N/A	
OH-15	States with system for recording and referring infants with cleft lip and palate (developmental) ^r	N/A	N/A	N/A
OH-16	States with oral and craniofacial health surveillance system	100	62.7 ⁱ	N/A
OH-17	State and local dental programs directed by public health professionals (PHP)			
	Indian Health Service and Tribal dental programs directed by PHP	25.70	23.40 ⁱ	
	Indian Health Service Areas and Tribal health programs with dental public health program directed by a dental professional with public health training	12 programs	11 programs ^j	

Note: Gray indicates California data not available.

^a = National Health and Nutrition Survey, 1999–2004

^b = National Health and Nutrition Survey, 2001–2004

^c = National Program of Cancer Registries (NPCR), CDC/National Chronic Disease Prevention and Health Promotion (NCCDPHP); Surveillance, Epidemiology, and End Results (SEER) Program, National Institutes of Health (NIH)/National Cancer Institute (NCI), 2007

^d = Medical Expenditure Panel Survey (MEPS), AHRQ 2007

^e = School-Based Health Care Census (SBHCC), National Assembly on School-Based Health Care (NASBHC), 2007–2008

^f = Uniform Data System (UDS), Health Resources and Service Administration (HRSA)/Bureau of Primary Health Care (BPHC), 2007

^g = Annual Synopses of State and Territorial Dental Public Health Programs (ASTDD Synopses), Association of State and Territorial Dental Directors (ASTDD), 2008

^h = Water Fluoridation Reporting System (WFRS), CDC/NCCDPHP, 2008

ⁱ = ASTDD Synopses, ASTDD, 2009

^j = Indian Health Service, Division of Oral Health, 2010

^k = Data from California Smile Survey (2006) for kindergarten

^l = Data from California Smile Survey (2006) for 3rd grade children

^m = BRFSS, 2012

ⁿ = CCR, 2011

^o = School Based Health Alliance. Of 231 health centers, 101 have some type of dental service, 49 offer preventive services only, 49 offer both preventive and restorative services, and 3 offer dental treatment only.

^p = HRSA, DHHS, 2013. Percentage calculated using number of patients who received dental services and total patients served.

(Source: <http://bphc.hrsa.gov/uds/datacenter.aspx?year=2013&state=CA>)

^q = CDC 2012 Water Fluoridation Statistics

^r = HP 2020 developmental objectives lack national baseline data. They indicate areas that need to be placed on the national agenda for data collection.

In 2015, the Centers for Disease Control and Prevention (CDC) issued an updated set of indicators for chronic disease surveillance that consists of uniformly defined data from standard sources (e.g., BRFSS) recommended for use by state and local public health professionals (PHPs) and policymakers. [10] Using the most recent California data available, indicators for oral health are listed in Table 2. CDPH will continue to monitor these indicators as a part of statewide oral health surveillance.

Table 2. Oral Health Indicators for Chronic Disease Surveillance, California and United States.

Indicator Number	Measure	Data Source	Year(s)	U.S.	CA
1.1	Visits to dentist or dental clinic among adults aged ≥ 18 years	BRFSS	2012	66.8**	66.8**
1.2	Dental visits among children and adolescents aged 1–17 years	NSCH	2011–12	78.4*	75.8*
2.1	Preventive dental visits among children and adolescents aged 1–17 years	NSCH	2011–12	77.9*	75.3*
2.2	Preventive dental care before pregnancy	PRAMS			No data available
3	Oral Health services at Federally Qualified Health Centers	UDS	2012	20.5	17.6
4.1	All teeth lost among adults aged ≥ 65 years	BRFSS	2012	16.5**	8.8**
4.2	Six or more teeth lost among adults aged ≥ 65 years	BRFSS	2012	39.5**	29.3**
4.3	No tooth loss among adults aged 18–64 years	BRFSS	2012	64.3	64.3
5	Population served by community water systems that receive optimally fluoridated drinking water	WFRS	2012	74.6	63.7
8 (from Diabetes Indicator Group)	Visits to dentist or dental clinic among adults aged ≥ 18 years diagnosed with diabetes	BRFSS	2012	50.0**	59.2**

Sources:

BRFSS = Behavioral Risk Factor Surveillance System

NSCH = National Survey on Children’s Health

PRAMS = Pregnancy Risk Assessment Monitory System (40 states, does not include California)

UDS = HRSA Uniform Data System

WFRS = WFRS

*crude prevalence

**age-adjusted prevalence

The California Wellness Plan [4] is the result of a statewide process led by the California Health and Human Services Agency to develop a roadmap with partners to create communities in which people can be healthy, improve the quality of clinical and community care, increase access to usable health information, assure continued public health capacity to achieve health equity, and empower communities to create healthier environments.

The plan, released in 2014, includes three state objectives for oral health:

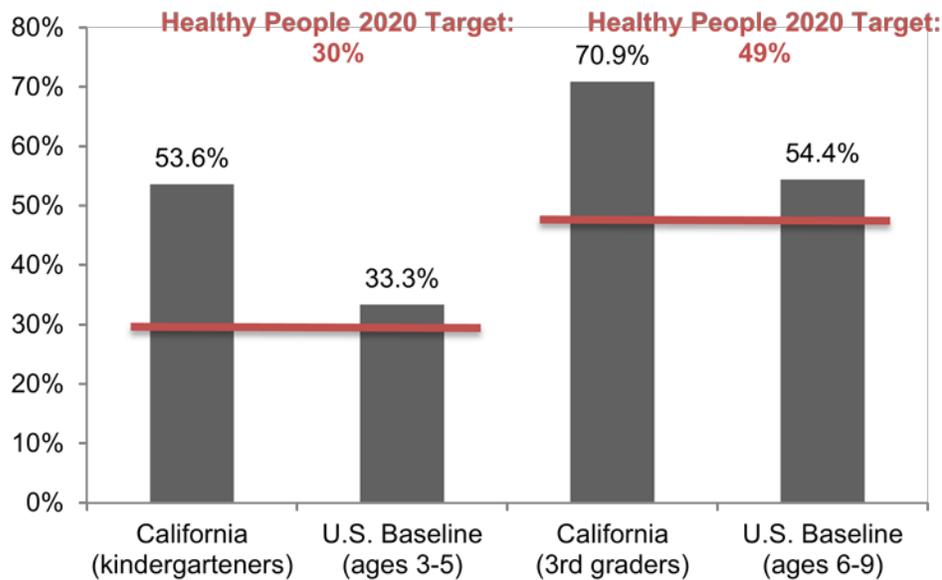
1. Increase the percentage of low-income children and adolescents aged 1–20 years enrolled in Medi-Cal for at least 90 continuous days who received any preventive dental service
2. Increase the percentage of low-income children aged 6–9 years enrolled in Medi-Cal for at least 90 continuous days who received a dental sealant on a permanent molar
3. Increase the proportion of adults in Medi-Cal who used the oral health care system in the past year (developmental indicator is defined as an indicator that needs to be placed on the agenda for periodic data collection in conjunction with HP 2020 objectives)

II. The Burden of Oral Disease and Disparities in California

Dental Caries

Dental caries, or cavities, commonly known as tooth decay, are caused by a breakdown of tooth enamel. This breakdown is the result of bacteria on teeth that break down foods and produce acid that destroys tooth enamel. Tooth decay is a preventable disease, yet it remains the most common chronic disease of children aged 6 to 11 years and adolescents aged 12 to 19 years [11]. Children with untreated tooth decay experience unnecessary pain, difficulty chewing, and difficulty speaking. This can impair a child's intellectual and social development and cause missed days of school. The American Academy of Pediatric Dentistry (AAPD) describes childhood dental caries as a public health problem that threatens the overall health and development of young children. [13]

Figure 1. Dental Caries Experience in Children: California vs. *Healthy People 2020* Baseline and Targets.



Source: California Smile Survey (2006), Healthy People 2020.

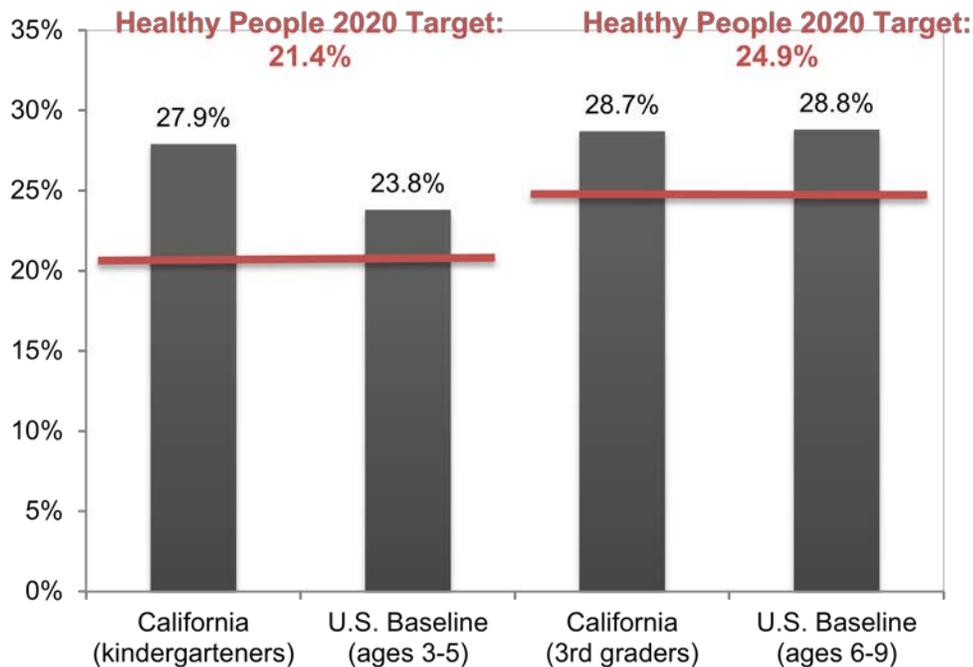
Note: California-specific data from the California Smile Survey are from children in kindergarten and 3rd grade, while Healthy People 2020 targets are for children aged 3–5 and 6–9, respectively. The California Smile Survey found a mean age of 5.35 for kindergarten children and 8.43 for third-grade children. Since the mean age in the California data are higher than the national data, a higher rate of caries experience can be expected in the California data (source: Center for Oral Health http://www.centerfororalhealth.org/imagel/lib_PDF/CASmileAppendices.pdf).

In California, nearly 54 percent of kindergarten children and over 70 percent of third graders have a history of tooth decay (Figure 1). [6] This compares unfavorably with the US baseline prevalence of 33.3 percent for children aged 3–5 years, and 54.4 percent for children aged 6–9 years. However, the age groupings used in the national and California data sources are not identical, which may account for some of the difference, particularly in the youngest age group: three-to-five year-olds in the national data source (National Health and Examination Survey [7]) and kindergarteners (mean age 5.4 years) in the California data source. [6] Among older children, the national data surveyed 6 to 9 year olds, whereas California surveyed third graders (mean age 8.4 years). In any case, prevalence of tooth decay in California children is well above the targets set by HP 2020.

Many California children with dental caries are not being treated, which is likely to result in more extensive and serious oral health issues. In California, 28 percent of kindergarteners and 29 percent of third graders had untreated tooth decay (Figure 2). While third graders are comparable to the national baseline established by HP 2020, kindergarteners are lagging, and both cohorts fall short of the national targets of

21 percent (children aged 3–5 years) and 25 percent (children aged 6–9 years). No statewide data are available in California to update progress on these measures.

Figure 2. Untreated Dental Decay in Children: California vs. Healthy People 2020 Baseline and Targets.



Source: California Smile Survey (2006), Healthy People 2020.

Note: California-specific data from the California Smile Survey are from children in kindergarten and third grade, while Healthy People 2020 targets are for children aged 3–5 and 6–9, respectively. The California Smile Survey found a mean age of 5.35 for kindergarten children and 8.43 for third grade children (source: Center for Oral Health http://www.centerfororalhealth.org/imaged/lib_PDF/CASmileAppendices.pdf)

Special Population: Infants and Younger Children

An infant’s teeth are vulnerable to tooth decay as soon as they appear, sometime between 6 and 12 months of age. [12] According to the AAPD, tooth decay may be difficult to diagnose in infants and toddlers, as the symptoms of pain may be easily mistaken for teething. Additionally, 50 percent of California infants in the general population aged 0–2 years have never been to the dentist, [16a] and nearly 1 in 5 were not insured in 2007. [16b] With implementation of the Patient Protection and Affordable Care Act, an increase in the number of children insured is anticipated.

Dental Caries: Adults

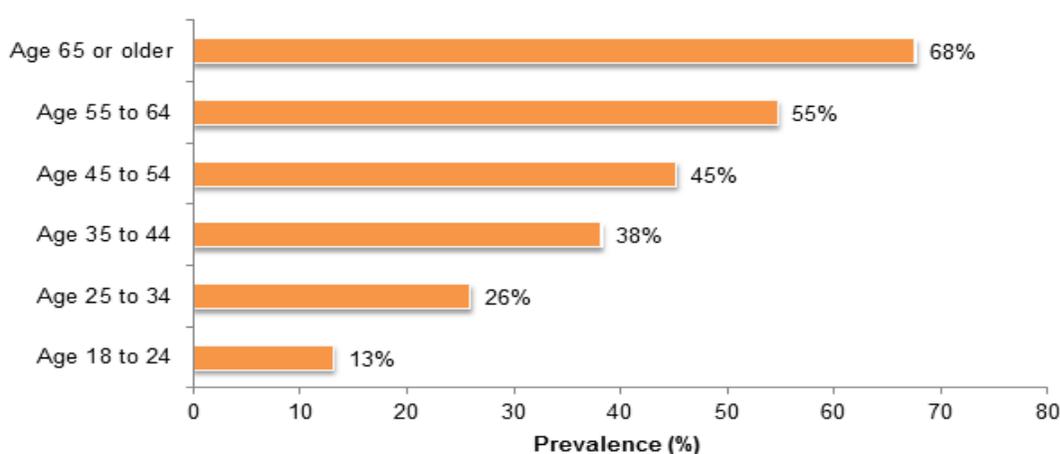
People are susceptible to dental caries throughout their lifetimes. Like children and adolescents, adults can experience new decay on the crown (enamel-covered) portion of the tooth. But adults can also develop caries on the root surfaces of teeth when those surfaces become exposed to bacteria and carbohydrates (simple sugars in food) as a result of gum recession. Not only do adults experience dental caries, but a substantial proportion of that disease is untreated at any given time. In 2005–2008, National Health and Nutrition Examination Survey (NHANES) results showed that 24 percent of adults aged 20–64 and 20 percent of adults aged 65–74 in the United States have untreated dental caries. [17] No California-specific data on the prevalence of dental caries among adults is available.

Tooth Loss

Most people can keep their teeth for life with adequate personal, professional, and population-based preventive practices. As teeth are lost, the ability to chew and speak decreases and can interfere with social functioning. The most common reasons for tooth loss in adults are tooth decay and periodontal (gum) disease. Tooth loss also can result from infection, unintentional injury, and head and neck cancer treatment. Certain orthodontic and prosthetic services sometimes require the removal of teeth.

The prevalence of tooth loss in the United States has been declining, according to a CDC report. [18] In 2012, 64 percent of adults aged 18–64 reported no history of tooth loss resulting from tooth decay or periodontal disease in California and in the United States overall. [19] Tooth loss rates increase with age. Data for California on the percentage of adults who have had permanent teeth extracted because of tooth decay or gum disease are presented in Figure 3. Trend data on this specific measure are not available because the survey methodology changed in 2011. [20]

Figure 3. Prevalence of Permanent Tooth Extraction Due to Tooth Decay or Gum Disease among Adults in California by Age, 2012



Source: Behavioral Risk Factor Surveillance System, California 2012.
Prepared by Madhurima Gadgil, MPH

Adults are persons 18 years and older. Includes teeth lost to infection, but not teeth lost for other reasons, such as injury or orthodontics. Wisdom teeth removed because of tooth decay or gum disease are included. Responses of Don't know/Not sure/Refused were coded as missing.

Periodontal Disease

Early periodontal (gum) disease, or gingivitis, is characterized by localized inflammation, swelling, and bleeding gums, without a loss of the bone that supports the teeth. [21] 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 and timely treatment is provided.

In 2009-2012, nearly half of U.S. adults age 30 and older, and 70 percent of adults age 65 and older, had some form of periodontal disease. [22] No California-specific data on the prevalence of periodontal disease among adults are available.

Oral and Pharyngeal Cancers

“Oral cancer” refers to cancers that form in the tissues of the oral cavity (mouth) or the oropharynx (the part of the throat at the back of the mouth). Alcohol, tobacco (including smokeless tobacco), poor diet, and infection with Human Papilloma Virus (HPV) are known risk factors for oral cancer. [23] Radiation from sun exposure is also a risk factor for lip cancer. In 2014, there were an estimated 42,440 new cases of oral cancer and 8,390 deaths from oral cancer in the United States. [24]

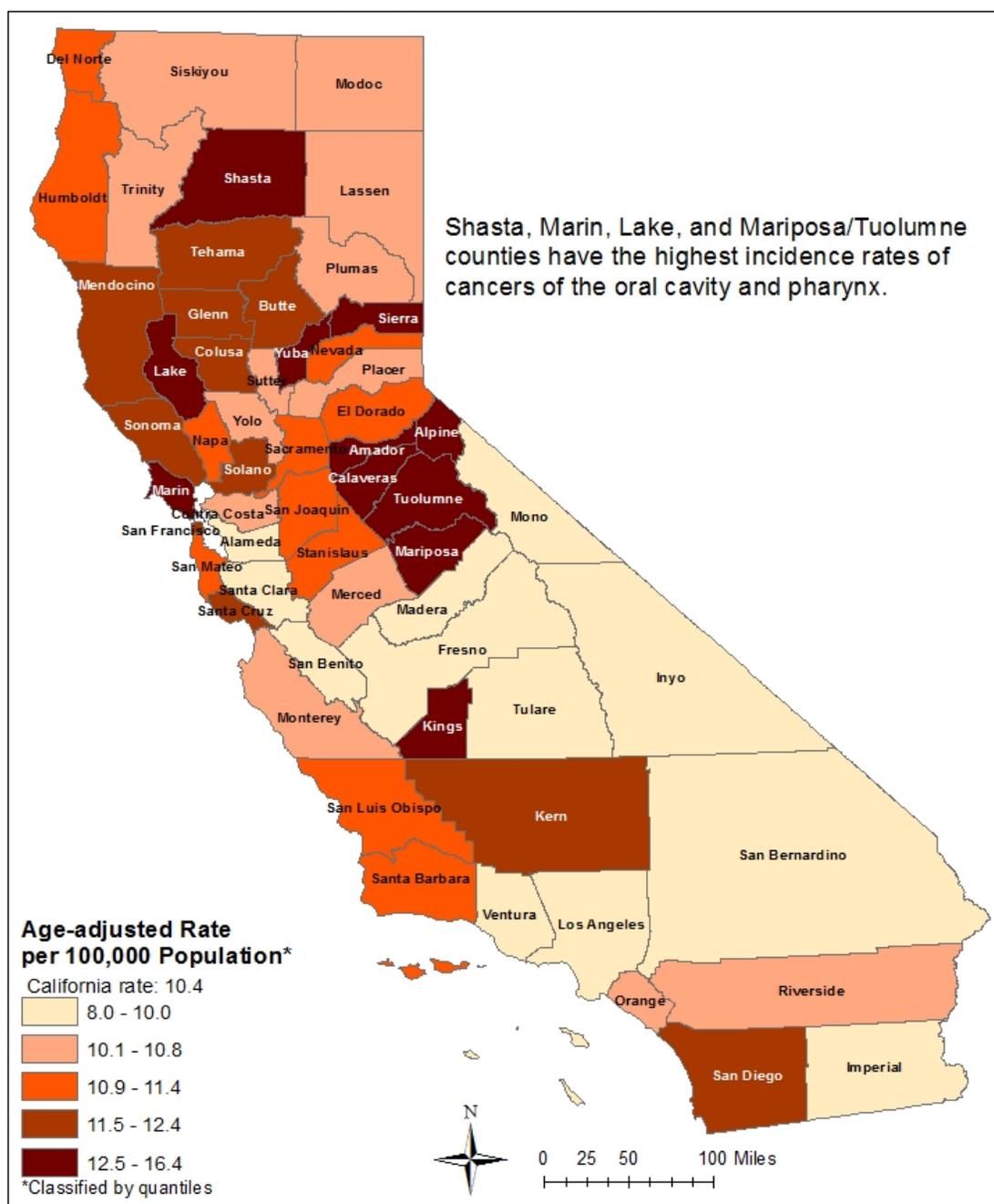
The incidence rate of oral cancer in the United States is 11.0 new diagnoses per 100,000 persons, and the mortality rate (deaths) is 2.5 per 100,000 persons. Cancers of the oral cavity and pharynx represents 2.5 percent of all new cancer cases in the United States. [24]

In California, overall oral cancer incidence and mortality rates were 10.4 per 100,000 and 2.6 per 100,000, respectively, in 2007–2011. [25] These rates vary geographically across the state (Figures 4 and 5).

