Violence

The family is the single most frequent locus of violence in Western society. Domestic violence includes child abuse, spousal and elder abuse, and abuse of the disabled. Child abuse is of particular concern to the oral health community because 65 percent of cases involve head and oral-facial trauma (Mathewson 1993, Needleman 1986) and dentists are required to report suspected cases of child abuse. In the young child, head injury is the most common cause of death. Psychological trauma from abuse can result in sleep disturbances, eating disorders, developmental growth failure in young children, and nervous habits such as lip and fingernail biting and thumb sucking. Effects may also include chronic underachievement in school and poor peer relationships (Mathewson 1993). In abusive families, physical neglect is commonplace, with inadequate provision of basic needs, including medical and oral health care (Mathewson 1993).

SELECTED CHRONIC AND DISABLING CONDITIONS

Oral, dental, or craniofacial signs and symptoms play a critical role in autoimmune disorders such as Sjögren's syndrome and in a number of chronic and disabling pain conditions.

Sjögren's Syndrome

Sjögren's syndrome is one of several autoimmune disorders in which the body's own cells and tissues are mistakenly targeted for destruction by the immune system. Like other autoimmune conditions, Sjögren's syndrome is more prevalent among women. The ratio of females to males affected is 9:1, with symptoms usually developing in middle age. There are an estimated 1 to 2 million individuals in the United States with Sjögren's syndrome (Talal 1992).

The disease occurs in two forms. Primary Sjögren's involves the salivary and lacrimal (tear) glands. In secondary Sjögren's the glandular involvement is accompanied by the development of a connective tissue or collagen disease, most often rheumatoid arthritis, lupus erythematosis, scleroderma, or biliary cirrhosis.

The glandular involvement causes a marked reduction in fluid secretion, resulting in xerostomia and xerophthalmia (dry eyes). The constant oral dryness causes difficulty in speaking, chewing, and swallowing; the dry eyes often itch and feel gritty. There is no cure for Sjögren's, and patients often carry eyedrops and water bottles or saliva substitutes in an attempt to provide symptomatic relief. Clinically, the reduction in salivary flow changes the bacterial flora, which, in addition to the reduction in salivary protective components, increases the risk of caries and candidiasis (Daniels and Fox 1992). Recent studies have indicated that there is a reduction in masticatory function (Dusek et al. 1996) and an increased prevalence of periodontal disease (Najera et al. 1997). In advanced stages the salivary glands may swell because of obstruction and infection or lymphatic infiltration. In both forms of the disease, other systems may eventually become affected. Nasal, laryngeal, and vaginal dryness may occur, as well as abnormalities in internal organs (Oxholm and Asmussen 1996).

Diagnosis is difficult in the early stages, and women often report that it took many years and consultations with many specialists before they received the correct diagnosis. Diagnosis involves demonstration of specific antibodies in the blood characteristic of an autoimmune disorder, a labial (minor) salivary gland biopsy, and a series of eye tests to measure flow rate and tissue characteristics. Confirmatory tests include an evaluation of salivary flow and chemistry.

Patients with Sjögren's syndrome are at some risk of developing diseases such as non-Hodgkin's lymphoma; clinical data indicate that such lymphomas develop in 5 percent of patients with Sjögren's syndrome (Moutsopoulos et al. 1978).

Histological examination shows that immune cells infiltrate the glands and cluster around the secretory elements, resulting in a breakdown of the normal structure of the gland. The mechanisms by which this occurs involve immune-cell-mediated inflammation and stimulation of the salivary gland cells themselves to produce tissue-destructive molecules such as cytokines. Another hypothesis is that a viral infection of the glands may trigger the immune response that leads to autoimmunity, whereas genetic or regulatory alterations might lead to abnormalities in apoptosis (Fox and Speight 1996).

In addition to saliva substitutes and artificial tears, some medications, such as pilocarpine and cevimeline, are prescribed to increase salivary flow from the residual healthy gland tissue, again providing symptomatic relief only. The problems that develop in the other organ systems are also treated symptomatically. At advanced stages, steroids are employed intermittently to alleviate problems.

Acute and Chronic Oral-Facial Pain

Since the nineteenth century, when two dentists, Horace Wells and Frederick Morton, demonstrated the analgesic powers of nitrous oxide and ether, oral health investigators have been recognized leaders in the field of pain management worldwide. Their analyses of the cells, pathways, and molecules involved in the transmission and modulation of pain have given rise to a growing variety of medications, often combined with other approaches, that can control acute and chronic pain. Pain researchers today stress that chronic pain can become a disease in itself, causing long-term detrimental changes in the nervous system. These changes may affect resistance to other diseases as well as effectively destroy quality of life. Most people have experienced acute pain involving teeth and the oral tissues at one time or another.

Atypical Facial Pain

Atypical facial pain is characterized by a continuous dull ache on one or both sides, most frequently in the region of the maxilla (the upper jaw). The pain tends to be episodic and is aggravated by fatigue, worry, or emotional upset. It is often accompanied by pain elsewhere in the body and depression. Once a dental cause can be ruled out, pain resolution depends on the successful use of antidepressants, psychotherapy, or both (Tyldesley and Field 1995).

Tic Douloureux

The oral-facial region is also subject to pain that can be paroxysmal or continuous along a distinct nerve distribution. The most frequently encountered of these oral facial neuralgias is tic douloureux, or trigeminal neuralgia, a disease of unknown etiology affecting one, two, or all three branches of the trigeminal nerve. The pain is highly intense and of a stabbing nature, and lasts for a few seconds. This transient attack may be repeated every few minutes or several hours. There may be no precipitating factor, or it may occur in response to a gentle touch or a breeze wafting across the face—a condition experts call *allodynia*, the feeling of pain in response to a normally nonpainful stimulus. On other occasions, there may be a specific trigger zone. Although spontaneous remission for weeks or months may occur, it is rarely permanent. Given the unknown, unpredictable nature of tic douloureux, it is not surprising that fear of pain comes to dominate these patients' lives, as they avoid doing anything that might trigger an attack.