Conditions such as oral and pharyngeal cancers (cancers of the lip, tongue, pharynx, and mouth) contribute to premature death and can be measured by years of life lost.

Oral and pharyngeal cancer experience also varies by race and ethnicity. In California, although oral and pharyngeal cancer incidence rates are lower among African-American males than among non-Hispanic white males (Age-Adjusted Incidence Rate [AAIR] 13.7 vs. 18.9 per 100,000 for 2007–2011), their oral cancer mortality rates are higher (Age-Adjusted Mortality Rate [AAMR] 4.3 vs. 4.1 per 100,000). [33] Further, African-Americans are more frequently diagnosed at a later stage of disease. As such, only 11.1 percent of oral and pharyngeal cancers are diagnosed in African-Americans at the earliest stage (American Joint Committee on Cancer), when tumors are small and have not spread, compared to 21.5 percent of cases in non-Hispanic whites, 16.4 percent in Hispanics, and 19.0 percent in Asian/Pacific Islanders. [34]

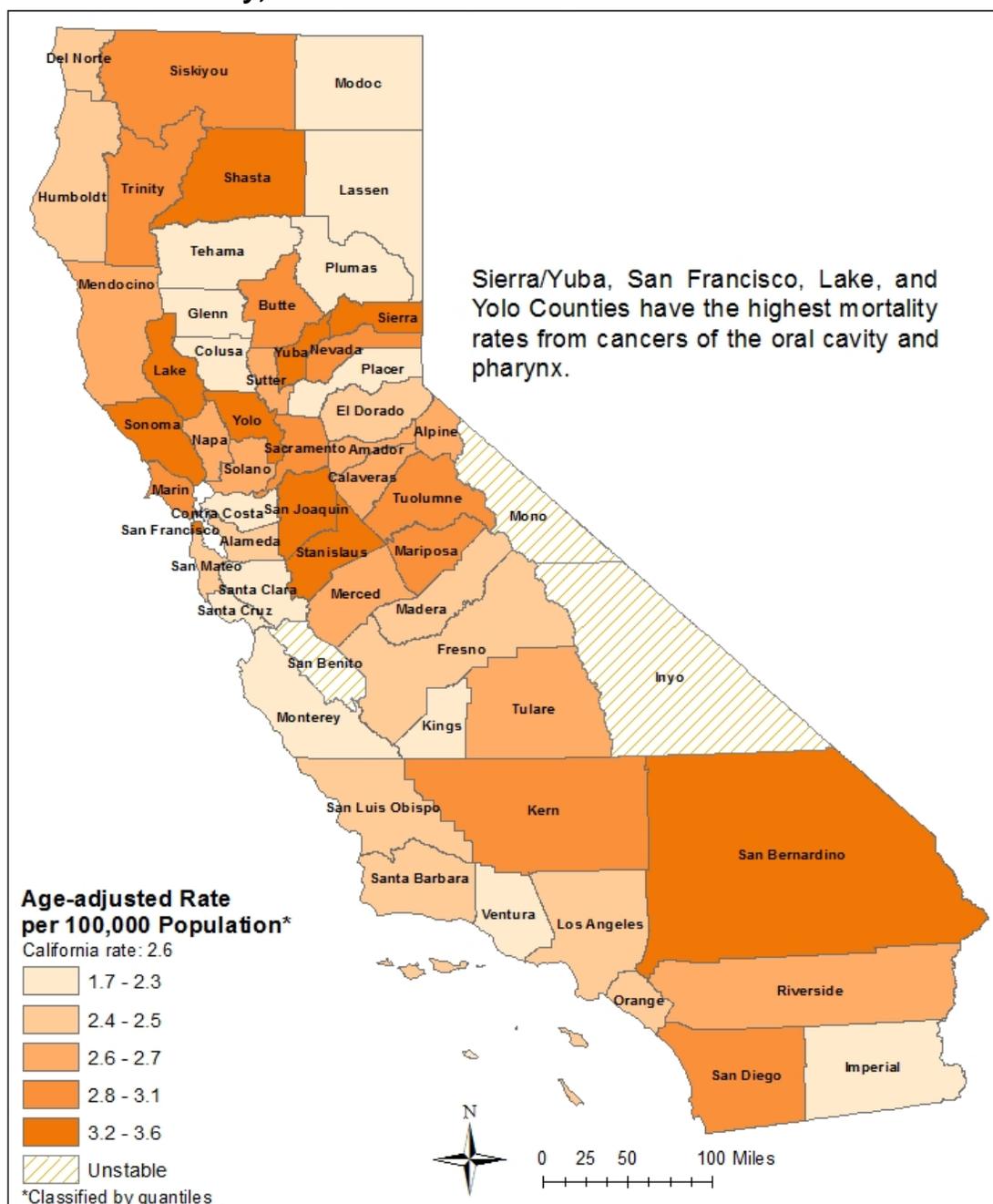
Figure 4. Oral and Pharyngeal Cancer Incidence Rates in California by County, 2007–2011.



Source: California Cancer Registry
 Prepared by Madhurima Gadgil, MPH

Rates are age-adjusted to the 2000 U.S. Standard Population. Due to the small number of cases, certain counties were combined as follows: (Mariposa, Tuolumne), (Alpine, Amador, Calaveras), (Colusa, Glenn, Tehama), (Del Norte, Humboldt), (Siskiyou, Trinity), and (Inyo, Mono).

Figure 5. Oral and Pharyngeal Cancer Mortality Rates in California by County, 2001–2011.



Source: California Cancer Registry
 Prepared by Madhurima Gadgil, MPH

Rates are age-adjusted to the 2000 U.S. Standard Population. Counts/rates are suppressed if fewer than 15 deaths were reported in the specified category. Due to the small number of cases, certain counties were combined as follows: (Sierra, Yuba), (Inyo, Mono), (Mariposa, Tuolumne), (Colusa, Glenn, Tehama), (Alpine, Amador, Calaveras), (Siskiyou, Trinity), (Lassen, Modoc, Plumas), and (Del Norte, Humboldt). Instability is due to the small number of cases in some county pairings, whereby a unit change in the number of cases may cause an exaggerated overall change that does not meet a minimum degree of accuracy.

Disparities

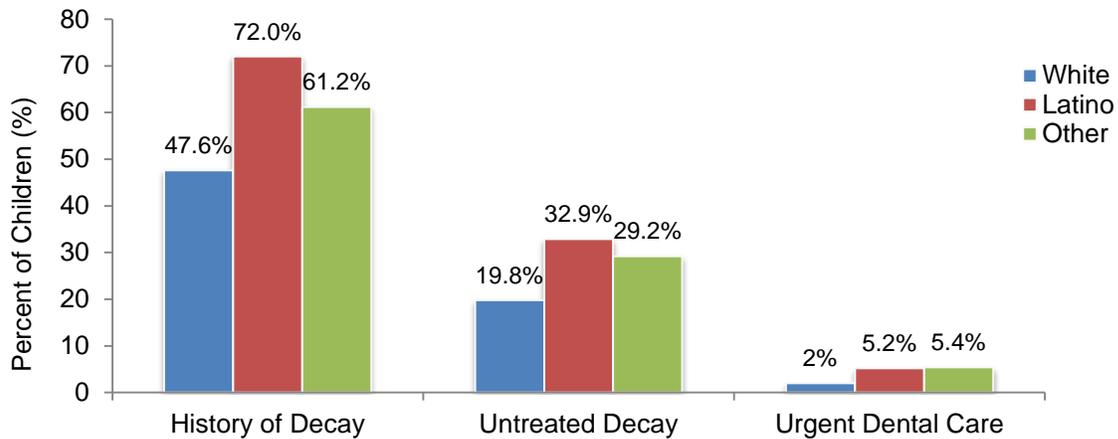
Racial/Ethnic Disparities: Children

Nationally, the experience of dental caries and untreated tooth decay varies among racial and ethnic groups. Tooth decay is more common among Hispanic and African-American children than among non-Hispanic white children: among 3-5 year-olds, 47.2 percent for Hispanic, 36.8 percent for African-Americans, and 29.2 percent for non-Hispanic whites, and among 6–9 year olds, 70.3 percent for Hispanic, 55.6 percent for African-Americans, and 50 percent for non-Hispanic whites. [26]

The prevalence of untreated tooth decay among children has declined in the United States from 24 percent during 1999–2004 to 14.2 percent during 2009–2010 among 3-5 year-olds. [27] Whereas improvement was seen in all racial/ethnic groups, untreated tooth decay is still more common among Mexican-American and African-American children in all age groups compared to non-Hispanic whites. For children aged 3–5 years, a decline from 34.5 percent to 24.1 percent was seen in untreated tooth decay among Hispanic children, from 27.5 percent to 18.0 percent among African-American children, and 20.1 percent to 11.3 percent among non-Hispanic white children. Similar declines were seen in 6–9 year olds: from 41.4 percent to 29.9 percent for Hispanic, from 35.7 to 18.6 percent for African Americans, and from 25.1 to 13.9 percent for non-Hispanic whites.

Latino (the terminology used in California survey data) children in California are significantly more likely to have a history of tooth decay (72.0 percent) and untreated tooth decay (32.9 percent) than non-Latino white children (47.6 percent and 19.8 percent, respectively), and are more likely than non-Latino white children to have an urgent need for dental care (Figure 6). [6] No recent statewide data are available in California to update progress on these measures, since the Smile Survey data were collected only in 2004–2005.

Figure 6. Oral Health of Kindergarten and Third Grade Children in California by Race and Ethnicity, 2004–2005.



Source: California Smile Survey, 2006.

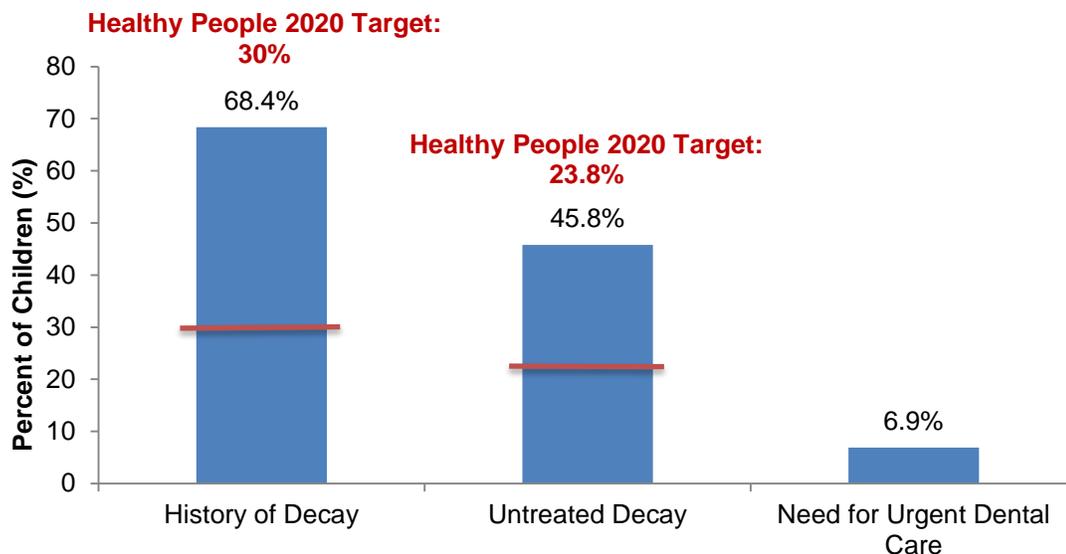
'White', 'Latino', and 'Other' are the only race/ethnic demographic categories considered for this survey

Special Population: American Indian and Alaska-Native Children

Nationally, American Indians and Alaska-Natives face persistent disparities in health and health care, resulting from high uninsured rates, significant barriers to obtaining care, and poor health status. [28a] The Indian Health Service (IHS) is the primary vehicle through which the federal government provides funding and health services for American Indians. California does not have IHS facilities, but services are provided by a network of forty-six Tribal and Urban Indian Health Center Clinics. California has the largest American Indian/Alaska-Native population of any state (723,000). [28b]

American Indian/Alaska-Native children experience more dental disease than other minorities in the United States [29]. In 2010, over two-thirds of American Indian/Alaska-Native children in California age 3–5 years had a history of tooth decay; and nearly half were untreated (Figure 7). [29] In 2011-2012, more than 80 percent of American Indian/Alaska-Native children in California aged 6–9 had a history of tooth decay; and 57 percent of American Indian/Alaska-Native children had untreated oral disease. In spite of these numbers, one-third of 6-9 year old American Indian/Alaska-Native children received one or more dental sealants on a permanent tooth in 2011-2012 (Figure 8) – which exceeded the HP 2020 target. [30]

Figure 7. Oral Health Status of American Indian Children 3–5 Years Old in California, 2010

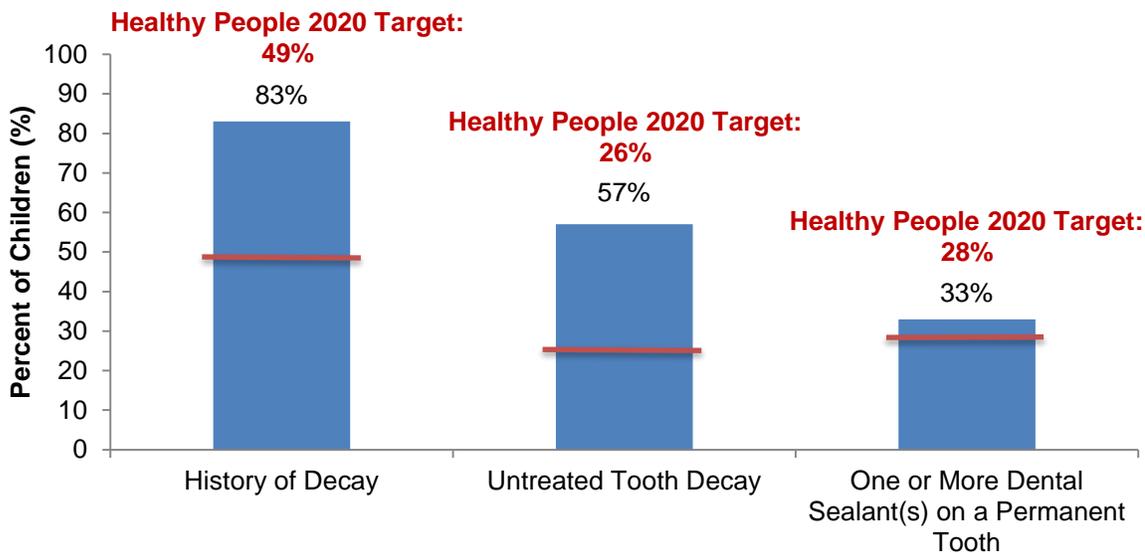


Source: 2010 IHS Oral Health Survey

(<http://www.ihs.gov/DOH/documents/IHS%20Oral%20Health%20Report%2004-17-2014.pdf>) and HP 2020.

Note: There is no HP 2020 target for need for urgent dental care.

Figure 8. Oral Health Status of American-Indian Children 6–9 Years Old in California, 2011–2012



Source: Indian Health Service Data Brief, March 2014

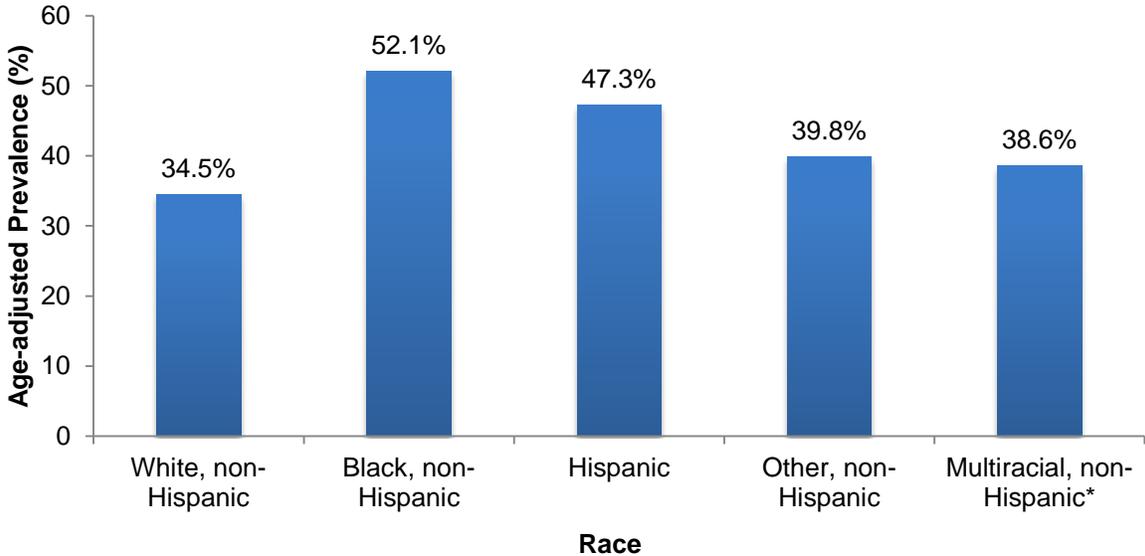
(<http://doh.sd.gov/documents/Prevention/oralhealth/IHS-2014.pdf>) and Healthy People 2020.

Note: The sampling frame for this survey was all schools with oversight from Bureau of Indian Education and public and private schools with a high American Indian/Alaska Native population.

Racial/Ethnic Disparities: Adults

Among US adults, African-Americans are twice as likely to have untreated tooth decay as non-Hispanic whites (39.7 percent vs. 19.3 percent). [31] No state data are available to evaluate this measure for California adults. California data do show, however, that African-American adults are more likely than other groups to have had teeth extracted due to tooth decay or gum disease (Figure 9). [32]

Figure 9. Prevalence of Permanent Tooth Extraction due to Tooth Decay or Gum Disease among Adults in California by Race, 2012



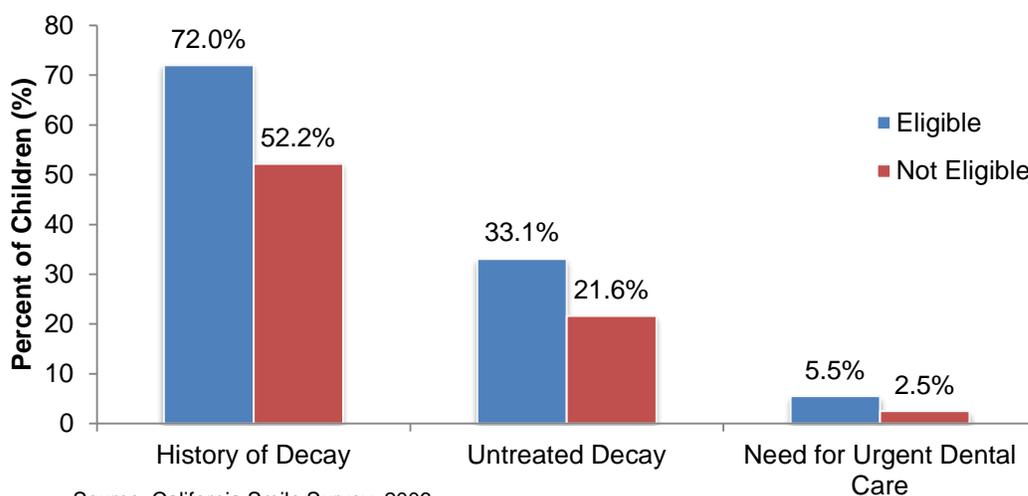
Source: Behavioral Risk Factor Surveillance System, 2012.
Data analyzed by Madhurima Gadgil, MPH.
Prevalences are age-adjusted to the 2000 U.S. Standard Population.
*The multiracial category is unstable.

Socioeconomic Status

Socioeconomic status is a strong determinant of oral health and outcomes. [3] Children of all age groups who live below 100 percent of the federal poverty level (FPL) are two times more likely to have untreated tooth decay than children living at or above 100 percent FPL, and adults in all age groups are less likely to retain all their teeth. [35] More than one-third of adults aged 65–74 at the lowest level of poverty have complete tooth loss (edentulism), more than twice the prevalence found in those above 100 percent FPL.

In California, as of 2004-2005, elementary-school-age children who were eligible for a free or reduced price lunch program due to low family income were more likely to have a history of tooth decay, untreated decay, and needed urgent dental care more than other children (Figure 10).

Figure 10. Oral Health of Kindergarten and Third Grade Children in California by Eligibility for the Free/Reduced Price Lunch Program, 2004–2005



Source: California Smile Survey, 2006

Oral Health of Women

In many aspects, women have better oral health than men. Women are less likely at all ages to have untreated tooth decay [31] and periodontal disease. [36] In California, the prevalence of tooth extraction for tooth decay or gum disease is similar for men and women—41 percent for both groups. [37] Women are less likely than men to develop oropharyngeal cancers, as women are less frequently exposed to risk factors such as smoking. The age-adjusted incidence rate is more than 1.5 times higher among men (16.5 per 100,000) than among women (10.2 per 100,000), and the mortality rate is nearly 3 times higher (3.8 per 100,000 vs. 1.4 per 100,000). [24] From 2007 to 2011, male incidence rates were also more than twice those of females (14.5 per 100,000 vs. 6.2 per 100,000), as were mortality rates (3.7 per 100,000 vs. 1.5 per 100,000). [33]

Special Population: Pregnant Women

Oral health during pregnancy is important because pregnant women have higher rates of certain oral health conditions than non-pregnant women, [38] and some studies have found associations between oral disease during pregnancy and poor infant outcomes. [39, 40, 41, 42] Although recent interventional studies do not show a reduction of pre-term birth when periodontal disease is treated, [43, 44, 45] few argue against the importance of oral health care during pregnancy. Dental care during pregnancy is considered safe, and the minimal risk of providing dental care to pregnant women (e.g., possible infection, bleeding, allergic reactions) is outweighed by the risk of not treating oral health conditions. [46] According to California perinatal oral health guidelines, [47] pregnant women should receive at least one dental visit during pregnancy. In addition, maternal oral health correlates with the oral health status of the woman’s children. [48] Pregnancy offers a window of opportunity to ensure good oral health for the mother and to educate her about oral health practices for herself and her children.

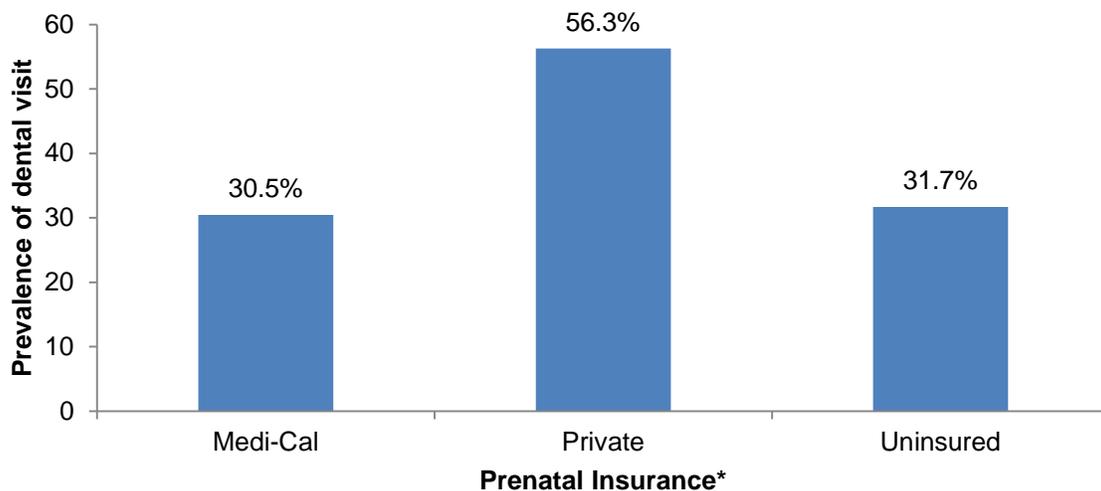
For Medi-Cal eligible pregnant women, including those in pregnancy related coverage, Medi-Cal covers all dental procedures listed in the Dental Manual of Criteria that are covered by the Medi-Cal program so long as all Manual of Criteria procedure requirements and criteria are met. Medi-Cal beneficiaries will also be eligible to receive these services for 60 days postpartum, including any remaining days in the month in which the 60th day falls.

According to data from California’s Maternal and Infant Health Assessment (MIHA) survey, 53 percent of pregnant women had a dental problem during pregnancy. Women with incomes below 100 percent of the federal poverty level or women with Medi-Cal coverage, women with only a high school education, and African-American women had a higher prevalence of dental problems during pregnancy than the state average. [49]

Despite the high prevalence of oral health problems, receipt of dental care during pregnancy has remained low. Although there has been a fairly steady increase over time, only 42 percent of California women had a dental visit during pregnancy in 2012 (the most recent year of data available).

Factors that affect access to dental visits during pregnancy include a lack of dental insurance; being of Latina, African-American, or other (non-white) race/ethnicity; having a low income; being younger than age 35; and attaining lower educational levels (Figures 11, 12, 13).

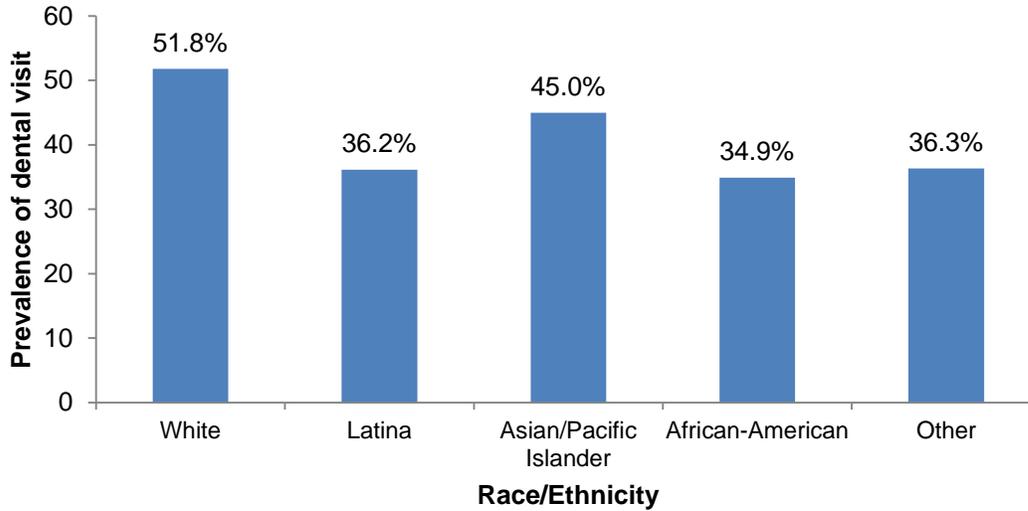
Figure 11. Prevalence of Receipt of Dental Visit during Pregnancy in California by Prenatal Insurance, 2012



Source: Maternal and Infant Health Assessment (MIHA), 2012. Data provided by the Maternal, Child, and Adolescent Health Program. Analysis conducted by University of California, San Francisco.

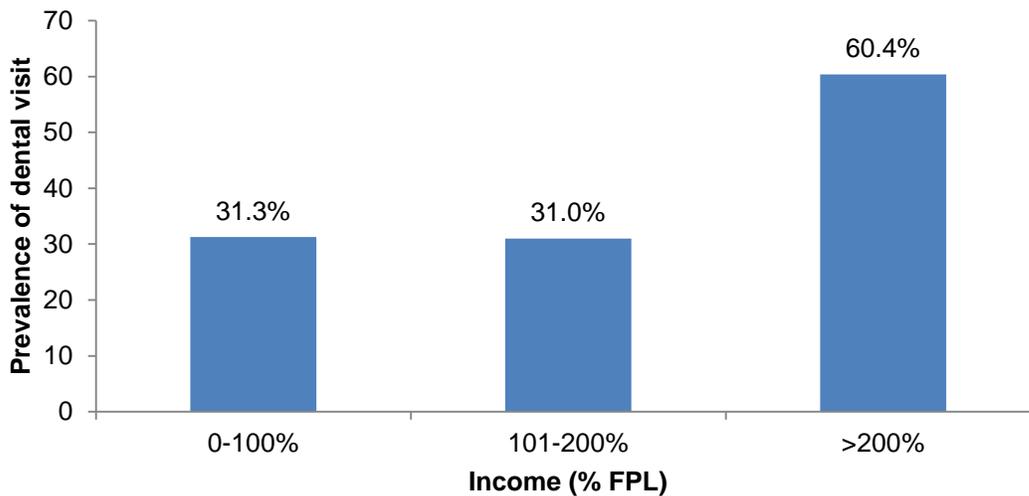
*Excludes women with other forms of insurance (military, etc). Women with both Medi-Cal and private insurance were included in the Medi-Cal group.

Figure 12. Prevalence of Receipt of Dental Visit during Pregnancy in California by Race, 2012



Source: Maternal and Infant Health Assessment (MIHA), 2012
 Data provided by the Maternal, Child, and Adolescent Health Program. Analysis conducted by University of California, San Francisco.

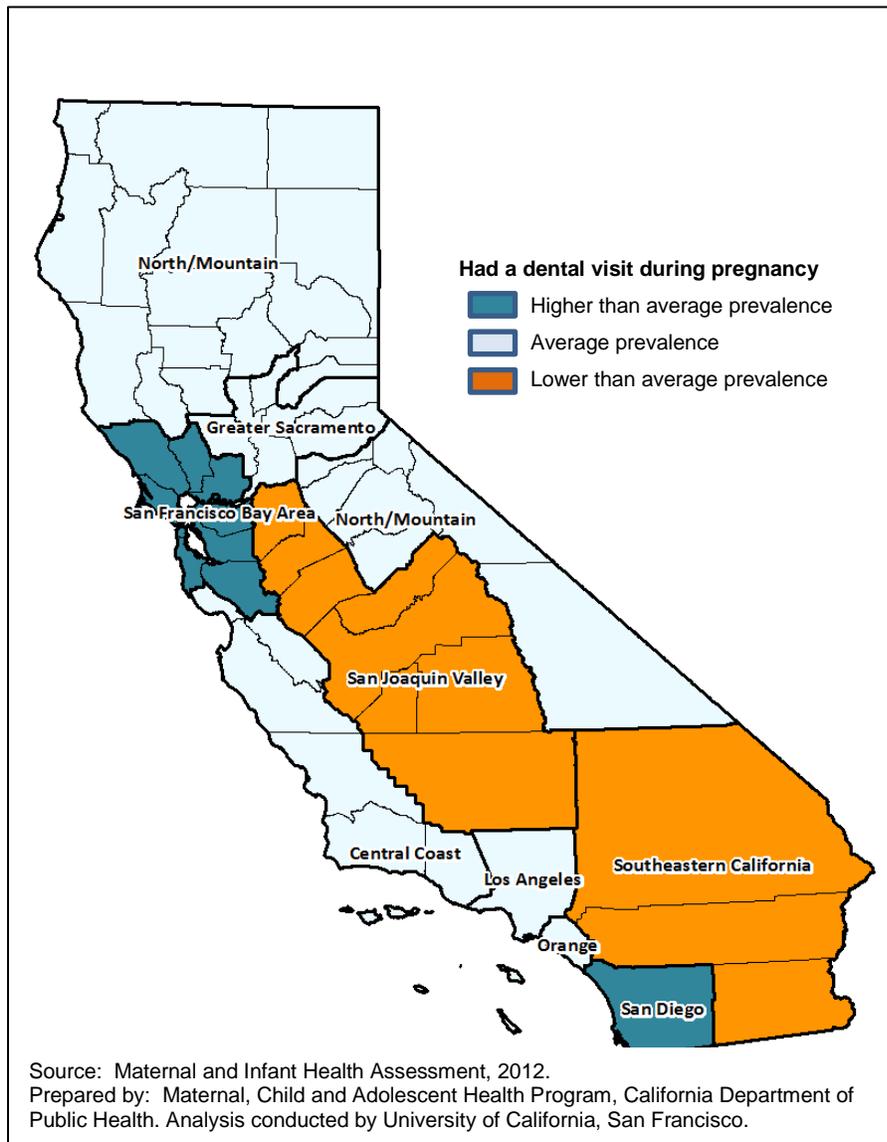
Figure 13. Prevalence of Receipt of Dental Visit during Pregnancy in California by Income, 2012



Source: Maternal and Infant Health Assessment (MIHA), 2012
 FPL is Federal Poverty Level. Data provided by the Maternal, Child, and Adolescent Health Program. Analysis conducted by University of California, San Francisco.

Receipt of dental care during pregnancy also varies geographically. Women living in the San Joaquin Valley and southeastern regions of California had a lower prevalence of dental visits during pregnancy than women in the rest of California (see Figure 14).

Figure 14. Dental Visit During Pregnancy by Maternal and Infant Health Assessment (MIHA) Region, California, 2012



Leading reasons for not having a dental visit during pregnancy were:

- A perceived lack of need for dental care (42 percent)
- The cost of dental care (39 percent)
- Inadequate dental insurance (37 percent)
- A belief that it was unsafe (30 percent)
- Logistical barriers (30 percent) [49]

Whereas, women with private dental insurance and those with higher incomes and education felt that they did not need to get dental care during pregnancy, women who are Medi-Cal recipients, cited cost and lack of dental insurance as the top reasons for not seeking care.

Medi-Cal does not impose co-insurance, premiums, co-payments or other forms of cost sharing for pregnant women under 213 percent of the federal poverty level. Pregnant women with income above 213 up to and including 322 percent of the FPL are required to pay a cost of 1.5 percent of their modified adjusted gross income. There are no other deductibles or copayments for pregnant in this income range.

Based on increasing evidence of the importance of dental care during pregnancy, California’s perinatal oral health guidelines [47] encourage medical providers to educate their patients and refer them to dental care. Despite barriers to receiving dental care during pregnancy, promotion of oral health by medical providers has been associated with a higher prevalence of dental care. Among women whose medical providers recommended that they see a dental provider, 64 percent had dental care during pregnancy, compared to 34 percent of women whose medical providers did not make such a recommendation. [49] During pregnancy, less than half of California women had a medical provider who addressed oral health-care— 42 percent reported that their providers discussed the health of their teeth and gums, and only 26 percent reported that their medical provider recommended that they see a dental provider (Figures 15, 16).