Trigeminal neuralgia generally occurs in later life, but also occurs in younger individuals affected by multiple sclerosis, where it is assumed to be associated with lesions (multiple sclerosis "plaques") in the brain stem. Medical treatment depends largely on the use of a drug that has become a virtual specific, the antiepileptic drug carbamazepine. For those patients with no consequential adverse effects, it can control the disease. An alternative for chronic sufferers is the surgical removal of a small vein or artery that may be exerting pressure on the nerve root or the selective destruction of the nerve fibers themselves using chemical or electrical methods. In many cases, these procedures can produce complete relief from pain (Tyldesley and Field 1995).

Temporomandibular Disorders

Various etiological factors, including trauma, can give rise to pain and dysfunction in the temporomandibular joint and surrounding muscles, conditions collectively called temporomandibular disorders (TMDs). The pain may be localized or radiate to the teeth, head, ears, neck, and shoulders. Abnormal grating, clicking, or crackling sounds, known as crepitus, in the joint often accompany localized pain. Pain is also found in response to clinical palpation of the affected structures. TMDs are common, occurring in as many as 10 million Americans. Although surveys indicate that both sexes are affected, the majority of individuals seeking treatment are women of childbearing age, a phenomenon suggesting that hormonal influences should be investigated.

Several factors can contribute to the onset or exacerbation of TMD symptoms. These factors include certain developmental anomalies; injury to the jaw from accidents or abuse; oral habits that greatly stress the joint and musculature, such as tooth grinding (bruxism); jaw manifestations of systemic diseases such as fibromyalgia and arthritic diseases; and some irreversible treatments for initial signs and symptoms.

The multiplicity of factors that may cause or contribute to TMDs has unfortunately led to a multiplicity of treatments. Most of these treatments have not been tested in randomized controlled clinical trials. During the 1970s and 1980s, many individuals underwent surgery, which proved unsuccessful in many cases.

Leading investigators have proposed standardized research diagnostic criteria to clarify the kinds of pathology that can give rise to TMDs and to classify the most common forms of TMDs. Such criteria could be used in designing clinical trials and could ultimately lead to better diagnostics, treatments, and prevention. The criteria use two dimensions or axes:

axis I delineates various forms of joint or muscle pathology; axis II explores pain-related disability and psychological status. The approach requires detailed clinical examinations and patient histories (Dworkin and LeResche 1992).

A MIRROR, A MODEL, AND A BETTER UNDERSTANDING OF DISEASES AND DISORDERS

Studying the diseases and disorders that affect craniofacial tissues can provide scientists with models of systemic pathology. Because some craniofacial tissues, such as bones, mucosa, muscles, joints, and nerve endings, have counterparts in other parts of the body and these tissues are often more accessible to research analysis than deeper-lying tissues, researchers studying craniofacial tissues can gain valuable insights into how cancer develops, the role of inflammation in infection and pain, the effects of diet and smoking, the consequences of depressed immunity, and the changes that can arise from a mutated gene.

Other craniofacial tissues—teeth, gingiva, tongue, salivary glands, and the organs of taste and smell—are unique to the craniofacial complex. Study of the diseases affecting these tissues has revealed a wealth of information about their special nature as well as the molecules and mechanisms that normally operate for the protection, maintenance, and repair of all the oral, dental, and craniofacial tissues. When factors perturb these nurturing elements, the oral health scale can tip toward disease. When those factors stem from systemic diseases or disorders, the mouth can sometimes mirror the body's ill health. Similarly underscoring the connection between oral and general health are studies suggesting that poor dental health, mainly due to chronic dental infections, may heighten the risk for both cardiovascular disease and stroke independently of factors such as social class and established cardiovascular risk factors (Grau et al. 1997). The interplay between craniofacial and systemic health and disease has become a lively focus of interest and research, as discussed in Chapter 5.

Current research on developmental disorders and diseases affecting the craniofacial complex is facilitating and complementing the intense effort of the Human Genome Project to map and sequence all 100,000 genes. This goal should be accomplished early in the twenty-first century and should begin to yield information on the genetic program that governs morphogenesis, organ development, and disease etiology and pathogenesis, with the potential for interventions that can correct errors in the program. The continued sequencing of the genomes of microbial pathogens involved in oral diseases also should lead to new diagnostic and preventive approaches.

FINDINGS

- Microbial infections, including those caused by bacteria, viruses, and fungi, are the primary cause of the most prevalent oral diseases. Examples include dental caries, periodontal diseases, herpes labialis, and candidiasis.
- The etiology and pathogenesis of diseases and disorders affecting the craniofacial structures are multifactorial and complex, involving an interplay among genetic, environmental, and behavioral factors.
- Many inherited and congenital conditions affect the craniofacial complex, often resulting in disfigurement and impairments that may involve many body organs and systems and affect millions of children worldwide.
- Tobacco use, excessive alcohol use, and inappropriate dietary practices contribute to many diseases and disorders. In particular, tobacco use is a risk factor for oral cavity and pharyngeal cancers, periodontal diseases, candidiasis, and dental caries, among other diseases.
- Some chronic diseases, such as Sjögren's syndrome, present with primary oral symptoms.
- Oral-facial pain conditions are common and often have complex etiologies.

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CHAPTER 4

The Magnitude of the Problem

The range of oral, dental, and craniofacial diseases and conditions that take a toll on the U.S. population is extensive. This chapter provides highlights of diseases and conditions affecting the U.S. population using available national and state data to describe the burden of disease in the United States. To capture the dimensions and extent of these diseases and conditions, the data are presented where possible by demographic measures such as race/ethnicity, sex, age, education, and economic status. Statistics and trends are presented for each of the six categories of oral diseases and disorders whose etiology and pathogenesis are described in Chapter 3: dental and periodontal infections, oral and pharyngeal cancers, mucosal infections and conditions, developmental disorders, intentional and unintentional injuries, and chronic and disabling conditions. Included are conditions as common as dental caries and periodontal diseases as well as relatively rare clefting syndromes. Also mentioned are conditions that are more common in certain demographic subpopulations—for example, Sjögren's syndrome and temporomandibular disorders, which are more common in women, and injuries, which are more common in men. (See Box 4.1 for a glossary of terms used in this chapter.)