Figure 15. Percent of Pregnant Women in California Whose Medical Provider Talked about Health of Teeth and Gums, 2012

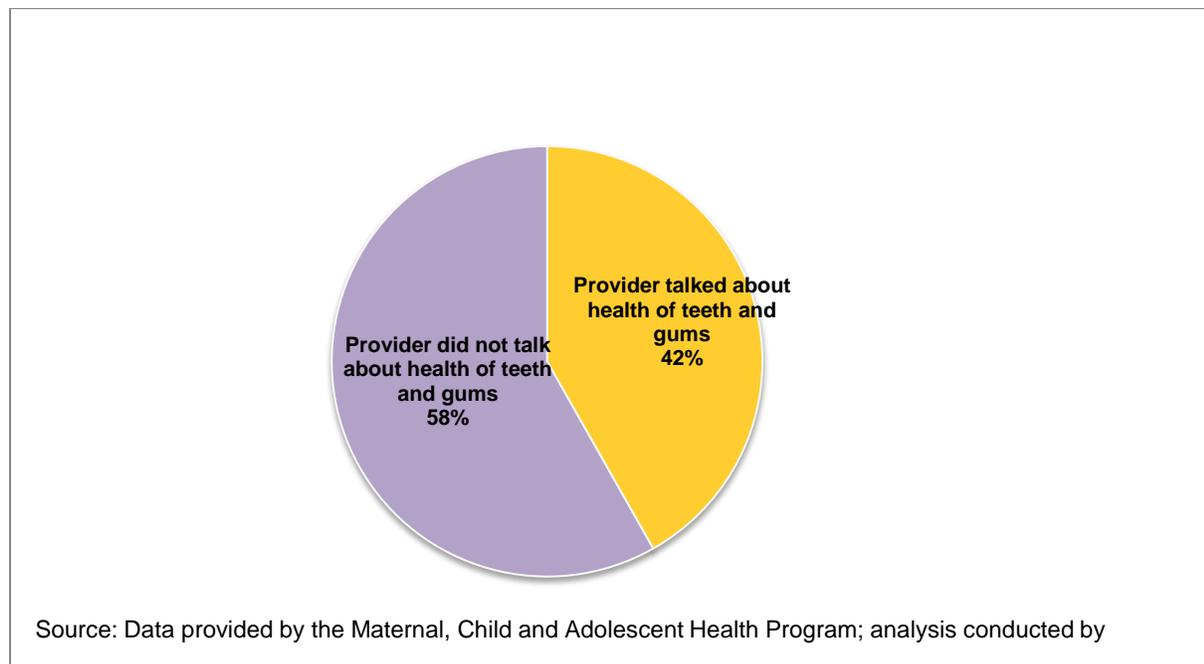
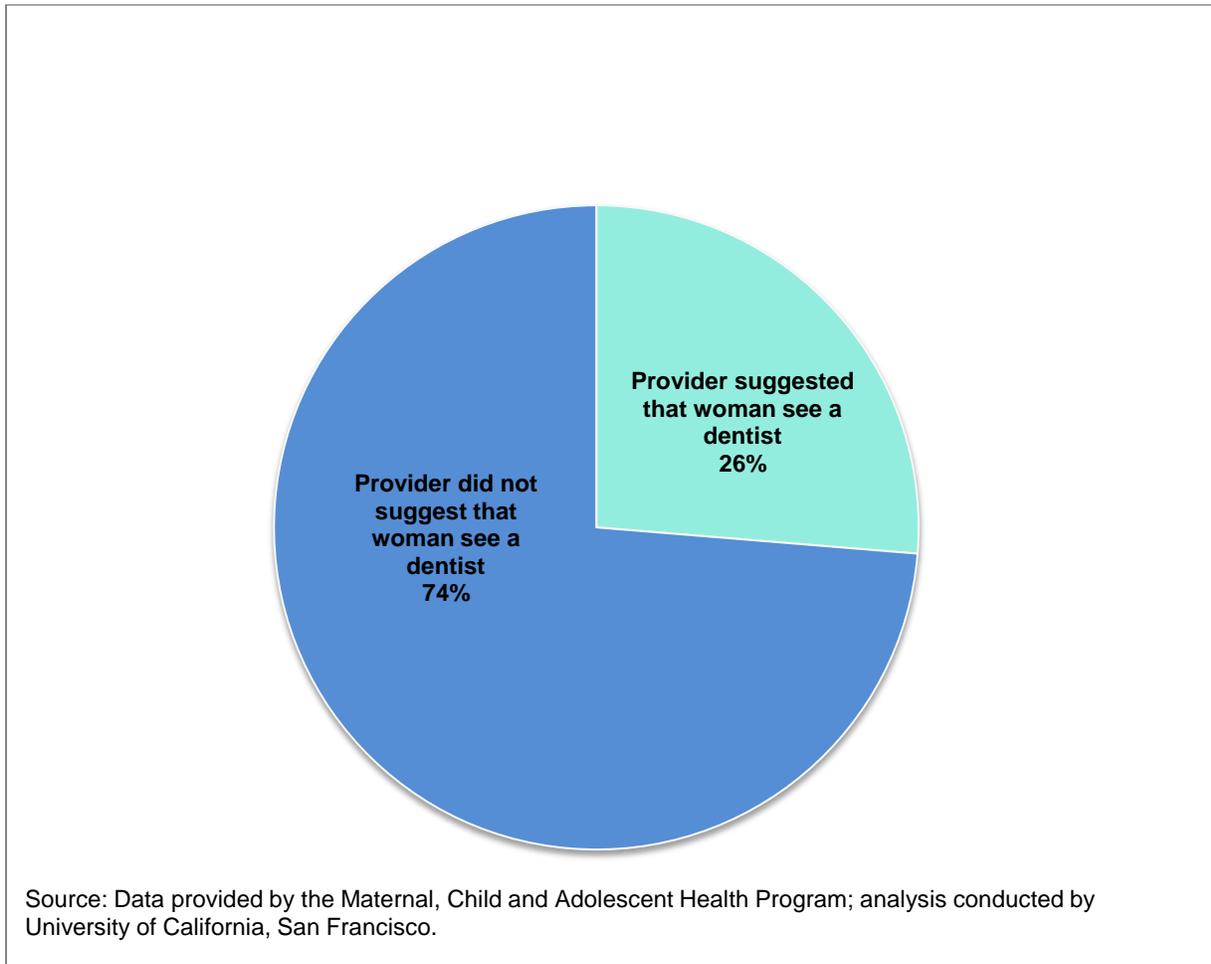


Figure 16. Percent of Pregnant Women in California Whose Medical Provider Suggested They See a Dentist, 2012



Disabilities

The oral health problems of individuals with disabilities are complex. These problems *may* be due to underlying congenital anomalies as well as an inability to perform personal hygiene or receive clinical dental services needed to maintain oral health. In 2010, more than 56.7 million persons in the United States reported having a disability, [50] including 2.8 million children aged 5-17. [51] Among non-institutionalized Californians age 5 and older, there is a lower percentage with selected disabilities including any disability, sensory disability, physical disability, mental disability, and self-care disability compared to the United States as a whole; however, a higher percentage of Californians age 16 to 64 have difficulty going outside of the home or they have an employment disability. [52]

No national studies have been conducted to determine the prevalence of oral and craniofacial diseases among populations with disabilities. Individuals with special health care needs, including those with complex medical, physical, or psychological conditions, are at greater risk for poor oral health than the general population, including untreated

tooth decay, tooth loss, and periodontal disease. [2] Disparities in outcomes and care in this diverse group may be related to a variety of factors, including difficulty maintaining oral hygiene due to physical or intellectual limitations, medications that adversely affect oral health (i.e., reduced saliva flow), and difficulty with physical access to a dental office. [2]

In California, to treat oral health problems of individuals with disabilities, the California Children's Services (CSS) program provides health services including diagnostic, treatment, and dental services, among others, to children from birth up to 21 years of age.

Social Impact

Oral health is related to well-being and quality of life as measured along functional, psychosocial, and economic dimensions. Diet, nutrition, sleep, psychological status, social interaction, school, and work are all affected by impaired oral and craniofacial health. Oral and craniofacial diseases and conditions may compromise the ability to bite, chew, and swallow foods, resulting in limitations in food selection and poor nutrition. These conditions include tooth loss, diminished salivary functions, oral-facial pain conditions such as temporomandibular disorders, alterations in taste, and functional limitations of prosthetic replacements. Oral-facial pain, as a symptom of untreated dental and oral problems and as a condition in and of itself, is a major source of diminished quality of life. It is associated with sleep deprivation, depression, and multiple adverse psychosocial outcomes. [1] Considering the importance of the mouth and teeth in verbal and nonverbal communication, diseases that disrupt their functions are likely to damage self-image and alter the ability to sustain and build social relationships.

Economic Impact

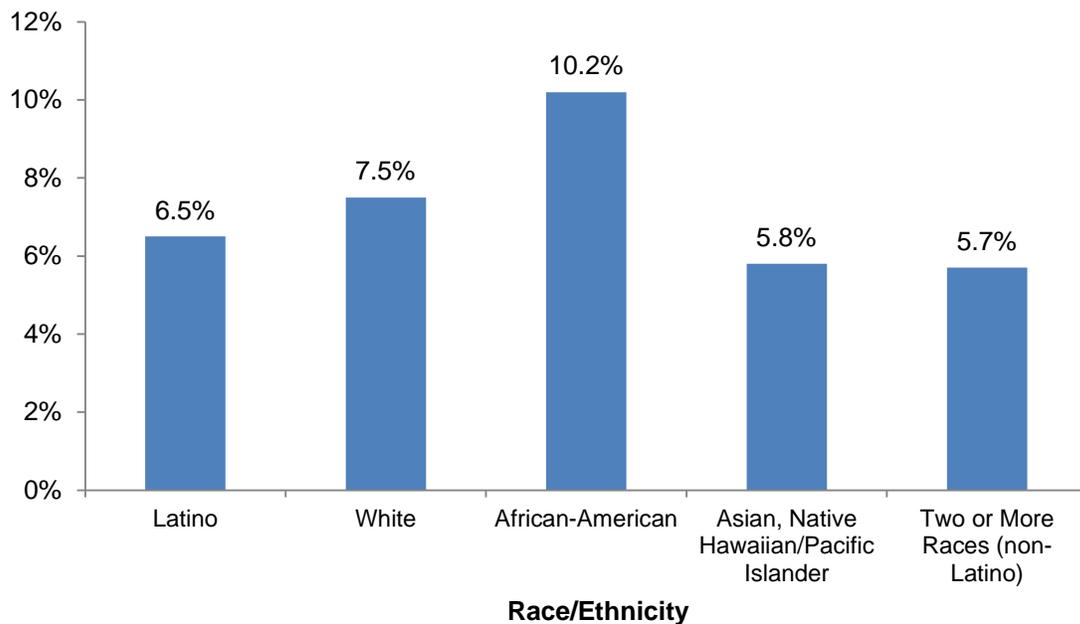
Nationally, both private and public expenditures from dental services in 2009 were \$102.2 billion, and in California they totaled \$14.7 billion. [53]

A large proportion of dental care costs are paid out-of-pocket by patients. Nationally, in 2008, nearly half (49.7 percent) of dental care expenditures were paid out-of-pocket and 41.8 percent of the cost was paid by private dental insurance. In comparison, 42.1 percent of Californians paid out-of-pocket for dental care and 44.2 percent of the cost was paid by private dental insurance. Dental care expenditures averaged \$671 per year nationally and \$711 per year in California. [54] Cost is the top reason adults cite for not planning to visit a dentist in the coming 12 months. [55]

Nationally, oral and craniofacial diseases and their treatment also place a burden on society in the form of lost days and years of productive work. In the U.S. children miss approximately 51.7 million hours of school each year as a result of a dental problem or visits. [56] According to the CDC, employed adults lose over 164 million hours of work each year due to oral health problems or dental visits. [57]

Dental problems cause California students to miss an estimated 874,000 days of school each year, costing schools over \$29 million resulting from a reduction in the average daily attendance rate. [58] Children who reported having recent tooth pain were four times more likely to have a low grade-point average. [59, 60] Among racial/ethnic groups, African-American children in California have a higher prevalence of missed school days due to dental problems than other groups (Figure 17).

Figure 17. Percentage of Californians Aged 5–17 Years Who Missed One or More Days of School Due to a Dental Problem in the Past Year by Race, 2007



Source: California Health Interview Survey (CHIS), 2007

Data for American Indian/Alaska native not included due to unstable estimates.

The race variable uses California Department of Finance's race categories (Version 1).

Latino is considered a race category. Any individuals who reported that they were of Latino/Hispanic origin were assigned to the 'Latino' category.

Oral Disease and Overall Health

Oral health and general health are integral to each other. Oral signs and symptoms may provide the first clues to the presence of other diseases such as diabetes, autoimmune disorders, human immuno-deficiency virus (HIV), and nutritional deficiencies. The mouth can be an entry point as well as a site for bacterial and viral infections that affect general health status. Oral conditions may not only reflect general health, but may adversely affect other chronic conditions. [3] Periodontitis has been associated with an increased risk of cardiovascular disease, [61] and the relationship between periodontal disease and diabetes has been described as “bi-directional” in which each condition can have a negative effect on the other. [62a] Infection of the gum is linked to systemic inflammation; and it is thought this infection adversely affects glycemic control. [62b]

III. Risk and Protective Factors for Oral Disease

Tobacco Use

The devastating effects of tobacco use on health and well-being are firmly established. Annually, nearly one-half million Americans die prematurely from smoking, while estimated costs of smoking and tobacco exposure are approaching \$300 billion per year. Nationally, direct medical costs related to tobacco use and exposure are at least \$130 billion per year and productivity losses lead to more than \$150 billion in indirect costs. One in three cancer deaths is caused by smoking. [63]

The adverse effects of tobacco use on oral health are also well established:

- 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 cancers (cancers of the lip, tongue, pharynx, and mouth) [63]
- Half of periodontal disease cases in the United States may be attributable to cigarette smoking [64]
- Smoking significantly increases inflammation of the gum and decreases clinical attachment levels of teeth to their supporting structures, leading to periodontitis and eventual tooth loss [65]
- Tobacco use decreases the effectiveness of periodontal therapy and success of dental implants, impairs oral wound healing, and increases the risk of a wide range of oral soft-tissue changes [66]

Comprehensive tobacco control programs reduce disease, disability, and death related to tobacco use by preventing the initiation of tobacco use, promoting tobacco cessation, eliminating exposure to secondhand tobacco smoke, and addressing disparities. Since 1990, the California Tobacco Control Program (CTCP) has been a leader in the fight to reduce tobacco use by youth, help tobacco users quit, and work toward increasing California's tobacco-free environments.

Although the smoking prevalence of high school students has decreased since 2000, the trend of illegal sale of tobacco to minors has not gone down since 2009. [67]

Tobacco use among youth and the reduction of illegal sales remain a public health issue that requires continued surveillance and prevention efforts.

In California, 13.8 percent of adults over age 18 are smokers. This is close to the HP 2020 target of 12 percent. Yet disparities remain: African-Americans and American Indians/Alaska natives have the highest smoking prevalence of all racial/ethnic groups in the state, at 21 percent and 29 percent, respectively (Table 3). [16]

Although significant progress has been made in the fight against tobacco, its use continues to take a physical, emotional, and financial toll:

- Tobacco remains the number one cause of preventable death, disease, and disability in California and the country. Annually, more than 35,000 people in California die prematurely from a tobacco-related disease [67]

- More than 3.6 million Californians smoke tobacco products (Source: California Tobacco Control Program [67])
- Smoking costs California \$18.1 billion annually, or \$4,603 per smoker. The cost is shared by all Californians, not only the smokers [68]

The U.S. Public Health Service's tobacco use and dependence clinical practice guidelines recommend that all health care providers, including dental providers, promote tobacco cessation to all patients and incorporate the guidelines into clinical practice. Similarly, U.S. Preventive Services Task Force (USPSTF) guidelines recommend that primary care clinicians provide interventions, including education or brief counseling, to prevent initiation of tobacco use among school-aged children and adolescents. In California, Medi-Cal's Early and Periodic Screening, Diagnostic and Treatment (EPSDT) tobacco cessation services for persons under 18 years of age follow American Academy of Pediatrics guidelines. For children and adolescents, counseling is recommended for adolescents who smoke, because it has been shown to be effective in treating adolescent smokers. Further, counseling is also recommended and shown to be effective in a pediatric setting of parents who smoke. Secondhand smoke can be harmful to children. Moreover, under the Patient Protection and Affordable Care Act, coverage for medically necessary tobacco cessation services, including both counseling and pharmacotherapy, is mandatory for children up to age 21 under Medicaid's EPSDT benefit. This benefit includes the provision of anticipatory guidance and risk reduction counseling regarding tobacco use. This includes a referral to the Helpline. [69]

Given these guidelines, the dental office provides an excellent venue for providing tobacco intervention services. Dental patients may be particularly receptive to health messages at periodic check-up visits, and the oral effects of tobacco use provide visible evidence and a strong motivation for tobacco users to quit. Dentists and dental hygienists can be effective in screening for, and treating, tobacco use and dependence. Results from a nationally representative survey in the United States in 2010–2011 indicated that more than 90 percent of dental providers reported that they routinely asked patients about tobacco use, 76 percent counseled their patients about tobacco use, and 45 percent routinely offered cessation assistance in the form of counseling referrals and cessation prescriptions. [70] These results appear to be contradicted, however, by another survey in which only about 1 in 10 smokers (11.8 percent) who visited a dental provider reported receiving advice to quit, while half of current smokers that visited a medical provider within the past year were advised to quit. [71]

Table 3. Adults Aged 18 Years and Older Who Are Current Smokers^a in the United States and California, by Selected Characteristics

	United States ^b (%) 2012	California ^c (%) 2011–12
Total Healthy People 2020 Target: 12	18.2	13.8
Race or Ethnicity		
American Indian or Alaska Native	18.8	29.1
Asian	10.2	10.0
Native-Hawaiian/Pacific-Islander	DSU ^d	
Black or African-American	17.7	21.0
White	18.8	14.7
Hispanic or Latino	12.1	12.3
Not Hispanic or Latino	19.4	14.5
Black or African-American	17.8	21.0 ^e
White	20.6	14.7 ^e
Sex		
Female	15.9	11.0
Male	20.6	16.7

Table 3 Sources:

Healthy People 2020, HP2020 Objective Data Search. More recent data can be found at: <http://www.healthypeople.gov/2020/data-search/Search-the-Data?nid=5287>

^aNumber of persons aged 18 years and over who have smoked at least 100 cigarettes in lifetime and who now report smoking cigarettes every day or some days

^bAge-adjusted to the US Census 2000 standard population.

^cCalifornia Health Interview Survey (CHIS), 2011–12

^dData are statistically unreliable or do not meet criteria for confidentiality

^eCHIS only estimates smoking prevalence for non-Latino black/African-American and white respondents

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 optimal 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 more than 65 years and has been recognized as one of ten great achievements in public health in the 20th century. [72] It is an ideal public health method because it is effective, eminently safe, inexpensive, requires no behavior change by individuals, and does not depend on access or availability of dental services. Water fluoridation is equally effective in preventing dental caries among different socioeconomic, age, racial, and ethnic groups. Water fluoridation helps lower the overall cost of dental care and prevent tooth loss. [1]

Water fluoridation offers significant cost savings to almost all communities. [73] Every \$1 invested in community water fluoridation saves approximately \$38 in dental treatment costs. [72] The cost per person of instituting and maintaining optimal water fluoridation of a community water system decreases with increasing population size.

California law requires fluoridation of public water systems, subject to available funding (Health and Safety Code § 116409–116415). [74] In 2012, 38 million people living in California received their drinking water from a community water system, but just over 24 million people (63.7 percent of the population) received fluoridated water. California's percentage is lower than the HP 2020 objective (OH-13), which is 79.6 percent. Although more people are served by fluoridated water in California than in any other state, California ranks 34th in the proportion of the overall population served by community water fluoridation. [72]

The last statewide survey of dental caries and community water system fluoridation status in California was conducted in 1993-1994. [75] This survey provided evidence of lower caries prevalence among school children in fluoridated areas in California; higher fluoridation was correlated with lower caries prevalence. The 1993-1994 survey led to the 1995 California fluoridation law (Assembly Bill 733) and subsequent plans to expand the number of community water systems with fluoridation in California. Efforts to fluoridate additional community water systems in California continue. [76]

Topical Fluorides and Supplements

Fluoride from sources such as toothpastes, mouth rinses, professionally applied fluoride treatments, and prescription fluoride supplements also aids in preventing tooth decay. [72] For communities that do not have access to fluoridated water and persons at high risk of dental caries, additional fluoride measures may be needed. Public health measures can include fluoride mouth rinse or tablet programs, which typically are conducted in schools. Individual measures include professionally applied topical fluoride gels or varnish for persons at high risk of dental caries.

The U.S. Preventive Services Task Force guidelines for oral health recommend that primary care clinicians prescribe oral fluoride supplementation starting at age 6 months for children whose water supply is deficient in fluoride, and apply fluoride varnish to the primary teeth of all infants and children starting at the age of primary tooth eruption.