There is no single measure of oral health or the burden of oral diseases and conditions, just as there is no single measure of overall health or overall disease. As a result, this chapter assembles clinical and epidemiologic measures for specific conditions affecting the craniofacial structures. Note too that the chapter presents an incomplete picture. State-specific data on oral diseases are extremely limited. There is a paucity of national data on rare conditions as well as on the health of selected populations and their subgroups. Some characteristics and unique needs of these populations are highlighted, and a number of questions raised. More extensive analyses of the differences among racial/ethnic, sex, and income groups are warranted. The relationship of oral health to the use of dental services is described. However, the effects of health care visits and of specific services rendered need further study.

Most of the data in the figures and tables presented in this chapter are derived from large, nationally representative surveys of the U.S. civilian, noninstitutionalized population. These include complex sample surveys, such as the National Health and Nutrition Examination Survey (NHANES), which use a sample of individuals selected with known probability to estimate the prevalence of particular characteristics and conditions in the nation as a whole. The multipurpose NHANES provides data on the frequency of the most common oral diseases and conditions. The most recent survey, NHANES III, was conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control between 1988 and 1994. Trained interviewers gathered demographic, health, and related data from eligible households. Selected persons in these households were invited to a mobile examination center, where they underwent multiple health assessments, including an oral examination by a trained dentist (NCHS 1996). Related surveys such as the National Health Interview Survey (NHIS) also use complex survey sampling and household interviews to obtain health information about the U.S. population (Kovar 1989). The NHIS conducted in 1989 included data on oral-facial pain conditions; several of these surveys have captured data on dental visits. The most extensive dental utilization survey that provides demographic and socioeconomic data and data on reasons for not visiting a dentist was conducted in 1989.

Surveys conducted by the National Institute of Dental and Craniofacial Research of a probability sample of U.S. schoolchildren in 1979-80 and 1986-87 (Snowden and Miller-Chisholm 1992) used

BOX 4.1
Glossary

Complex sample survey. A survey of individuals selected with known probability to estimate the prevalence and/or extent of particular characteristics and conditions.

dfs. The count (number) of decayed (untreated) or filled primary tooth surfaces per person.

dft. The count (number) of decayed (untreated) or filled primary teeth per person.

DMFS. The count (number) of decayed (untreated), missing (due to caries), or filled permanent tooth surfaces per person.

DMFT. The count (number) of decayed, missing (due to caries),[1] or filled permanent teeth per person.

Epidemiology. The study of the distribution and determinants of disease frequency in human populations.

Incidence. The number of cases of a disease, or condition, that occurs during a specified period of time.

Incidence rate. The number of cases of a disease, or condition, that occurs during a specified period of time, per specified unit of population.

Loss of periodontal attachment.[2] The distance from the cementoenamel junction to the bottom of the gingival sulcus.

Mortality rate. The number of deaths during a stated period of time divided by the total number of persons in the population.

Prevalence. The number of existing cases of a disease, or condition, at a designated point in time.

Prevalence rate. The number of existing cases of a disease, or condition, at a designated point in time, per the number of persons in the population.

Relative survival rate. Survival rates for persons with a particular disease or condition corrected for the expected occurrence of death in persons in the age group.

Survival rate. The number of persons surviving over a specified time period divided by the number of persons alive at the start of the time period.

[1] In the Third National Health and Nutrition Examination Survey, the M (missing) component of the DMFT (S) index reflects teeth (or tooth surfaces) missing because of dental caries or periodontal disease. Teeth missing because of trauma, orthodontic treatment, or other non-disease-related reasons were not scored.

[2] Periodontal disease status is assessed by measuring the distance from the gingival margin (FGM) to depth of the gingival sulcus, or pocket depth, and the distance from the gingival margin to the cementoenamel junction (FGM-CEJ). A third measure, loss of attachment, is determined by calculating the difference between pocket depth and the FGM-CEJ distance. Loss of attachment is important because it serves as a measure of how much support from the tissues surrounding the tooth has been lost.

similar oral examination procedures as in NHANES. Because school attendance is high in the United States, these surveys are considered representative of noninstitutionalized children throughout the United States and are used in this chapter.

Record-based surveys are another approach to obtaining health data for the nation as a whole or for selected broad areas. Mortality statistics are obtained by determining the number of deaths in the United States and dividing that figure by the total U.S. population as determined from U.S. Census data (Kovar 1989). Cancer statistics are derived from population-based cancer registries in selected large geographic areas of the United States using reports of cancer occurrences from hospitals, doctors, and laboratories. This data system, maintained by the National Cancer Institute, is called the Surveillance, Epidemiology, and End Results program (Ries et al. 1999). Birth certificate registries in geographic areas and surveys of health care facilities provide valuable information from record-based systems about other aspects of oral and craniofacial health such as birth defects (Schulman et al. 1993). The Centers for Disease Control and Prevention's Behavioral Risk and State Surveillance System provides essential state data on edentulousness (Tomar 1997). In selected cases, survey findings other than from national probability surveys are used. State-specific data are provided for those conditions for which there are data from most states—that is, cancer mortality statistics and self-reports of edentulism.

Economic status is derived from annual income data. Unless otherwise stated, "poor" is defined in this chapter as an annual income below the U.S. poverty level. For both national and other surveys, the race and ethnicity terms used in this report are consistent with the terms used in the supporting documentation as referenced in the text and cited in the reference list. Available national data for most conditions are limited primarily to Hispanic, non-Hispanic black, and non-Hispanic white populations, due to the sampling design of the national surveys. The NHANES III oversampled Mexican Americans, so the data from that survey are available for this subpopulation of Hispanics.

WHO HAS WHAT DISEASES AND CONDITIONS?

Dental Caries, Periodontal Diseases, and Tooth Loss

Dental Caries

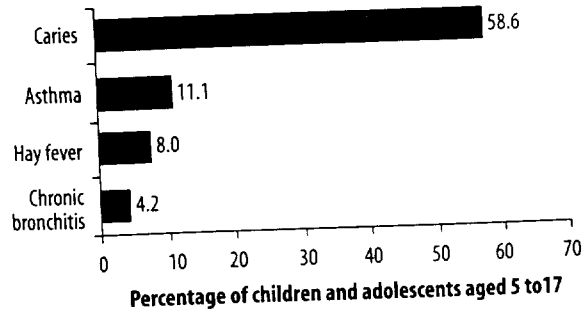
Dental caries is one of the most common childhood diseases. In this section, *decayed* refers to teeth with caries that have not been treated. The term *filled* refers to treated caries. *Dental caries* refers to both decayed and filled teeth. Among 5- to 17-year-olds, dental caries is more than 5 times as common as a reported history of asthma and 7 times as common as hay fever (Figure 4.1). Prevalence increases with age. The majority (51.6 percent) of children aged 5 to 9 years had at least one carious lesion or filling in the coronal portion of either a primary or a permanent tooth. This proportion increased to 77.9 percent for 17-year-olds and 84.7 percent for adults 18 or older. Additionally, 49.7 percent of people 75 years or older had root caries affecting at least one tooth (NCHS 1996, NHANES III).

Despite progress in reducing dental caries, individuals in families living below the poverty level experience more dental decay than those who are economically better off. Furthermore, the caries seen in these individuals is more likely to be untreated than caries in those living above the poverty level (Figure 4.2); more than one third (36.8 percent) of poor children aged 2 to 9 have one or more untreated decayed primary teeth, compared to 17.3 percent of nonpoor children.

In addition to poverty level, the proportion of teeth affected by dental caries also varies by age and race/ethnicity. Poor Mexican American children aged 2 to 9 have the highest number of primary teeth affected by dental caries (a mean of 2.4 decayed or filled teeth) compared to poor non-Hispanic blacks (mean 1.5) and non-Hispanic whites (mean 1.9). Among the nonpoor, Mexican American 2- to 9-year-olds have the highest number of affected teeth (mean 1.8), followed by non-Hispanic blacks (1.3) and non-Hispanic whites (1.0).

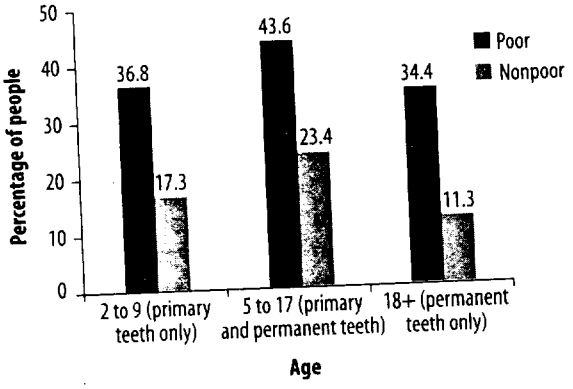
There are also differences by race/ethnicity and poverty level in the proportion of untreated decayed teeth for all age groups. Poor Mexican American children aged 2 to 9 have the highest proportion of untreated decayed teeth (70.5 percent), followed by poor non-Hispanic black children (67.4 percent) (Figure 4.3). Nonpoor children have lower propor-

FIGURE 4.1
Dental caries is one of the most common diseases among 5- to 17-year-olds



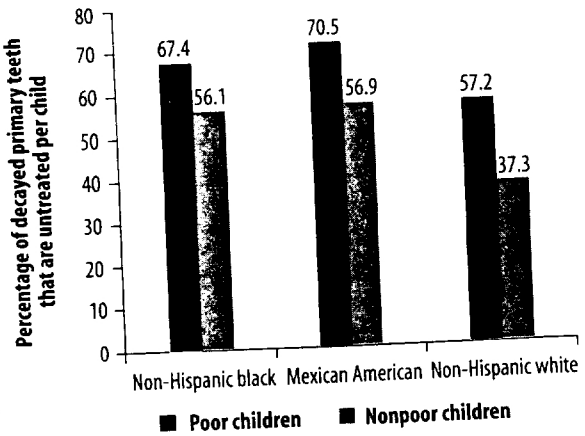
Note: Data include decayed or filled primary and/or decayed, filled, or missing permanent teeth. Asthma, chronic bronchitis, and hay fever based on report of household respondent about the sampled 5- to 17-year-olds.
Source: NCHS 1996.

FIGURE 4.2
A higher percentage of poor people than nonpoor have at least one untreated decayed tooth



Source: NCHS 1996.

FIGURE 4.3
Poor children aged 2 to 9 in each racial/ethnic group have a higher percentage of untreated decayed primary teeth than nonpoor children



Source: NCHS 1996.

tions of untreated decayed teeth, although the group with the lowest proportion (non-Hispanic whites) still has an average of 37.3 percent of decayed teeth untreated.