Dental Sealants

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

Pit-and-fissure dental sealants—plastic coatings bonded to susceptible tooth surfaces—have been approved for use for many years and recommended by professional health/dental associations and public health agencies. The first permanent molars erupt into the mouth at about age 6. 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. The Community Preventive Services Task Force recommends school-based sealant delivery programs based on strong evidence of effectiveness in preventing tooth decay among children. [77] Pit-and-fissure surfaces of teeth are susceptible to dental caries in older children as well. Therefore, young

teenagers need to receive dental sealants shortly after the eruption of their second permanent molars, usually between aged 11 and 14. [78]

The California Children’s Dental Disease Prevention Program (CCDDPP) served approximately 300,000 students in over 1,000 schools in 33 counties. Children received dental sealants, fluoride supplements (such as fluoride varnish, mouth rinse, and tablets), oral health education, toothbrush/flossing instruction, and, in some cases, oral health screenings. Although no statewide data exist in California to determine the prevalence of these preventive measures, the number of children receiving topical fluoride, fluoride supplements, and dental sealants is likely to be lower now due to CCDDPP’s elimination.

Oral Health Education

Oral health education informs, motivates, and helps people adopt and maintain beneficial health practices and lifestyles; causes policy makers to create policy and environmental changes to improve oral health; and leads to 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 empower people and communities to take action to protect their health.

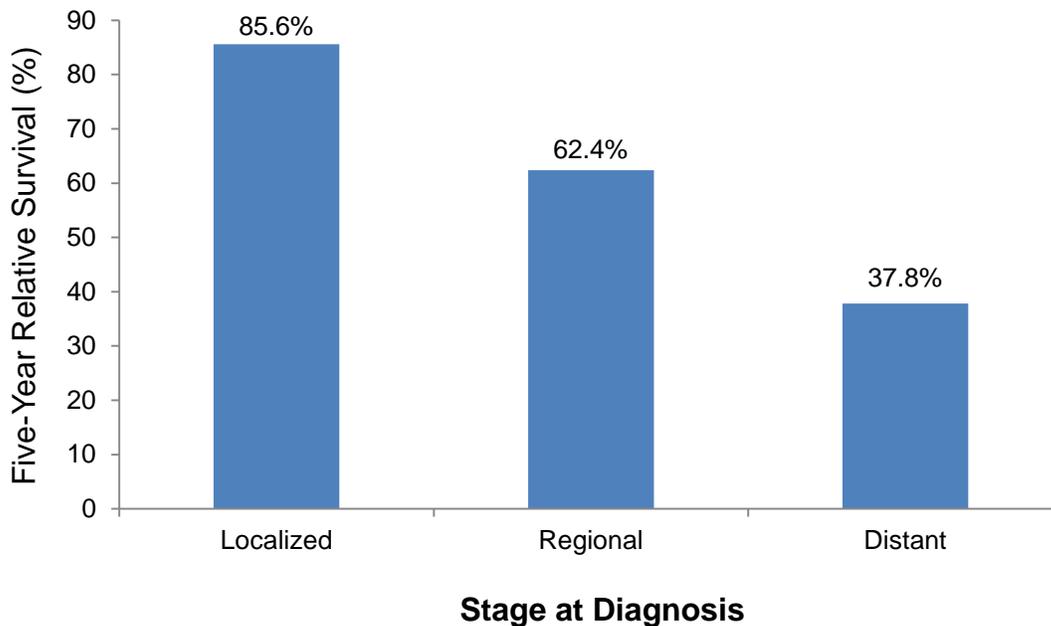
Local health departments (LHDs), Child Health and Disability Prevention (CHDP) programs, Head Start/Early Head Start, and First 5 programs provide oral health education at the local level to the extent possible.

Early Detection of Oral Cancer

Survival rates from oral cancers vary widely, depending on the stage of disease at diagnosis (Figure 18). In California, oral cancer diagnosed at a localized stage has the highest five-year survival rate—85.6 percent. In contrast, the five-year survival rate is only 62.4 percent once the cancer has spread to lymph nodes, and only 37.8 percent when oral cancer has spread to other parts of the body (distant metastasis).[80]

Several HP 2020 objectives specifically address early detection of oral cancer: OH-6 is “Increase the proportion of oral and pharyngeal cancers detected at the earliest stage,” and OH-14.2 is “Increase the proportion of adults who received an oral and pharyngeal cancer screening from a dentist or dental hygienist in the past year.” [7] In California, 23 percent of oral cancers are detected at the earliest stage, with variation by sex, race, ethnicity, and age (Table 4). Although early detection greatly improves survival rates, the evidence is insufficient to assess the balance of benefits and harms of screening for oral cancer in asymptomatic adults. [81]

Figure 18. Five-Year Relative Survival for Oral and Pharyngeal Cancer in California by Stage at Diagnosis, 2002-2011



Source: California Cancer Facts and Figures (http://www.ccrca.org/pdf/Reports/ACS_2014.pdf), California Department of Public Health.
 Note: Follow-up is through December 2010. Cancers that were unstaged at time of diagnosis are excluded.

Table 4. Proportion of Oral and Pharyngeal Cancers Detected at the Earliest Stage* in the United States and California, by Selected Characteristics

	Proportion of Oral and Pharyngeal Cancers Detected at the Earliest Stage	
	United States (2009) (%)	California (2011) (%)
Healthy People 2020 Target: 35.8		
TOTAL	31.2	23.2
Sex		
Male	26.8	19.4
Female	41.5	32.7
Race or ethnicity		
American Indian or Alaska native	25.8	
Asian/Pacific-Islander	27.1	
Black or African-American	22.6	
White	32.0	
Hispanic or Latino	29.1	18.2

	Proportion of Oral and Pharyngeal Cancers Detected at the Earliest Stage	
	United States (2009) (%)	California (2011) (%)
Not Hispanic or Latino**	31.3	
Black or African-American, not Hispanic or Latino	22.7	15.3
White, not Hispanic or Latino	32.2	25.0
American-Indian or Alaska native		17.4
Asian/Pacific-Islander		20.3
Age Group		
<20 years	46.1	42.1
20–34 years	53.3	36.1
35–44 years	34.7	26.8
45–64 years	26.1	18.6
65–74 years	33.1	24.9
75 years and over	38.4	29.0

Table 4 Sources: HP 2020, CCR (2011)

*Earliest stage has been defined as Stage 1 after referring to HP 2020 OH-6. Only cases with known stage are included in the analysis.

**For California, race/ethnicity is grouped into the mutually exclusive categories of non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic Asian/Pacific Islander, and non-Hispanic American-Indians.

California Data Source: CCR (www.ccrca.org), CDPH. SEER*Stat Database: Incidence - California, June 2014 (1988–2011), 07/24/2014; NAACCR 3339 Version. Benchmarked 1988-1989 DOF population estimates, 6/12/2006; NCHS population estimates 1990–2011.

NOTE: Averaging the sum of age groupings will not equal the US and California total averages of 31.2% and 23.2%, respectively. This is because the numbers in the table are age-specific proportions and not actual case counts. In other words, the average of sums (case counts) is not the same as the average of the proportions.

IV. Dental Services

Dental Visits

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

Adults who do not receive regular professional dental 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/or poorly fitting or poorly maintained dentures.

Racial and ethnic minorities and individuals with less education and more limited incomes are less likely to have visited a dentist or dental clinic within the last year. In California, racial and ethnic minorities, people with less than a high school education, and those with annual incomes under \$25,000 are least likely to have visited a dentist or dental clinic within the prior 12 months (Table 5). [82]

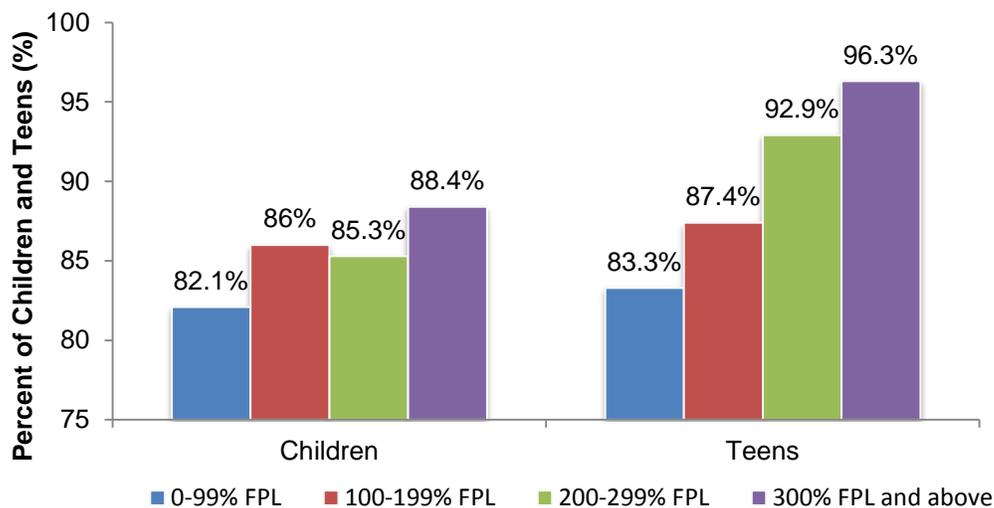
Children and teens near or below the poverty line are less likely to have had a dental visit in the last year (Figure 19). [16]

Table 5. Proportion of Persons Aged 18+ Years Who Visited a Dentist or Dental Clinic in the Previous 12 Months in 2008

	Dental Visit in Previous Year, 2008	
	United States (%)	California (%)
Healthy People 2020 Target: 49.0		
TOTAL	68.5	67.6
Age		
18–24	67.0	63.2
25–34	63.8	61.9
35–44	69.5	64.2
45–54	71.0	71.1
55–64	72.2	74.5
65+	67.1	73.3
Race or Ethnicity		
White	72.1	75.7
Black	59.3	63.2
Hispanic	58.4	58.2
Other	68.0	70.4
Multiracial	60.5	67.8
Sex		
Male	66.3	65.2
Female	70.5	70.0
Education level		
Less than high school	46.1	51.1
High school graduate or GED equivalent	61.9	63.6
Some Post-High School Education	69.3	68.0
College graduate	81.0	81.0
Income Level		
Less than \$15,000	45.8	52.6
\$15,000–24,999	51.0	50.3
\$25,000–34,999	59.5	59.0
\$35,000–44,999	67.7	67.2
\$50,000+	80.9	81.1

Source: HP 2020

Figure 19. Percent of Children and Teens in California Who Have Had a Dental Visit in the Last Year by Percent of Federal Poverty Level, 2011–2012



Source: California Health Interview Survey, 2011-2012. FPL is defined as the federal poverty line. Data is for children 0-11 years and teens 12-17 years of age. Prepared by Madhurima Gadgil, MPH

Emergency Department Dental Visits

Left untreated, dental disease can develop into serious problems that require an emergency department visit. In 2012, emergency departments in California had approximately 113,000 visits for preventable dental conditions. [83]

Providing dental care in emergency departments is significantly more expensive than providing preventive outpatient dental care. In 2009, the California Healthcare Foundation found that the average cost of a preventive dental visit ranged from \$41 to \$60, whereas the median cost of emergency treatment is nearly three times greater, at \$172. If treatment for the dental emergency requires hospitalization, the median cost increases dramatically to over \$5,000. [84]

Figures 20a and 20b show the rates of preventable emergency department dental visits by county. The *age-adjusted rates* shown in Figure 20a allow for comparison between counties by calculating the number of emergency room visits per 100,000 people. Figure 20b shows the *absolute number* of emergency department dental visits by county. When considering the number of dental visits alone, Figure 20b seems to show a higher number of dental visits concentrated in the southern counties. This is because the population in the southern counties is higher than the population in northern counties. However, when standardizing the population in each county and calculating the number of visits per 100,000 people, Figure 20a shows a more accurate reflection of the rate of emergency department dental visits.

Figure 20. Preventable Dental Emergency Department (ED) Visits in California by County, 2012

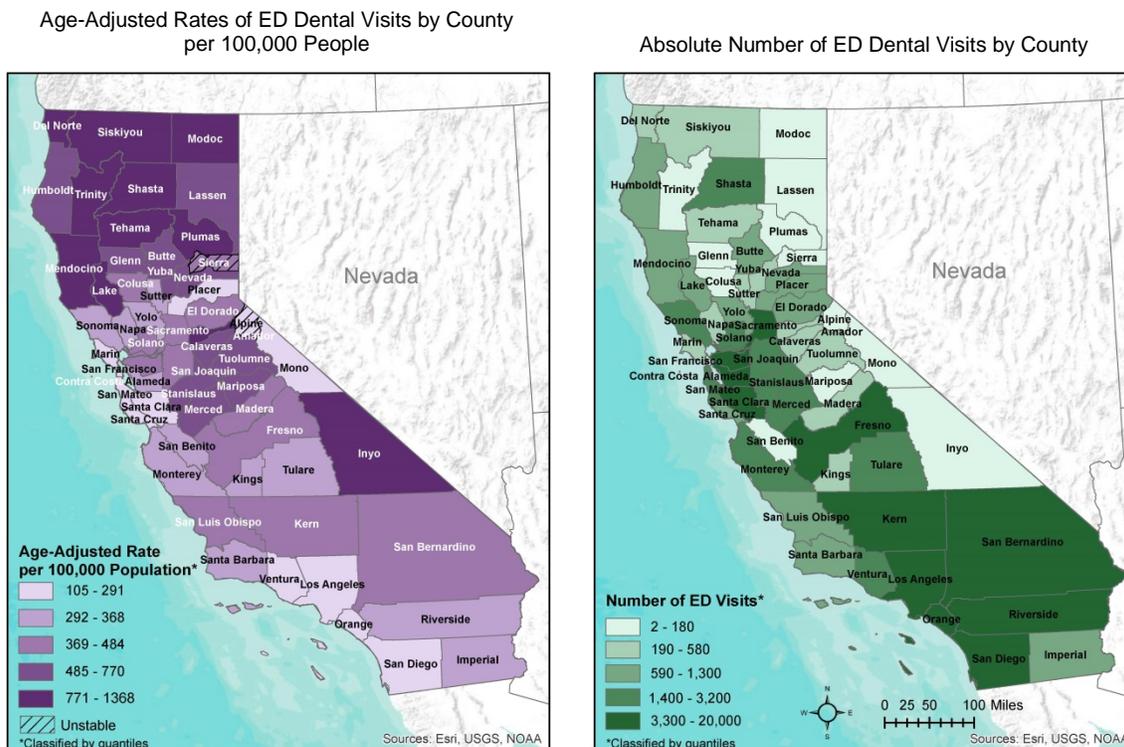


Figure 20a

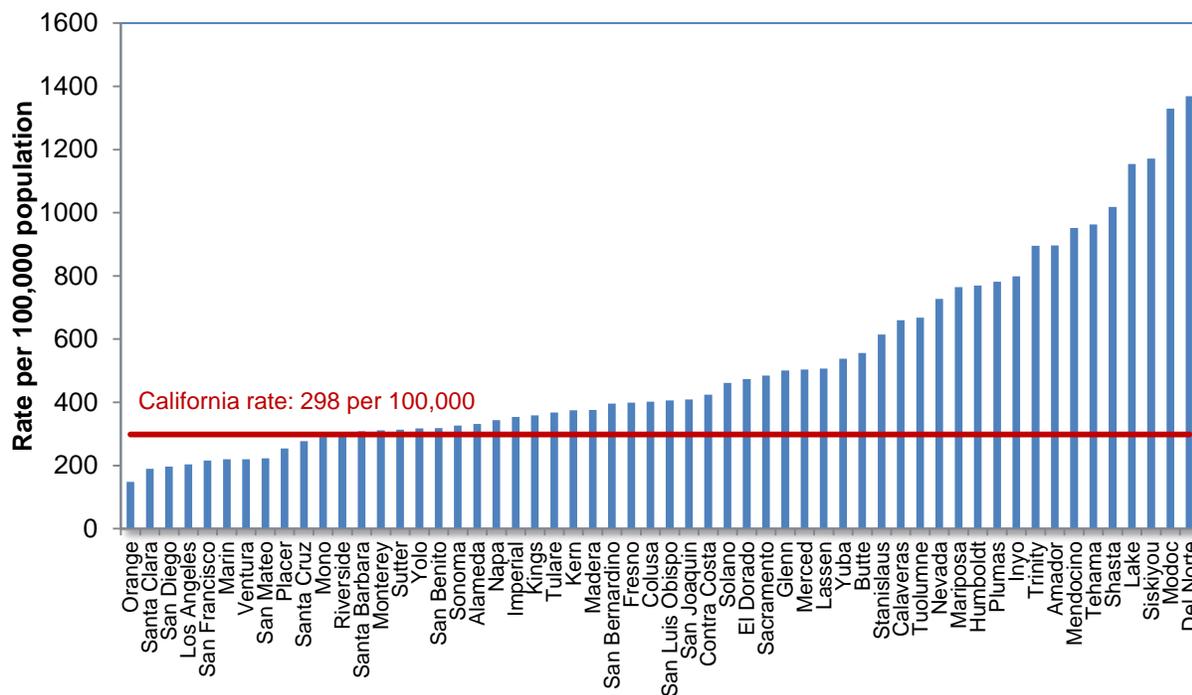
Figure 20b

Source: Office of Statewide Health Planning and Development (OSHPD), 2012
 Prepared by Madhurima Gadgil, MPH

Preventable dental-related emergency department (ED) visits were defined as those with ICD-9 diagnosis codes 521, 522, 523, 525, or 528. Rates were suppressed for counties with < 20 preventable dental-related ED visits. Rates are age-adjusted to the 2000 U.S. standard population.

Thus, of California’s 58 counties, Del Norte, Modoc, Siskiyou, Lake, and Shasta Counties have the highest age-adjusted rates of preventable emergency department dental visits. However, by sheer volume, San Diego, Riverside, Sacramento, San Bernardino, and Los Angeles Counties have the greatest number of emergency department visits for preventable dental conditions. Routine and timely preventive care would reduce the need for emergency department visits for dental conditions (Figure 21).

Figure 21. Age-Adjusted Rates of Preventable Dental Emergency Department Visits per 100,000 in California by County, 2012



Source: Office of Statewide Health Planning and Development (OSHPD), 2012

Prepared by Madhurima Gadgil, MPH

Rates are age-adjusted to the 2000 U.S. standard population. Preventable dental-related emergency department (ED) visits were defined as those with ICD-9 diagnosis codes 521, 522, 523, 525, or 528. Rates were suppressed for counties with <20 preventable dental-related ED visits (Alpine and Sierra).

Medi-Cal and Denti-Cal

Medicaid (known as Medi-Cal in California) is the primary source of health care for approximately 13.5 million Californians. This program is jointly funded by federal and state governments to assist states in providing medical, dental, and long-term care assistance to people who meet certain eligibility and medical necessity criteria. In 2011, the California Healthcare Foundation reported that Medi-Cal expenditures for dental services accounted for approximately 1 percent of the \$41.9 billion total spent on medical, dental, and long-term services. [93]

Medi-Cal covers dental services as part of a comprehensive set of benefits referred to as the Early and Periodic Screening, Diagnostic and Treatment (EPSDT) benefit for children and young adults under 21 years of age. In 2016, approximately 51 percent of the 11.1 million children (ages 0-20) in California had dental insurance coverage through Medi-Cal/Denti-Cal, (California’s Medicaid program); [88] in 2015, 44 percent of beneficiaries enrolled for at least 90 continuous days received at least 1 dental service through the program. [89]

Although oral screening may be a part of a physical exam, it does not substitute for a dental examination performed by a dental provider. A referral to a dental provider is

required for every child in accordance with the periodicity schedule set by the American Academy of Pediatric Dentistry. Per the Centers for Medicare & Medicaid Services (CMS), dental services for children must at least include relief of pain and infections, restoration of teeth, and maintenance of dental health. [85]

According to CMS, states have the flexibility to determine what dental benefits are provided to adult Medicaid enrollees. Although most states provide at least emergency dental services for adults, less than half provide comprehensive dental care. Except for pregnant women, there are no federally mandated minimum requirements for adult dental services.