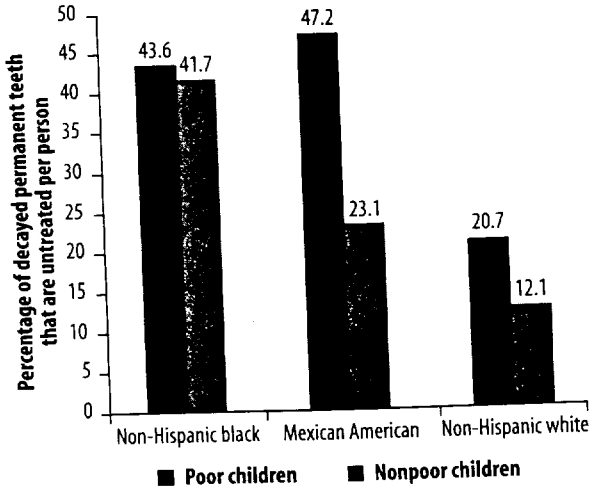
Poor adolescents aged 12 to 17 in each racial/ethnic group have a higher percentage of untreated decayed permanent teeth than the corresponding nonpoor adolescent group (Figure 4.4). Poor Mexican American (47.2 percent) and poor non-Hispanic black adolescents (43.6 percent) have more than twice the proportion of untreated decayed teeth than poor non-Hispanic white adolescents (20.7 percent). For nonpoor adolescents the proportion of untreated decayed permanent teeth is highest in non-Hispanic black adolescents (41.7 percent)—a proportion only slightly lower than for this group's poor counterparts (43.6 percent). The mean number of permanent teeth affected by dental caries (decayed or filled) for this age group is similar among Mexican Americans (2.7), non-Hispanic whites (2.5), and non-Hispanic blacks (2.3). As income level increases, the percentage of adolescents with decayed teeth decreases and the proportion of decayed teeth that have been filled increases (Vargas et al. 1998).

Adult populations (aged 18 and older) show a similar pattern, with the proportion of untreated decayed teeth higher among the poor than the nonpoor (Figure 4.5). Regardless of poverty level status, adult non-Hispanic blacks and Mexican Americans have higher proportions of untreated decayed teeth than their non-Hispanic white counterparts.

Improvements have been noted over the past 25 to 30 years with regard to dental caries. Among most age groups, the average number of teeth per person affected by dental caries has decreased, and the average number of teeth per person that show no signs of infection, as well as the proportion of the population that is caries-free, has increased.

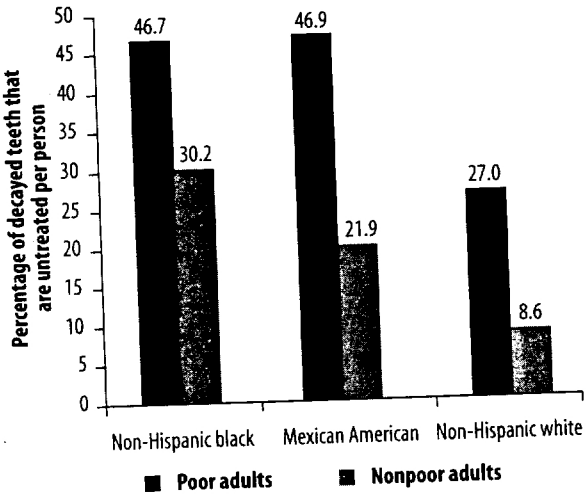
Since 1971-74, major increases have been noted in the percentage of children and adolescents aged 5 to 17 who have never experienced dental caries in their permanent teeth. Younger adults have experienced a decline in dental caries during this time period, as measured by the average number of teeth without decay or fillings (Figure 4.6). These trends are not found among those 55 to 74 years of age.

FIGURE 4.4
Poor children aged 12 to 17 in each racial/ethnic group have a higher percentage of untreated decayed permanent teeth than nonpoor children



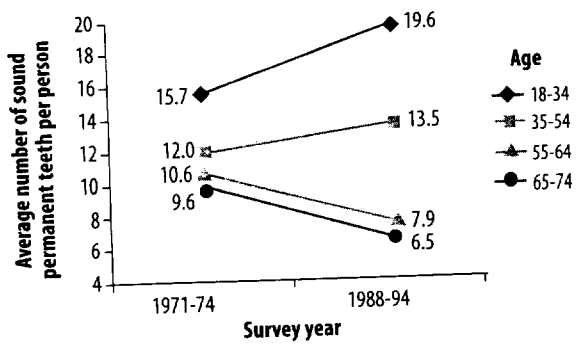
Source: NCHS 1996.

FIGURE 4.5
Poor adults aged 18 and older have a higher percentage of untreated decayed teeth than nonpoor adults



Source: NCHS 1996.

FIGURE 4.6
Since 1971-74, the average number of permanent teeth without decay or fillings has increased among 18- to 54-year-olds



Sources: NCHS 1975, 1996.

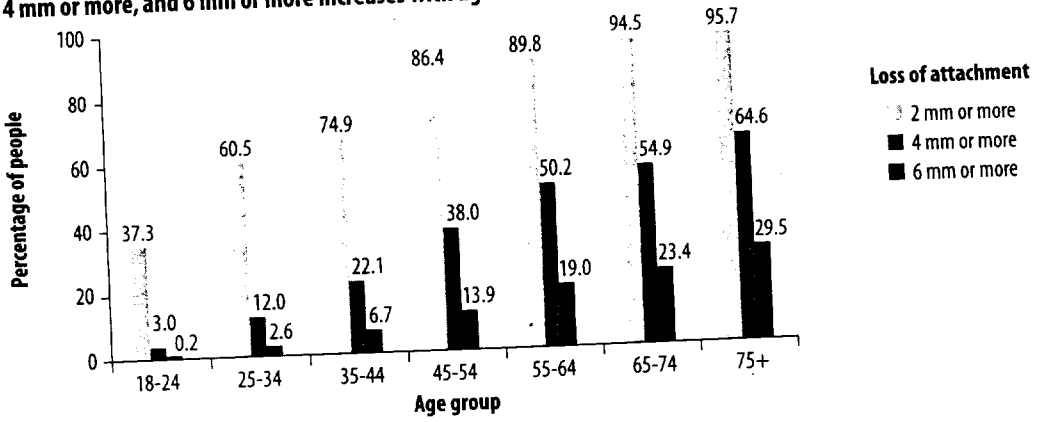
The number of untreated decayed teeth per person across all age groups has also declined.

Periodontal Diseases

The presence of periodontal disease is measured clinically in several ways, one of which is by calculating the loss of periodontal attachment. Figure 4.7 shows that most adults 25 years and older have at least 2 mm or more loss of attachment. The disease is more serious as the amount of attachment loss and number of tooth sites affected increase. More severe disease can be defined as having 4 mm or more loss of attachment in at least one site. The percentage of adults with 6 mm or more loss of attachment at one or more sites increases at older age groups, with 19.0 percent of 55- to 64-year-olds and 23.4 percent of 65- to 74-year-olds having this amount of loss or more. Figure 4.8 displays these data in a different format and shows that a small but increasing percentage of the population at each older age group has severe disease.

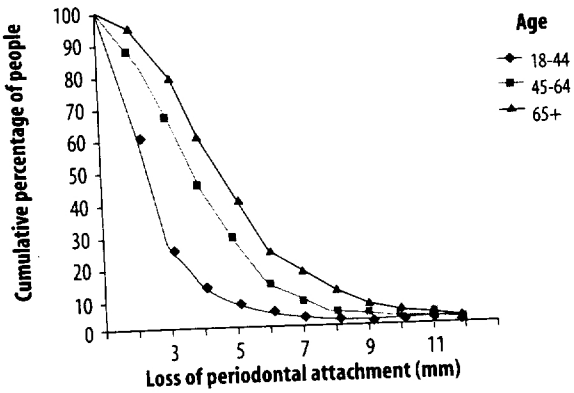
At all ages, men are more likely than women to have at least one tooth site with a 6 mm or more loss of attachment (Figure 4.9). In addition to age and sex, the prevalence of periodontal loss of attachment also varies by racial/ethnic group (Figure 4.10). A higher percentage of non-Hispanic black persons at each age group have at least one tooth site with 6 mm or more of periodontal attachment loss as compared to other groups. Within each racial/ethnic group, the highest percentage affected is found among individuals 70 years and older. At every age, a higher proportion of those at the lowest socioeconomic status

FIGURE 4.7
The proportion of adults with at least one site with loss of periodontal attachment of 2 mm or more, 4 mm or more, and 6 mm or more increases with age



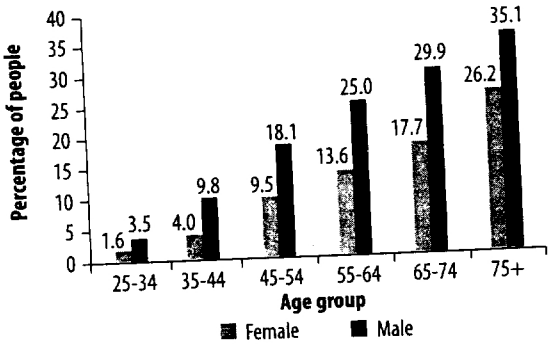
Sources: Adapted from NCHS 1996, Burt and Eklund 1999.

FIGURE 4.8
Although older adults have more periodontal attachment loss than younger adults, severe loss is seen among a small percentage of individuals at every age



Sources: Adapted from NCHS 1996, Burt and Eklund 1999.

FIGURE 4.9
Males are more likely than females to have at least one tooth site with 6 mm or more of periodontal loss of attachment



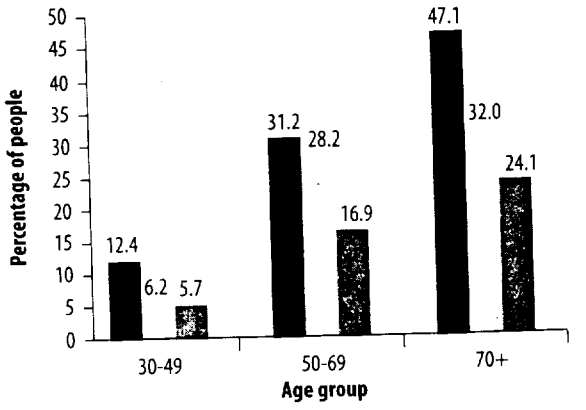
Sources: Adapted from NCHS 1996, Burt and Eklund 1999.

(SES) level have at least one site with attachment loss of 6 mm or more, compared to those at higher SES levels (Figure 4.11) (Burt and Eklund 1999).[1]

Gingivitis as measured by gingival bleeding, a sign of inflammation, is more evident among Mexican Americans (63.6 percent) than among non-Hispanic blacks (55.7 percent) and non-Hispanic whites (48.6 percent) (Albandar et al. 1999).

Early-onset periodontitis, a severe, rapidly progressive disease occurring in individuals under age 35, has been reported to be 4 times more common in males than in females (Löe and Brown 1991); among 13- to 17-year-olds, it has been found to be highest among African Americans (10.0 percent), as compared with Hispanics (5.0 percent) and whites (1.3 percent) (Albandar et al. 1997).

FIGURE 4.10
Non-Hispanic blacks are more likely than other groups to have at least one tooth site with 6 mm or more of periodontal loss of attachment



Source: NCHS 1996.

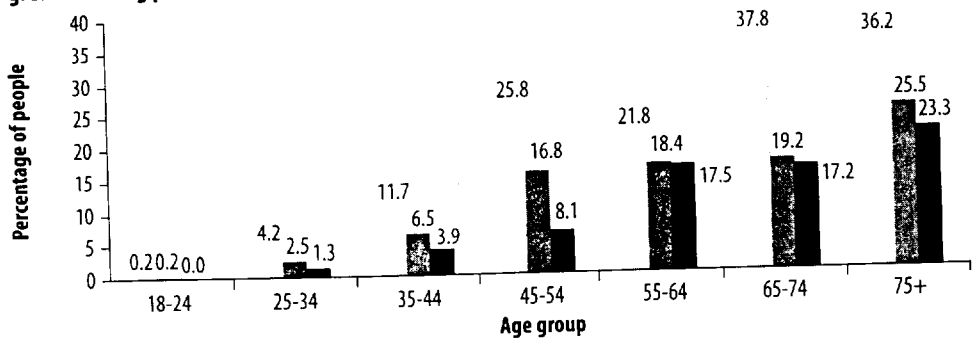
Tooth Loss and Edentulism

Although teeth are lost for a number of reasons, including trauma, orthodontic treatment, and removal of third molars (wisdom teeth), most teeth are lost because of periodontal disease or dental caries (Phipps and Stevens 1995, Neissen and Weyant 1989). By age 17, more than 7.3 percent of U.S. children have lost at least one permanent tooth because of caries; by age 50, Americans have lost an average of 12.1 teeth, including the third molars.