As of May 1, 2014, the Medi-Cal Dental Program (Denti-Cal) restored many adult dental services. These restored benefits include: exams and x-rays, cleanings (Prophylaxis), fluoride treatments, fillings, root canals in front teeth, prefabricated Crowns (stainless steel or tooth colored), full dentures, and other medically necessary dental services. Cosmetic procedures, experimental procedures, and orthodontic services for adults are not covered benefits. [87]

Denti-Cal provides EPSDT dental services for beneficiaries under age 21 via fee-for-service in most parts of the state and Dental Managed Care contracts in Sacramento and Los Angeles Counties. As required by the EPSDT benefit, Denti-Cal provides all medically necessary dental services for any Denti-Cal beneficiary under 21 years of age in accordance with a periodicity schedule recommended by the AAPD. AAPD recommendations include, but are not limited to, routine cleanings, oral examinations to assess growth and development and caries risk, radiographic assessments, fluoride treatments (Prophylaxis, topical, and supplementation), counseling (anticipatory, oral hygiene, dietary, injury prevention, non-nutritive habits, speech/language development), assessments for treatment of developing malocclusion, pit and fissure sealants, removal of third molars, and transition to adult dental care when necessary. The Denti-Cal provider manual governs which procedures are covered benefits and the frequency at which they are allowable. For example, whenever a Denti-Cal provider completes an oral examination on a child, an EPSDT screening and diagnostic service has occurred. Subsequent dental treatment resulting from that initial examination is considered an EPSDT dental service if published in the provider manual. [86]

Child Health and Disability Prevention Program (CHDP)

The CHDP program oversees the screening and follow-up components of the federally mandated Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program for Medi-Cal eligible children and youth.

The CHDP program provides complete health assessments for the early detection and prevention of disease and disabilities for low-income children and youth. A health assessment consists of a health history, physical examination, developmental assessment, nutritional assessment, dental assessment, vision and hearing tests, a tuberculin test, laboratory tests, immunizations, health education/anticipatory guidance, and referral for any needed diagnosis and treatment.

Children's Health Insurance Program (CHIP)

The Children's Health Insurance Program (CHIP), previously known as the Healthy Families Program in California, provides health insurance for medical, vision, and dental services to children in families with incomes too high to qualify for Medi-Cal and up to 250 percent of the federal poverty level for children up to age 19, and up to 322 percent of the federal poverty level for children up to their 2nd birthday. [91]

Covered California

Covered California is California's health insurance exchange, established in 2010 as a result of the federal Patient Protection and Affordable Care Act. A wide variety of insurance providers participate in Covered California. [94]

Beginning in 2015, pediatric dental benefits were included in all standard health insurance plans offered by Covered California. In 2016 in the individual market, twelve health insurance plans sold through Covered California include pediatric dental benefits for members under age 19; tax subsidies are available to qualified families. Covered California will also offer six stand-alone family dental insurance plans that will provide comprehensive dental benefits for children and adults. Both dental HMO and dental PPO plan options are available. Family dental plans are offered at an additional cost. Adults can choose to enroll in one of these dental insurance plans without enrolling all family members. [95, 96]

As of March 2014, 1,395,929 individuals were enrolled in Covered California. Of those enrolled, 1,222,320 (88 percent) were eligible to receive federal subsidies to mitigate costs. [97, 98]

Local Health Departments and Community Clinics

The California population of over 38 million people is divided into 61 local health jurisdictions (58 counties and 3 cities). CDPH works with these 61 local health departments (LHDs) to implement public health programs at the local level, as the state is very large both in population and geography.

Some LHDs have conducted their own oral health needs assessments to develop oral health plans for their communities: Alameda, San Francisco, Marin, Santa Barbara, Los Angeles, and Orange Counties have completed oral health plans.

HP 2020 Objective OH-10 is: "Increase the proportion of local health departments and Federally Qualified Health Centers (FQHCs) that have an oral health program." In 2007, 75 percent of California FQHCs had an oral health component (oral health prevention, dental services, or referrals to dental providers), below the HP 2020 target of 83 percent for FQHCs. [7] In 2008, 25.8 percent of US local health departments had an oral health prevention program or offered dental services. The HP 2020 target is 28.4 percent for LHDs. [7] In January 2014, 32.8 percent of LHDs offered (either directly or by contract) oral health prevention or dental care services. [100]

Community clinics provide family-oriented primary care and preventive health services to people living in rural and urban medically underserved communities. These clinics serve populations in areas where economic, geographic, or cultural barriers exist, and are a key component of the medical safety net. There are 1182 California Community Clinics and Health Centers (CCHCs), 735 Federally Qualified Health Centers (FQHCs), 32 Rural Health Clinics (RHCs) in California, 38 FQHC Look-Alike sites, and 377 Community Clinics. CCHCs provide a significant proportion of comprehensive primary care services to Californians whose health insurance is publicly subsidized or who are uninsured. In these CCHCs, 691 dental providers (dentists and dental hygienists) provide education, diagnostic and treatment services, and referrals for complex dental conditions. Of the 16 million visits at CCHCs in 2013, 12 percent (1.9 million) were dental visits. [99]

In addition, other local health department and community clinical services related to oral health include migrant health. The Migrant Health Program is distributed throughout California and delivers health services to more than 650,000 migrant and seasonal farm workers. Many migrant health centers provide dental services in addition to primary care services.

Innovative Models of Care

Virtual Dental Home

The traditional dental care system has primarily delivered dental services in brick-and-mortar offices and clinics. Most data about dental services is based on billing claims or other information from this fixed-facility delivery mechanism. Recent national reports issued by the Institute of Medicine describe challenges and disparities in accessing oral health services that are experienced by a significant portion of the US population, and call for new systems to improve oral health in populations who are not adequately served by the traditional office-based delivery system. [2, 3]

An innovative new model for delivering dental care is the Virtual Dental Home (VDH), a demonstration project of the Pacific Center for Special Care at the University of the Pacific authorized by the California OSHPD. [101, 102] The VDH demonstration project, in existence for the past five years, employs dental hygienists to provide dental services in community settings such as Head Start pre-schools, elementary schools, residential facilities for people with disabilities, community centers, and nursing homes. VDH delivers preventive and early-intervention dental services and oral health information in these community settings.

It uses the latest telehealth technology to link practitioners in the community with dentists at remote office sites. Registered dental hygienists in alternative practice (RDHAP), dental hygienists working in public health programs (RDH) and registered dental assistants (RDA) can keep people healthy in community settings by providing education, triage, case management, preventive procedures, and interim therapeutic restorations. VDH connects patients with dentists in the area when more complex dental treatment is needed. [103] Approximately two-thirds of the patients seen in a VDH were able to receive the care they needed at the community site. Data collection and reporting systems will need to capture data about this and other innovative

community-based dental care systems to demonstrate increased access to care, improved outcomes, and costs saved.

Value-Based Purchasing Incentives (VBI) for Providing High-Quality Dental Services

A 2010 CDPH Oral Health Workforce grant funded by the federal Health Resources and Services Administration (HRSA) was awarded to the Pacific Center for Special Care. The grant included the development of a blueprint for a value-based purchasing project for Medi-Cal/Denti-Cal. The project plan included quality of care and outcome measures, a high-level project operations plan to implement strategies, and a description of policy, procedure, and strategy changes. A workgroup with CDPH and DHCS representatives, as well as national and statewide experts, completed the program design. As part of a new HRSA award, the VBI system will be piloted in at least one of three VDH sites. The premise of the VBI system is that value-based purchasing will provide financial incentives to implement strategies that will result in better integration of services, better oral health outcomes, and lower cost per capita for the dental-insurance-plan population. The VBI system has the potential to lead to a paradigm shift in the delivery of dental services.

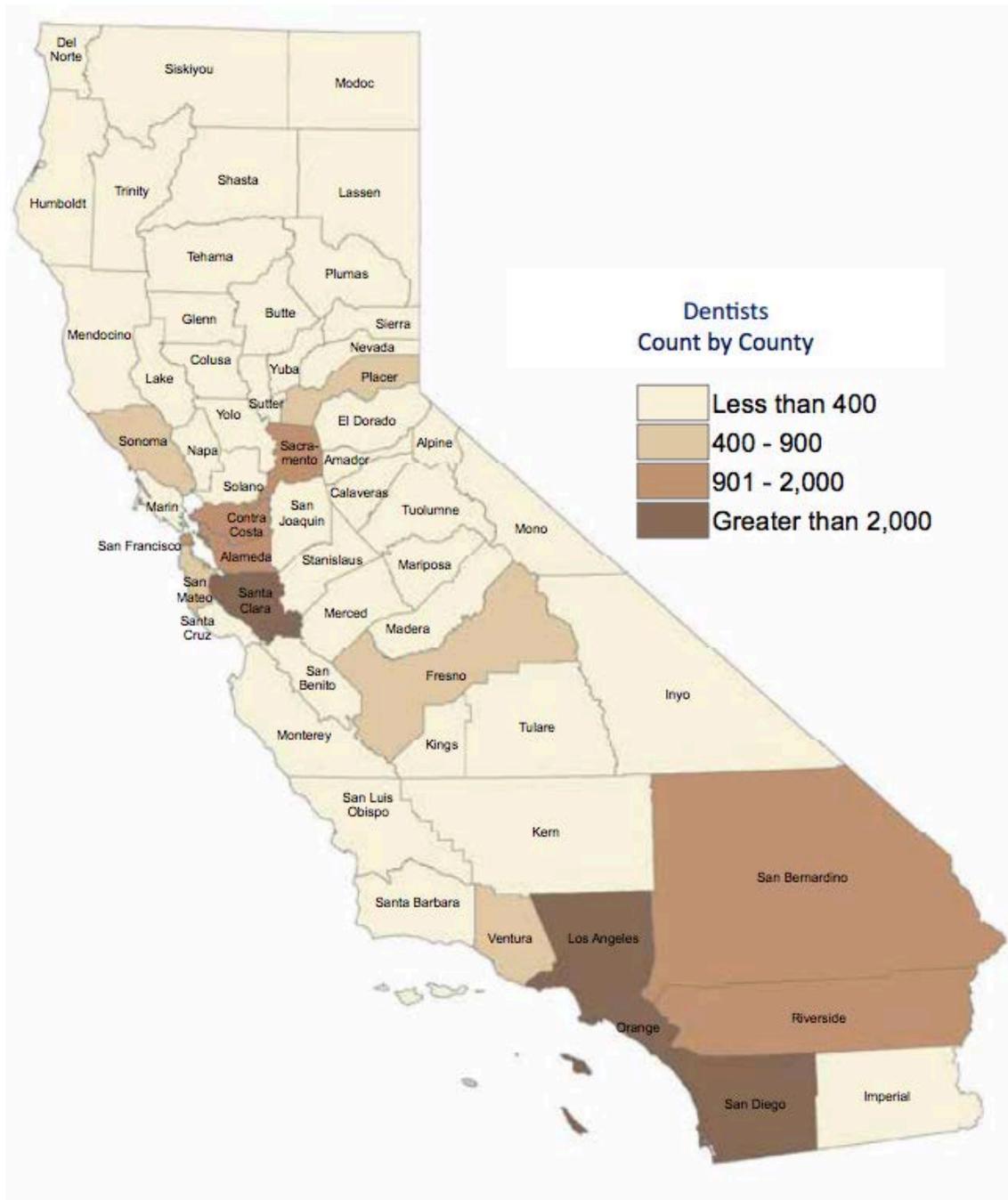
V. Access to Dental Services

A critical component of quality care is access to services. Health policies intended to expand access to care, improve quality of care, or constrain costs must take into consideration the supply, geographic distribution, and utilization of dental providers.

In June 2014, according to the Dental Board of California, California had 36,165 active licensed dentists, [104] 18,759 Registered Dental Hygienists (RDH), [105] and 34,159 Registered Dental Assistants (RDAs). [106] These professionals provide preventive and restorative dental services throughout the state.

Over 50 percent of dentists with California licenses reside in 5 of the 58 California counties, according to the 2013 OSHPD survey. Less than 40 percent provide dental services in the other 53 counties in California (11 percent of dentists live out of state). The 5 counties with the most dentists were Los Angeles, Orange, San Diego, Santa Clara, and Alameda—a total of 18,659 dentists. In comparison, the five counties with the fewest dentists—Sierra, Mono, Colusa, Trinity, and Modoc—had a combined total of 17 dentists (Figure 22). [107]

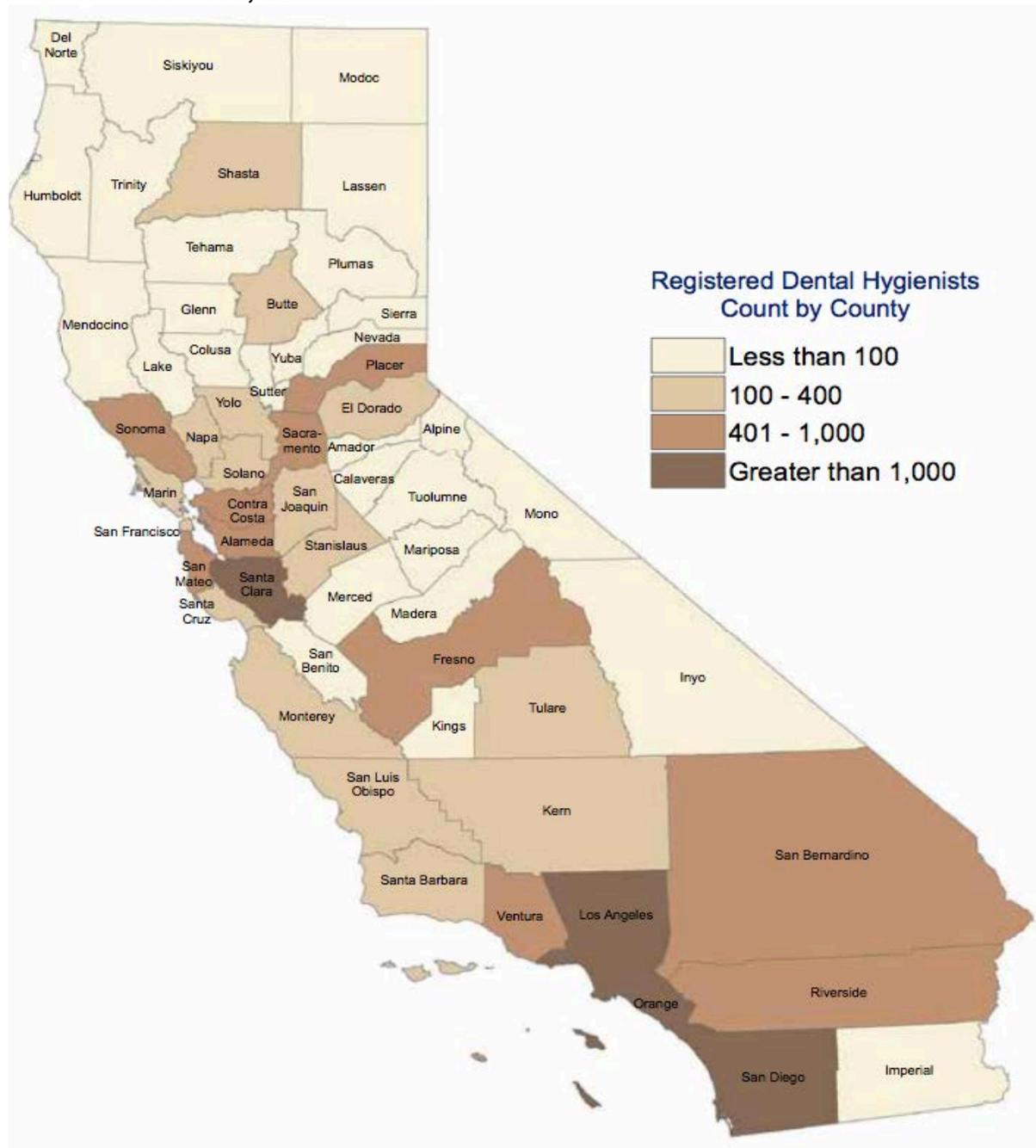
Figure 22. Current Supply of Dentists by County of Record, 2013



Data Source: Department of Consumer Affairs, Dental Board of California Public Master File, June 2013.
 For purposes of this Fact Sheet, currently licensed dentists are defined as "renewed and current".
 Revised 10/30/2013

The distribution of Registered Dental Hygienists in California showed a similar trend. In the same 2013 survey, over 50 percent of Registered Dental Hygienists reside in 8 of the state's 58 counties; less than 50 percent provide dental services in the remaining 50 counties. In addition, the majority (56 percent) of Registered Dental Hygienists work part-time [Figure 23]. [108]

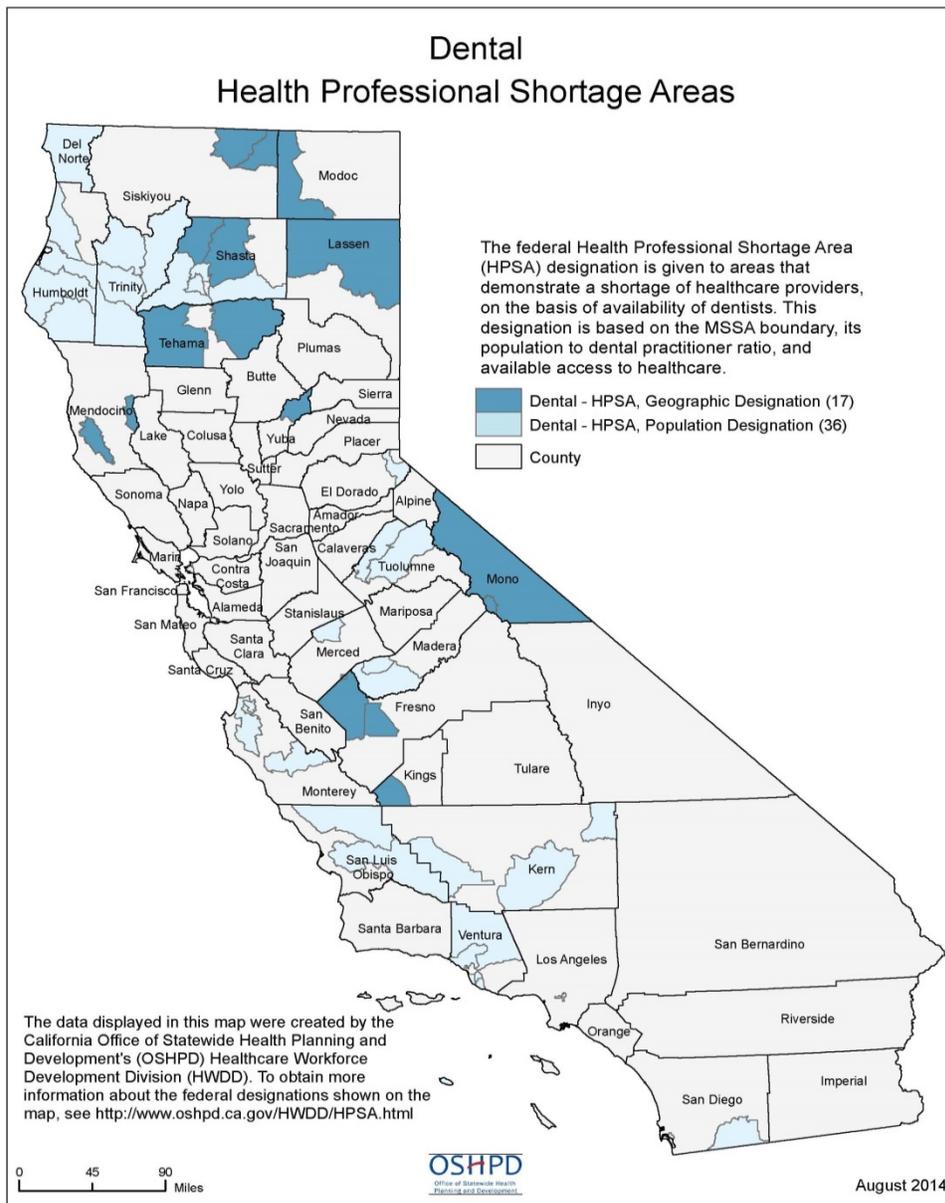
Figure 23. Current Supply of Registered Dental Hygienists (RDHs) by County of Record, 2013



Data Source: Department of Consumer Affairs, Dental Board of California Public Master File, June 2013. For purposes of this Fact Sheet, currently licensed RDHs are defined as "renewed and current". Revised 11/18/2013

California Dental Health Professional Shortage Areas (DHPSAs), as designated by the California Office of Statewide Health Planning and Development, have a population to general practice dentist ratio of 5,000:1; have a ratio of 4,000:1 plus population features demonstrating “unusually high need”; or have a lack of access to dental services in surrounding areas due to excessive distance, overutilization, or access barriers. [109] In August 2014, California had 17 DHPSAs, based on the geographic designation, and 36 DHPSAs, based on the population designation. The majority of DHPSAs are in Northern California; the rest are scattered through California’s Central Valley and central coastal areas (Figure 24).