Men and women are nearly equally likely to be edentulous. Overall, a higher percentage of individuals living below the poverty level are edentulous than are those living above (Figure 4.12). Individuals with incomes equal to or above twice the poverty level have a rate of edentulism of 6.9 percent. This rate is less than half the rate for those with incomes below twice the poverty level (14.3 percent).

Although the overall rate of edentulism for adults 18 and older is approximately 10 percent (9.7 percent), the rate increases with age, so that about a third (33.1 percent) of those 65 and older are edentulous. Comparisons across race/ethnicity for the population 18 years and older indicate that the edentulous rate

FIGURE 4.11
The percentage of adults with at least one tooth site with 6 mm or more of periodontal attachment loss is greater among persons of low socioeconomic status at all ages



Sources: Adapted from NCHS 1996, Burt and Eklund 1999.

[1]In this section, income levels are defined as *low* (less than 185 percent of the U.S. poverty level or below), *middle* (185.1 percent to 350 percent of the poverty level), and *high* (350.1 percent of the poverty level or higher).

for non-Hispanic whites is 10.9 percent; for non-Hispanic blacks, it is 8.0 percent; and for Mexican Americans, 2.4 percent. Non-Hispanic whites, both poor and nonpoor, have the highest rates of edentulism compared to non-Hispanic blacks and Mexican Americans. Of the three population groups, Mexican Americans are the least likely to lose all of their teeth, and the proportion of Mexican Americans who are edentulous varies only slightly by economic status. A lower proportion of U.S. adults have lost all their natural teeth now than was the case two decades ago (Figure 4.13). The decline is most pronounced at older ages.

Edentulism is one of a few conditions for which state-specific data exist. These data reveal a wide variation in the percentages of the population aged 65 and older who have no teeth, from a low of 13.9 percent in Hawaii to a high of 47.9 percent in West Virginia; this is more than a threefold difference (Table 4.1) (Tomar 1997). Reasons for these differences are unknown at this time.

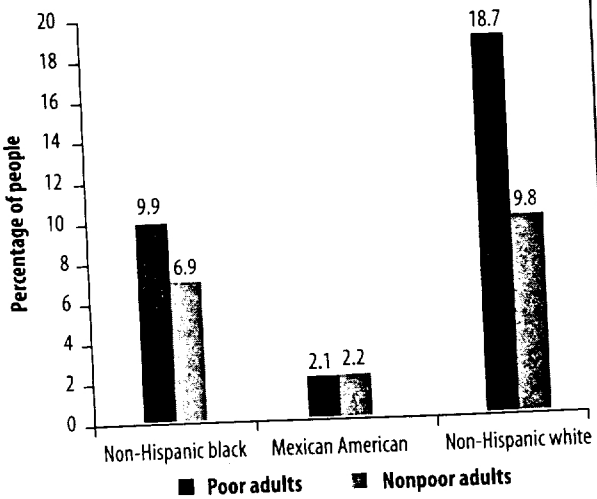
Oral and Pharyngeal Cancers and Precancerous Lesions

Oral and Pharyngeal Cancers

Every year, about 1.2 million people develop cancer in the United States (based on 2000 estimates). Sites in the oral cavity and pharynx (throat) account for about 30,200 cases, or 2.4 percent of all cancers, and about 7,800 Americans die from these cancers each year (ACS 1999). The life of each person with these cancers is shortened by an average of 16.5 years. The median age at diagnosis of oral and pharyngeal cancer is 64, and the rate of occurrence increases with age. More than 95 percent of oral cancers occur in individuals aged 35 and older (Ries et al. 1999).

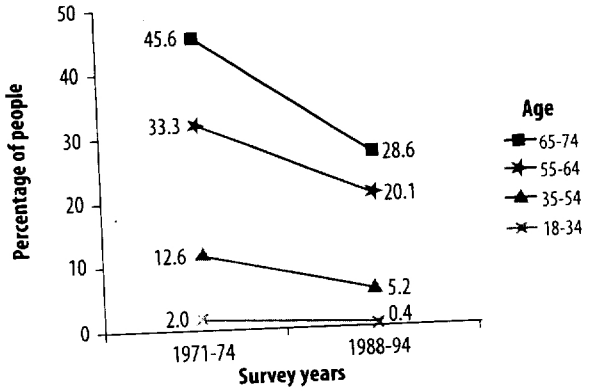
The overall 5-year survival rate for people with oral and pharyngeal cancers is 52 percent, which is worse than that for—among others—cancers of the prostate, corpus and uterus, breast, bladder, larynx, cervix, colon, and rectum in both blacks and whites (Ries et al. 1999). People with oral cancers detected at an early stage have a 5-year survival rate of 81.3 percent; however, only 35 percent of individuals with oral and pharyngeal cancers are diagnosed at an early stage. The 5-year survival rate drops to 21.6 percent

FIGURE 4.12
Complete tooth loss varies by race/ethnicity and poverty status: a higher percentage of poor and nonpoor non-Hispanic white adults (18 and older) have no teeth compared with non-Hispanic blacks and Mexican Americans



Source: NCHS 1996.

FIGURE 4.13
The percentage of people without any teeth has declined among adults over the past 20 years



Sources: NCHS 1975, 1996.