Figure 24. Dental Health Professional Shortage Areas, 2014



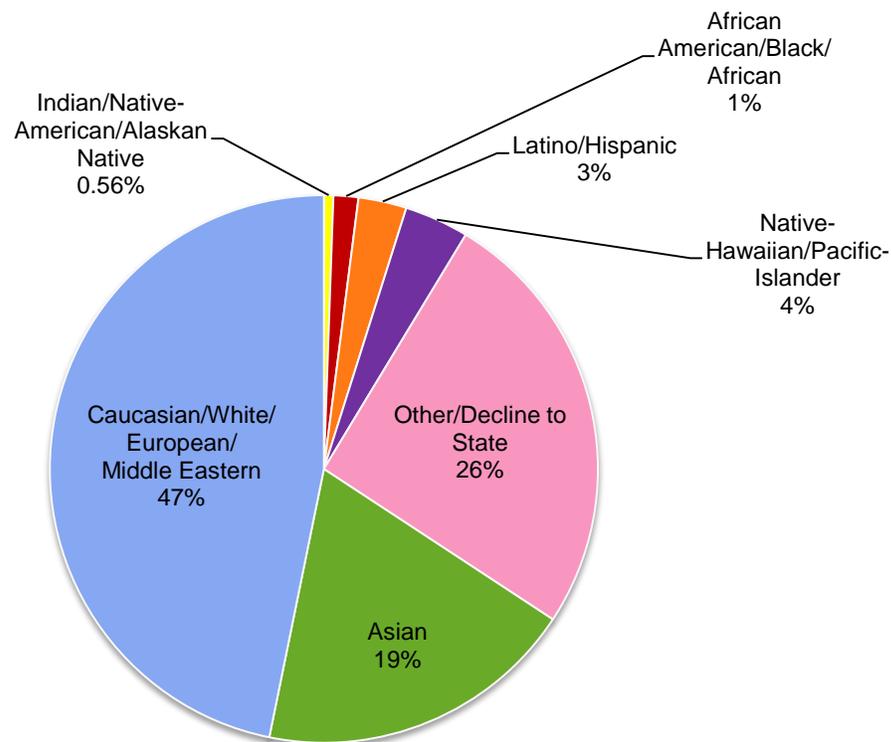
Source: California OSHPD: available online at: http://www.oshpd.ca.gov/hwdd/MSSA/GIS/HPSA_DentalCare.pdf.

VI. Dental Providers

One cause of oral health disparities is a lack of access to dental services, in particular among racial/ethnic populations.

Nearly 50 percent of dentists in California are Caucasian/White/European or Middle Eastern. Dentists who identify as African-American/Black/African, Latino/Hispanic, Indian/Native-American/Alaska-native or native-Hawaiian/Pacific-Islander make up less than 10 percent of the workforce. The predominant language spoken by dentists is English, and Spanish is second (Figure 25). [110]

Figure 25. Distribution of Dentists in California by Race/Ethnicity, 2013



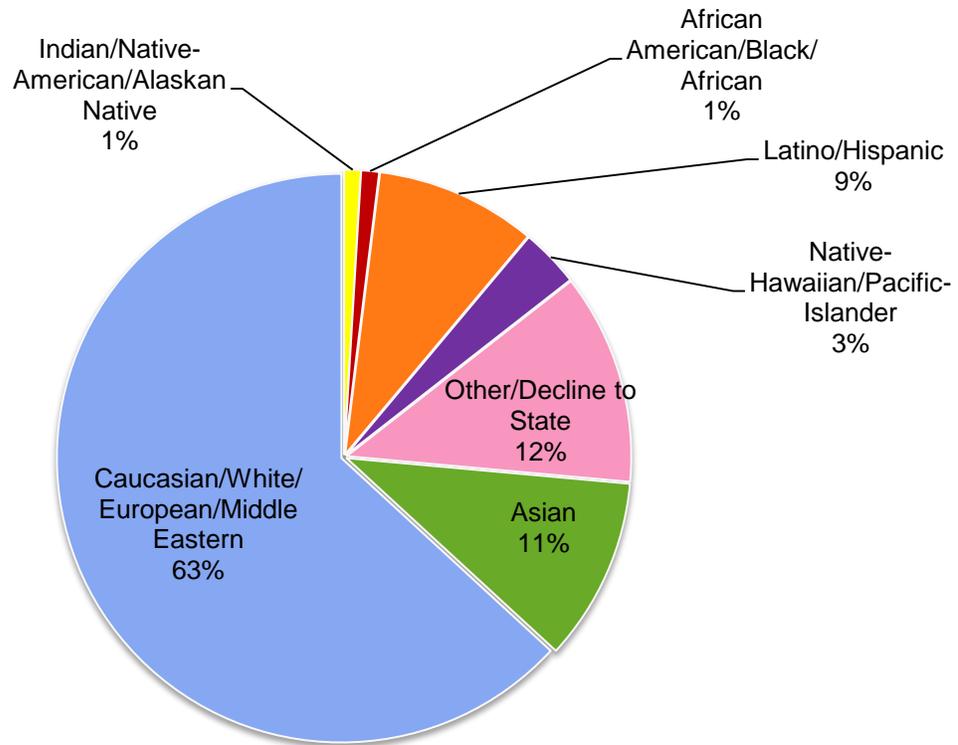
Source: California OSHPD. Fact Sheet, November 2013.

Available online at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-factsheet.pdf>.

Increasing the number of dental professionals from these under-represented racial and ethnic groups is viewed as an integral part of the solution to improving access to care (USDHHS 2000b).

The findings for Registered Dental Hygienists are similar. Of the 19,407 Registered Dental Hygienists surveyed, over 12,000 are Caucasian/White/European or Middle Eastern, and the predominant language spoken is English, followed by Spanish (Figure 26). [111]

Figure 26. Distribution of Dental Hygienists in California by Race/Ethnicity, 2013



Source: California OSHPD. Fact Sheet, November 2013. Available online at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-Hygenist-factsheet.pdf>.

Of the dentists surveyed, the majority were age 55 and older; dentists under the age of 34 made up the smallest cohort. The median number of years of licensure was 19. Although it may vary, dentists often retire in their mid- to late-60's. California could experience a shortage of dentists if there is not an adequate supply of younger dentists to replace them. The median age of Registered Dental Hygienists was 48, and the median number of years of licensure was 16. [112]

California has six dental schools: University of California, San Francisco; University of California, Los Angeles; University of the Pacific; Loma Linda University; University of Southern California; and Western University of Health Sciences. From 2006 through 2012, these schools awarded 4,770 dental degrees, with an average of 680 graduates per year. In 2013, there were an average of 580 job openings at any time for both new and replacement dentists in California. [113]

California has 29 dental hygiene programs in public and private universities, as well as community colleges. From 2006 through 2012, schools awarded 5,586 dental hygiene

degrees, with an average of 798 graduates per year. In 2013, there were an average of 750 job openings at any given time for new and replacement Registered Dental Hygienists in California. [114]

Conclusion

This report shows that oral diseases are highly prevalent in all stages of life among California residents. Further, these diseases are correlated with socioeconomic factors such as income, race and ethnicity and education. Although effective preventive measures are available, both clinical dental services and community level interventions are underutilized. This report also shows that there are geographic variations with respect to availability of services.

Although data were available, in many cases it was not current. As a result it was difficult to determine trends and patterns of diseases and risk factors. This highlights the need for surveillance and evaluation as critical components of an overall state oral health program.

References

1. U.S. Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000. <http://www.nidcr.nih.gov/DataStatistics/SurgeonGeneral/Documents/hck1ocv.@www.surgeon.fullrpt.pdf>
2. IOM (Institute of Medicine). 2011. Advancing Oral Health in America. Washington, DC: The National Academies Press.
3. IOM (Institute of Medicine) and NRC (National Research Council). 2011. Improving access to oral health care for vulnerable and underserved populations. Washington, DC: The National Academies Press.
4. Nuñez de Ybarra JM, Weiss R, Pendleton J, Wittenberg R, Rousseve M, Van Court J, Logan J, Lewis M, Lee A, Conroy S, Maizlish N, Peck C. The California Wellness Plan, 2014. Sacramento, CA: California Department of Public Health, 2014. Available at: [http://www.cdph.ca.gov/programs/cdcb/Documents/CDPH-CAWellnessPlan2014%20\(Agency%20Approved\).FINAL.2-27-14\(Protected\).pdf](http://www.cdph.ca.gov/programs/cdcb/Documents/CDPH-CAWellnessPlan2014%20(Agency%20Approved).FINAL.2-27-14(Protected).pdf).
5. California Health & Human Services, Let's Get Healthy California Task Force – Web site: <http://www.chhs.ca.gov/paged/LGHCTF.aspx>. Accessed February 23, 2015
6. Dental Health Foundation, “Mommy, It Hurts to Chew” The California Smile Survey: An Oral Health Assessment of California’s Kindergarten and 3rd Grade Children, Oakland, CA: Dental Health Foundation, 2006. http://www.centerfororalhealth.org/imagelibrary/PDF/dhf_2006_report.pdf
7. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. Available at: <https://www.healthypeople.gov> . Accessed February 23, 2015.
8. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020 Leading Health Indicators: Progress Update. Washington, DC. Available at: https://www.healthypeople.gov/sites/default/files/LHI-ProgressReport-ExecSum_0.pdf . Accessed February 23, 2015.
9. 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.
10. Holt JB, Huston SL, Heidari K, et.al, Indicators for Chronic Disease Surveillance – United States, 2013. MMWR Recomm Rep 2015;64 (No. RR-1)
11. Centers for Disease Control and Prevention, Hygiene-related Diseases: Dental Caries (Tooth Decay). Available at: http://www.cdc.gov/healthywater/hygiene/disease/dental_caries.html . Accessed February 23, 2015
12. American Academy of Pediatric Dentistry, The State of Little Teeth (2014). Available at: http://www.aapd.org/assets/1/7/State_of_Little_Teeth_Final.pdf. Accessed February 23, 2015

13. American Academy of Pediatric Dentistry, Guideline on Infant Oral Health Care, Reference Manual Vol 36, No 6: 141-145. Revised 2014. Available at: http://www.aapd.org/media/Policies_Guidelines/P_OralHealthCareProg.pdf. Accessed February 23, 2015. California Medi-Cal Program, Dental Periodicity Schedule for Children, Denti-Cal Bulletin, 26: 7 March 2010. Available at: <http://www.aapd.org/assets/1/7/Periodicity-California.pdf>. Accessed on July 2, 2015.
14. American Dental Association, Statement on Early Childhood Caries. Available at: <http://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/statement-on-early-childhood-caries>. Accessed February 23, 2015.
15. American Academy of Pediatrics. Oral health risk assessment timing and establishment of the dental home. Pediatrics. 2003;111(50): 1113-6. Re-affirmed 2009;125(2): 845 Available at: <http://pediatrics.aappublications.org/content/111/5/1113.full.pdf+html> . Accessed February 23, 2015.
- 16a. California Health Interview Survey (CHIS). 2011–2012 CHIS. Los Angeles, CA: UCLA Center for Health Policy Research, 2013. <http://ask.chis.ucla.edu>. Accessed February 23, 2015.
- 16b. California Health Interview Survey (CHIS). 2007 CHIS. Los Angeles, CA: UCLA Center for Health Policy Research. <http://ask.chis.ucla.edu>.
17. National Center for Health Statistics. Health, United States, 2013: With Special Feature on Prescription Drugs. Hyattsville, MD. 2014. Pp. 236-237 Table 71 Untreated dental caries, by selected characteristics: United States, selected years 1971-1974 through 2007-2010. Available at: <http://www.cdc.gov/nchs/data/hus/2013/071.pdf> . Accessed February 23, 2015.
18. Dye BA, Tans, Smith V. et al, Trends in Oral Health Status: United States, 1988–1994 and 1999–2004 Vital Health Stat 11 2007 (248) 1-92. Available at: http://www.cdc.gov/nchs/data/series/sr_11/sr11_248.pdf. Accessed February 23, 2015.
19. Centers for Disease Control and Prevention, Chronic Disease and Health Promotion Data & Indicators, Chronic Disease Indicators. Available at: <https://chronicdata.cdc.gov/health-area/chronic-disease-indicators>. Accessed February 25, 2015.
20. Methodologic Changes in the Behavioral Risk Factor Surveillance System in 2011 and Potential Effects on Prevalence Estimates, MMWR 61(22); 410-413 Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6122a3.htm>. Accessed February 23 2015.
21. National Institute of Dental and Craniofacial Research, Periodontal (Gum) Disease: Causes, Symptoms, and Treatments. Available at: <http://www.nidcr.nih.gov/oralhealth/Topics/GumDiseases/PeriodontalGumDisease.htm>. Accessed February 4, 2015.
22. Eke PI, Dye BA, Wei L, et. Al. Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009-2012. Journal of Periodontology. Accessed online February 17, 2015

23. National Cancer Institute, Oral Cancer Prevention (PDQ®), Available at: http://www.cancer.gov/cancertopics/pdq/prevention/oral/HealthProfessional#_121_toc Accessed February 23, 2015.
24. Surveillance, Epidemiology, and End Results Program (SEER). SEER Stat Fact Sheets: Oral Cavity and Pharynx Cancer. Bethesda, MD, National Cancer Institute, National Institutes of Health. c. 2014 Available at: <http://seer.cancer.gov/statfacts/html/oralcav.html>. Accessed on February 23, 2014.
25. California Cancer Registry, California Department of Public Health, Annual Statistical Tables by Site, 1988-2011. Oral Cavity and Pharynx Cancer. Available at: http://www.ccrca.org/pdf/AnnualReport/1988-2012_ORAL.pdf. Accessed February 23, 2015.
26. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. HP2020 Objective Data Search, Oral Health, OH-1.1. Available at: <http://www.healthypeople.gov/2020/data-search/Search-the-Data?nid=4992>. Accessed February 5, 2015.
27. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC. HP2020 Objective Data Search, Oral Health, OH-2.1 Available at: <http://www.healthypeople.gov/2020/data-search/Search-the-Data?nid=5016>. Accessed February 5, 2015.
- 28a. The Henry J. Kaiser Family Foundation. Health Coverage and Care for American Indians and Alaska Natives. Available: <http://kff.org/disparities-policy/issue-brief/health-coverage-and-care-for-american-indians-and-alaska-natives/>
- 28b. Norris T, Vines PL, Hoefel EM. The American Indian and Alaska Native Population: 2010, U.S. Census Bureau, 2010 Census Briefs, C2010BR-10, issued January 2012. Available at: <http://www.census.gov/prod/cen2010/briefs/c2010br-10.pdf>. Accessed February 23, 2015.
29. Indian Health Service. The 2010 Indian Health Service Oral Health Survey of American Indian and Alaska Native Preschool Children. Rockville, MD: U.S. Department of Health and Human Services, Indian Health Service, 2013. Available at: <http://www.ihs.gov/DOH/documents/IHS%20Oral%20Health%20Report%2004-17-2014.pdf>. Accessed February 23, 2015.
30. Indian Health Service Data Brief March 2014, The Oral Health of 6-9 year old American Indian and Alaska Native Children compare to the general US Population and Health People 2020 Targets. <http://doh.sd.gov/documents/Prevention/oralhealth/IHS-2014.pdf> Accessed February 23, 2015.
31. Dye BA, Li X, Beltrán-Aguilar ED. Selected oral health indicators in the United States, 2005–2008. NCHS data brief, no 96. Hyattsville, MD: National Center for Health Statistics. 2012. Available at: <http://www.cdc.gov/nchs/data/databriefs/db96.htm>. Accessed February 23, 2015.
32. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Questionnaire. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2012.

- Available at: <http://apps.nccd.cdc.gov/brfss/page.asp?yr=2012&state=CA&cat=OH#OH>. Accessed February 23, 2015
33. California Cancer Registry, Data and Mapping Tool. Available at: <http://www.cancer-rates.info/ca/index.php>. Accessed February 23, 2015.
 34. Morris CR, Ramirez CN, Cook SN, Parikh-Patel A, Kizer KW, Bates JH, Snipes KP. Cancer Stage at Diagnosis, 2013. Sacramento, CA: California Department of Public Health, California Cancer Registry, June 2013. Available at: http://www.ccrca.org/pdf/Reports/CCR_Cancer_Stage_at_Diagnosis_2013.pdf. Accessed February 23, 2015.
 35. Dye BA, Li X, Thornton-Evans G. Oral Health Disparities as Determined by Selected Healthy People 2020 Oral Health Objectives for the United States, 2009-2010. NCHS Data Brief No. 104. Hyattsville, MD. National Center for Health Statistics, 2012. Available at: <http://www.cdc.gov/nchs/data/databriefs/db104.pdf>. Accessed February 23, 2015.
 36. Periodontal Disease, Division of Oral Health, Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/oralhealth/periodontal_disease/index.htm. Accessed February 23, 2015.
 37. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Questionnaire. Atlanta, Georgia: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2012. Available at: <http://apps.nccd.cdc.gov/brfss/sex.asp?cat=OH&yr=2012&qkey=8451&state=CA>. Accessed February 23, 2015.
 38. Silk, H., Douglass, A.B., Douglass, J.M., & Silk, L. (2008). Oral health during pregnancy. *Am Fam Physician*, 77(8), 1139-1144.
 39. Boggess, K.A., Berggren, E.K., Koskenoja, V., Urlaub, D., & Lorenz, C. (2013). Severe preeclampsia and maternal self-report of oral health, hygiene, and dental care. *J Periodontol*, 84(2), 143-151.
 40. Chambrone, L., Guglielmetti, M.R., Pannuti, C.M., & Chambrone, L.A. (2011). Evidence grade associating periodontitis to preterm birth and/or low birth weight: A systematic review of prospective cohort studies. *J Clin Periodontol*, 38(9), 795-808.
 41. Clothier, B., Stringer, M., & Jeffcoat, M.K. (2007). Periodontal disease and pregnancy outcomes: Exposure, risk and intervention. *Best Pract Res Clin Obstet Gynaecol*, 21(3), 451-466.
 42. Xiong, X., Buekens, P., Fraser, W.D., Beck, J., & Offenbacher, S. (2006). Periodontal disease and adverse pregnancy outcomes: A systematic review. *BJOG*, 113(2), 135-143.
 43. Macones, G.A., Parry, S., Nelson, D.B., Strauss, J.F., Ludmir, J., Cohen, A.W., Jeffcoat, M. (2010). Treatment of localized periodontal disease in pregnancy does not reduce the occurrence of preterm birth: Results from the periodontal infections and prematurity study (pips). *Am J Obstet Gynecol*, 202(2), 147 e141-148.

44. Michalowicz, B.S., Hodges, J.S., DiAngelis, A.J., Lupo, V.R., Novak, M.J., Ferguson, J.E, Tschida, P.A. et al. (2006). Treatment of periodontal disease and the risk of preterm birth. *N Engl J Med*, 355(18), 1885-1894.
45. Offenbacher, S., Beck, J., Jared, H., Mauriello, S.M., Mendoza, L.C., Couper, D.J, Hauth, J. et al. (2009). Effects of periodontal therapy on rate of preterm delivery: A randomized controlled trial. *Obstet Gynecol*, 114(3), 551-559.
46. American College of Obstetricians and Gynecologists. Committee opinion no. 569 August 2013: Oral health care during pregnancy and through the lifespan. Available at: <http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Health-Care-for-Underserved-Women/Oral-Health-Care-During-Pregnancy-and-Through-the-Lifespan>. Accessed February 23, 2015.
47. California Dental Association Foundation (2010). Oral health during pregnancy & early childhood: Evidence-based guidelines for health professionals. Sacramento, CA: California Dental Association Foundation. Available at: http://www.cdafoundation.org/Portals/0/pdfs/poh_guidelines.pdf. Accessed February 23 2015.
48. Chaffee, B.W., Gansky, S.A., Weintraub, J.A., Featherstone, J.D., & Ramos-Gomez, F.J. (2014). Maternal oral bacterial levels predict early childhood caries development. *J Dent Res*, 93(3), 238-244.
49. California Department of Public Health, Maternal, Child and Adolescent Health Division, Maternal and Infant Health Assessment. (MIHA, 2005-2007). Prevalence of dental problems during pregnancy by maternal characteristics; Reasons women stated for not having a dental visit during pregnancy, by maternal characteristics, among women with no dental visit. (MIHA, 2012). Sacramento, CA: California Department of Public Health.
50. Brault MW. Americans with Disabilities: 2010, Household Economic Studies. Current Population Reports, Issued July 2012, US Census Bureau. Available at: <http://www.census.gov/prod/2012pubs/p70-131.pdf>. Accessed February 23 2015.
51. Brault MW. School-Aged Children With Disabilities in U.S. Metropolitan Statistical Areas: 2010. American Community Survey Briefs, November 2011. US Census Bureau. Available at: <https://www.census.gov/prod/2011pubs/acsbr10-12.pdf>. Accessed February 23, 2015.
52. Waldrop J, Stern SM. Disability Status: 2000. Census 2000 Brief. Issued March 2003. C2KBR-17. Available at: <https://www.census.gov/prod/2003pubs/c2kbr-17.pdf>. Accessed February 23, 2015.
53. Centers for Medicare and Medicaid Services. Health Expenditures by State of Residence: Summary Tables, 1991-2009. Total All Payers State Estimates by State of Residence – Dental Services. Available at: <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/res-tables.pdf>. Accessed February 23, 2015.
54. Rohde, F. Dental Expenditures in the 10 Largest States, 2008. Statistical Brief #353. December 2011. Agency for Healthcare Research and Quality, Rockville, MD. Available at: http://meps.ahrq.gov/mepsweb/data_files/publications/st353/stat353.shtml. Accessed February 23, 2015.

55. Yarbrough C, Nasseh K, Vujcic M. Why adults forgo dental care: Evidence from a new national survey. Health Policy Institute Research Brief. American Dental Association. November 2014. Available at: http://www.ada.org/~media/ADA/Science%20and%20Research/HPI/Files/HPIBrief_114_1.ashx. Accessed February 23, 2015.
56. Gift HC, Reisine ST, Larach DC. The Social Impact of Dental Problems and Visits. *Am J Public Health*, 1992; 82 (12): 1663-1668
57. Centers for Disease Control and Prevention, Division of Oral Health. Fact Sheet: Oral Health for Adults (2006). Available at: http://www.cdc.gov/OralHealth/publications/factsheets/adult_oral_health/adults.htm. Accessed February 23, 2015.
58. Pourat N and Nicholson G. Unaffordable Dental Care Is Linked to Frequent School Absences. Los Angeles, CA: UCLA Center for Health Policy Research, 2009. Available at: <http://healthpolicy.ucla.edu/publications/Documents/PDF/Unaffordable%20Dental%20Care%20Is%20Linked%20to%20Frequent%20School%20Absences.pdf>. Accessed February 23, 2015
59. Children Now, 2014 California Children's Report Card. Available at http://www.childrennow.org/uploads/documents/2014_CA_Childrens_Report_Card.pdf. Accessed on February 23, 2015
60. Seirawan H, Faust S, Mulligan R. The Impact of Oral Health on the Academic Performance of Disadvantaged Children. *Am J Public Health*. 2012; 102:1729-1734.
61. Demmer RT, Desvarieux M. Periodontal Infections and Cardiovascular Disease: The Heart of the Matter. *JADA* 2006;137(10 supplement): 14S-20S.
- 62a. Mealey BL. (2006). Periodontal Disease and Diabetes: A Two-Way Street. *Journal of the American Dental Association*, 137, (10 supplement), 26S-31S. Available at: http://www.ada.org/~media/ADA/Member%20Center/Files/Perio_diabetes.ashx.
- 62b. King GL. The role of inflammatory cytokines in diabetes and it's complications. *J Periodontol* 2008; 79:1527-1534
63. U.S. Department of Health and Human Services. The Health Consequences of Smoking: 50 Years of Progress. 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, 2014. Printed with corrections, January 2014. Available at: <http://www.surgeongeneral.gov/library/reports/50-years-of-progress/50-years-of-progress-by-section.html>. Accessed February 23, 2015.
64. Tomar SL, Asma S. Smoking-attributable periodontitis in the United States: Findings from NHANES III. *National Health and Nutrition Examination Survey. J Periodontol*. 2000 May;71(5): 743-51.
65. Nociti FH, Casati MZ, Duarte PM. Current perspective of the impact of smoking on the progression and treatment of periodontitis. *Periodontology* 2000 2015. 67: 187-210.
66. American Academy of Periodontology. Position Paper: Tobacco Use and the Periodontal Patient. *J Periodontal* Nov 1999: 1419-27. Available at: <http://www.aap.org>

- [//www.joponline.org/doi/pdf/10.1902/jop.1999.70.11.1419](http://www.joponline.org/doi/pdf/10.1902/jop.1999.70.11.1419). Accessed on February 23, 2015.
67. California Department of Public Health, California Tobacco Control Program. State Health Officer's Report on Tobacco Use and Promotion in California. Sacramento, CA 2012. Available at: http://www.cdph.ca.gov/programs/tobacco/Documents/Resources/Publications/CA%20Health%20Officers%20Report%20on%20Tobacco_FINAL_revised%2001%2002%2013.pdf. Accessed February 23 2015; and CDPH, California Tobacco Control Program, Youth Tobacco Purchase Survey, 1997-2014.
 68. California Department of Public Health, California Tobacco Control Program, Health and Economic Consequences (2010). Available at: http://www.cdph.ca.gov/programs/tobacco/Documents/Archived%20Files/CTCPHealthEconCon_10.pdf. Accessed February 23, 2015.
 69. U.S. Department of Health and Human Services, Tobacco Use and Dependence Guideline Panel. Treating Tobacco Use and Dependence: 2008 Update. Rockville, MD. Available at: <http://www.ncbi.nlm.nih.gov/books/NBK63952/>. Accessed February 23, 2015. U.S. Preventive Services Task Force, Final Recommendation Statement: Primary Care Interventions to Prevent Tobacco Use in Children and Adolescents. May 2015. Available at: <http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/tobacco-use-in-children-and-adolescents-primary-care-interventions>. Accessed July 23, 2015.
 70. Jannat-Khah DP, McNeely J, Pereyra MR, et al. Dentists' Self-Perceived Role in Offering Tobacco Cessation Services: Results From a Nationally Representative Survey, United States, 2010–2011. *Prev Chronic Dis* 2014;11: 140186. Available at: http://www.cdc.gov/pcd/issues/2014/pdf/14_0186.pdf. Accessed February 23, 2015.
 71. Danesh D, Paskett ED, Ferketich AK. Disparities in Receipt of Advice to Quit Smoking From Health Care Providers: 2010 National Health Interview Survey. *Prev Chronic Dis* 2014;11: 140053. Available at: http://www.cdc.gov/pcd/issues/2014/14_0053.htm. Accessed February 23, 2015.
 72. Centers for Disease Control and Prevention, Community Water Fluoridation. Available at: <http://www.cdc.gov/fluoridation>. Accessed February 23, 2015.
 73. Griffin SO, Jones K, Tomar SL. An economic evaluation of community water fluoridation. *J Public Health Dent* 2001 Spring;61(2): 78-86.
 74. Available at: <http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=116001-117000&file=116409-116415>. Accessed February 23, 2015.
 75. Pollick, HF et al. Report of the California Oral Health Needs Assessment of Children, 1993-1994. Oakland. The Dental Health Foundation. 1999
 76. Stocks M, Pollick H. The CDA Foundation model to fluoridate communities. *J Calif Dent Assoc*. 2012 Aug;40(8): 648-55.
 77. Guide to Community Preventive Services. Preventing dental caries: school-based dental sealant delivery programs (abbreviated). Available at: www.thecommunityguide.org/oral/schoolsealants.html. Last updated: April 2013. Accessed on February 23, 2015.

78. National Institute of Dental and Craniofacial Research, Seal Out Tooth Decay. Available at: <http://www.nidcr.nih.gov/oralhealth/Topics/ToothDecay/SealOutToothDecay.htm#whoShouldGet>. Accessed February 25, 2015.
79. Kressin NR, DeSouza MB. Oral Health education and health promotion in Gluck GM, Morganstein WM (eds). *Jong's Community Dental Health*, 5th edition. St. Louis, MO; Mosby; 2003;277-328.
80. American Cancer Society, California Department of Public Health, California Cancer Registry. *California Cancer Facts & Figures 2014*. Oakland, CA: American Cancer Society, Inc. California Division, February 2014
81. U.S. Preventive Services Task Force Guide to Clinical Preventive Services, Oral Cancer Screening (2013). Available at: <http://www.uspreventiveservicestaskforce.org/BrowseRec/Index?k=oral%2Cancer&d=True>; Accessed February 23, 2015.
82. Centers for Disease Control and Prevention (CDC). Oral Health Resources, National Oral Health Surveillance System: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Atlanta, Georgia 2008. Available at: <http://apps.nccd.cdc.gov/nohss/DisplayV.asp?DataSet=2&nkey=10126&qkey=5> . Accessed February 23, 2015.
83. California Department of Public Health, Office of Statewide Health Planning and Development (OSHPD). *Emergency Department Data Nonpublic Files 2012*. Sacramento, CA: OSHPD, 2013
84. California Health Care Foundation, Snapshot: Emergency Department Visits for Preventable Dental Conditions in California, California Health Care Foundation, Oakland, CA. 2009. Available at: <http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/E/PDF%20EDUseDentalConditions.pdf>. Accessed February 23, 2015.
85. Centers for Medicare and Medicaid Services, Dental Care. Available at: <http://www.medicare.gov/Medicare-CHIP-Program-Information/By-Topics/Benefits/Dental-Care.html>. Accessed February 23, 2015.
86. California Medi-Cal Dental Program, Dental Periodicity Schedule for Children, Denti-Cal Bulletin, 26: 7 March 2010. Available at: http://www.denti-cal.ca.gov/provsrvcs/bulletins/Volume_26_Number_7.pdf. Accessed February 23, 2015. California Medi-Cal Dental Program, Dental Periodicity Schedule for Children, Denti-Cal Bulletin, 26: 7 March 2010. Available at: http://www.denti-cal.ca.gov/provsrvcs/bulletins/Volume_26_Number_7.pdf. Accessed July 1, 2015. Department of Health Care Services, Medi-Cal Dental Program Provider Handbook (June 2015), 19-19. Available at: <http://www.denti-cal.ca.gov/WSI/Publications.jsp?fname=ProvManual>. Accessed July 1, 2015.
87. Department of Health Care Services, Medi-Cal Dental Division, "Return of Some Medi-Cal Adult Dental Benefits," May 1, 2014. Available at: https://www.denti-cal.ca.gov/bene/notice_of_reinstatement_dental_services_revised.pdf. Accessed on July 2, 2015.

88. California Department of Health Care Services. Available at http://www.dhcs.ca.gov/dataandstats/statistics/Documents/Fast_Facts_Nov_2016.pdf. Accessed April 6, 2017.
89. Centers for Medicare and Medicaid Services. Annual EPSDT Participation Report, 2015 CMS Form 416. Available at <https://www.medicaid.gov/medicaid/benefits/epsdt/index.html>. Accessed April 6, 2017.
90. California State Auditor, Department of Health Care Services: Weaknesses in its Medi-Cal Dental Program Limit Children's Access to Dental Care, Report 2013-125, December 2014. Available at: <https://www.auditor.ca.gov/pdfs/reports/2013-125.pdf>. Accessed February 23, 2015.
91. California Department of Health Care Services, Healthy Families Program (HFP) Transition to Medi-Cal. Available at: <http://www.dhcs.ca.gov/services/Paged/HealthyFamiliesTransition.aspx>. Accessed February 23, 2015.
92. California Dental Association, News and Events: Medi-Cal/Denti-Cal. *Update on California's Healthy Families Program Transition*. Available at: <http://www.cda.org/news-events/update-on-californias-healthy-families-program-transition>. Accessed on July 24, 2015.
93. California Healthcare Foundation, California Health Care Almanac: Medi-Cal Facts and Figures: A Program Transforms, May 2013. California Healthcare Foundation, Oakland, CA. Available at: <http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/M/PDF%20MediCalFactsAndFigures2013.pdf>. Accessed February 23, 2015.
94. California Health Benefit Exchange, Powering Covered California. Available at: <http://hbex.coveredca.com/>. Accessed on February 26, 2015.
95. Covered California, Covered California Health Plans. Available at: <http://www.coveredca.com/individuals-and-families/getting-covered/health-plans/>. Accessed on February 26, 2015.
96. Covered California, Health Plan Websites. Available at: <http://www.coveredca.com/get-help/health-plans/>. Accessed February 26, 2015.
97. Covered California, Individuals Enrolled from October 1, 2013, through March 31, 2014 with Subsidy Status, Across Region. Available at: http://www.coveredca.com/news/PDFs/regional-stats-march/March_RegionalEnrollmentTables_forWeb_ss.pdf. Accessed February 26, 2015.
98. California Hospital Association, Covered California, DHCS Announce Data for First Open Enrollment Period (April 17, 2014). Available at: <http://www.calhospital.org/cha-news-article/covered-california-dhcs-announce-data-first-open-enrollment-period>. Accessed February 26, 2015.
99. California Primary Care Association, 2016 State Profile of California Community Clinics and Health Centers, Sacramento CA. Available at: <http://cpca.org/index.cfm/health-center-resources/data-reports/cchc-profiles/>. Accessed July 29, 2016.
100. California Department of Public Health, Oral Health Program, Internal Data (January 2014).

101. Glassman P, Harrington M, Mertz E, Namakian M. The Virtual Dental Home: Implications for Policy and Strategy. J Calif Dent Assoc. 2012 July;40(7): 605-611.
102. Policy Brief: The Virtual Dental Home: Improving the Oral Health of Vulnerable and Underserved Populations Using Geographically Distributed Telehealth-Enabled Teams, Updated August 2014. University of the Pacific Arthur A. Dugoni School of Dentistry. San Francisco, CA. Available at: http://www.dental.pacific.edu/Documents/community/special_care/acrobat/VirtualDentalHome_PolicyBrief_Aug_2014.pdf.
103. Glassman P, Harrington M, Namakian M, Subar P. The Virtual Dental Home: Bringing Oral Health to Vulnerable and Underserved Populations. CDA Journal July 2012 40(7): 569-577. Available at: <http://dental.pacific.edu/departments-and-groups/pacific-center-for-special-care/publications>. Accessed February 26 2015.
104. California Dentists: Age, Sex, and Education 2014. Office of Statewide Health Planning and Development, Healthcare Workforce Clearinghouse. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentists-age-sex-education.pdf>. Accessed February 26, 2015.
105. California Registered Dental Hygienists 2014. Office of Statewide Health Planning and Development, Healthcare Workforce Clearinghouse. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Hygienist.pdf>. Accessed February 26 2015.
106. California Registered Dental Assistants 2014. Office of Statewide Health Planning and Development, Healthcare Workforce Clearinghouse. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dental-Assistant.pdf>. Accessed February 26 2015.
107. Dentists November 2013 Office of Statewide Planning and Development, Healthcare Workforce Clearinghouse. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-factsheet.pdf>. Accessed February 26 2015.
108. Registered Dental Hygienists (RDH) November 2013. Office of Statewide Planning and Development, Healthcare Workforce Clearinghouse. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-Hygenist-factsheet.pdf>. Accessed February 26 2015.
109. U.S. Department of Health and Human Services, Health Resources and Services Administration, Health Workforce, Dental HPSA Designation Overview. Available: <http://bhpr.hrsa.gov/shortage/hpsas/designationcriteria/dentalthpsaoverview.html>. Accessed February 26, 2015.
110. California Department of Public Health, Office of Statewide Health Planning and Development. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-factsheet.pdf>
111. Ibid. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-Hygenist-factsheet.pdf>.
112. Ibid. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentists-ASL-2014.pdf>.
113. Ibid. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-factsheet.pdf>

114. Ibid. Available at: <http://www.oshpd.ca.gov/HWDD/HWC/FactSheets/Dentist-Hygenist-factsheet.pdf>.