TABLE 4.1
Five states with highest and lowest percentages of edentulous persons aged 65 and older

States with Highest Percentage		States with Lowest Percentage	
State	Percentage Edentulous	State	Percentage Edentulous
West Virginia	47.9	Hawaii	13.9
Kentucky	44.0	California	16.2
Louisiana	43.0	Oregon	16.5
Arkansas	39.2	Arizona	18.5
Maine	37.8	Wisconsin	19.4

Source: Tomar 1997.

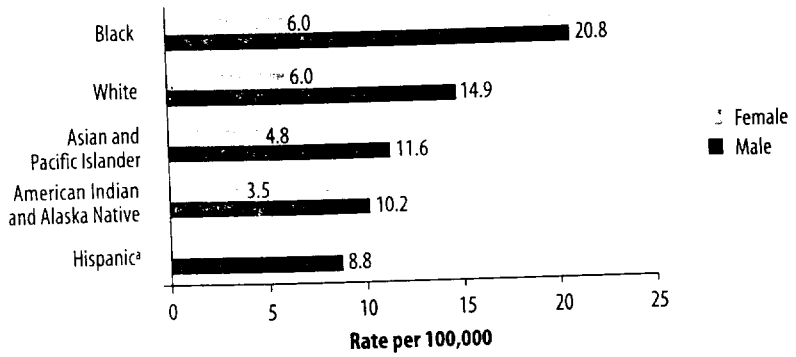
among people diagnosed with advanced-stage cancers (Ries et al. 1999). Compared to patients with other types of cancer, oral and pharyngeal cancer patients who survive have the highest rate of development of new cancers in the mouth or in other parts of the body (Winn and Blot 1985).

Incidence rates for oral and pharyngeal cancers are higher for black individuals than for whites: 12.5 cases versus 10.0, respectively, per 100,000 people each year. In the United States, Asians and Pacific Islanders (7.9 per 100,000), American Indians and Alaska Natives (6.4 per 100,000), and Hispanics (5.8 per 100,000) have lower incidence rates than whites and blacks (Wingo et al. 1999).

Figure 4.14 provides incidence rates for selected racial/ethnic groups by sex. Males have higher incidence rates than females; specifically, they are 2.6 times more likely to develop oral and pharyngeal cancers than women (Ries et al. 1999). The incidence rates of oral and pharyngeal cancers for black males are 39.6 percent higher than for white males (20.8 versus 14.9, respectively, per 100,000 males per year). Rates for black and white females are the same (6.0 per 100,000 females per year) (Ries et al. 1999). Oral and pharyngeal cancers are the seventh most common cancer among white males and the fourth most frequently diagnosed cancer among black males (Figure 4.15) (Wingo et al. 1999).

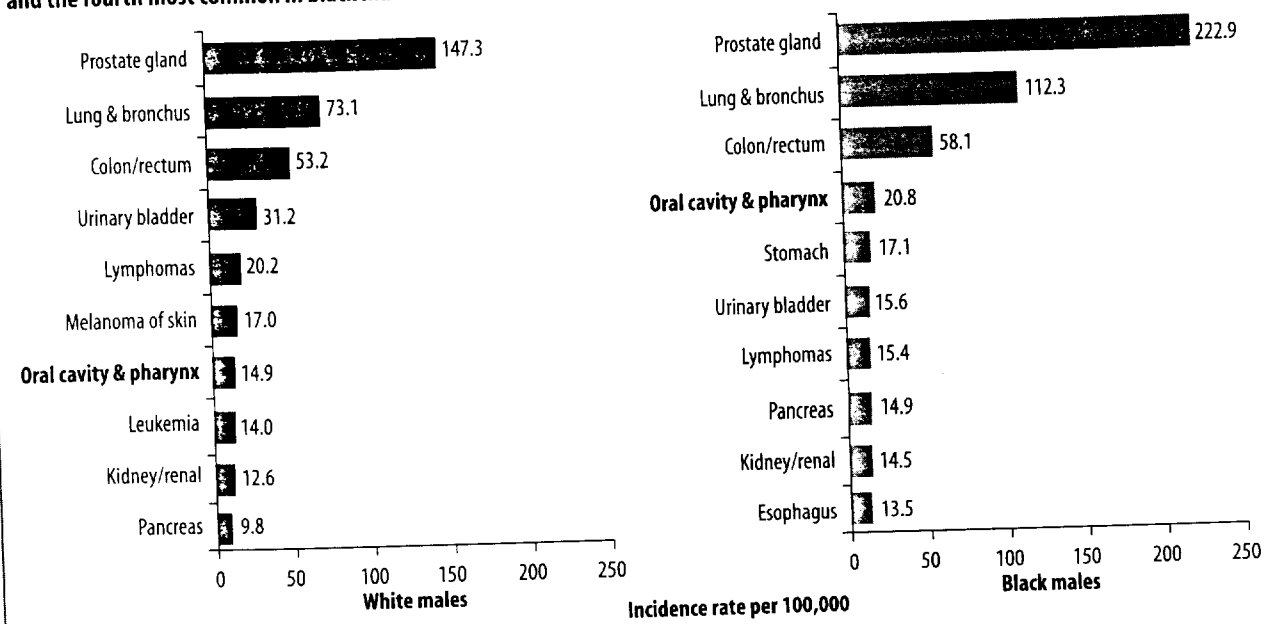
As for many other cancer sites, the overall 5-year survival rate for oral and pharyngeal cancers is lower for blacks than for whites: 34 versus 56 percent

FIGURE 4.14
Males have higher incidence rates of oral and pharyngeal cancers than females



Note: Age adjusted to the 1970 U.S. standard.
[a] Data are unavailable for Hispanic females.
Sources: Adapted from Wingo et al. 1999; SEER Program, 1990-96, Ries et al. 1999.

FIGURE 4.15
Cancers of the oral cavity and pharynx are the seventh most common cancers in white males and the fourth most common in black males



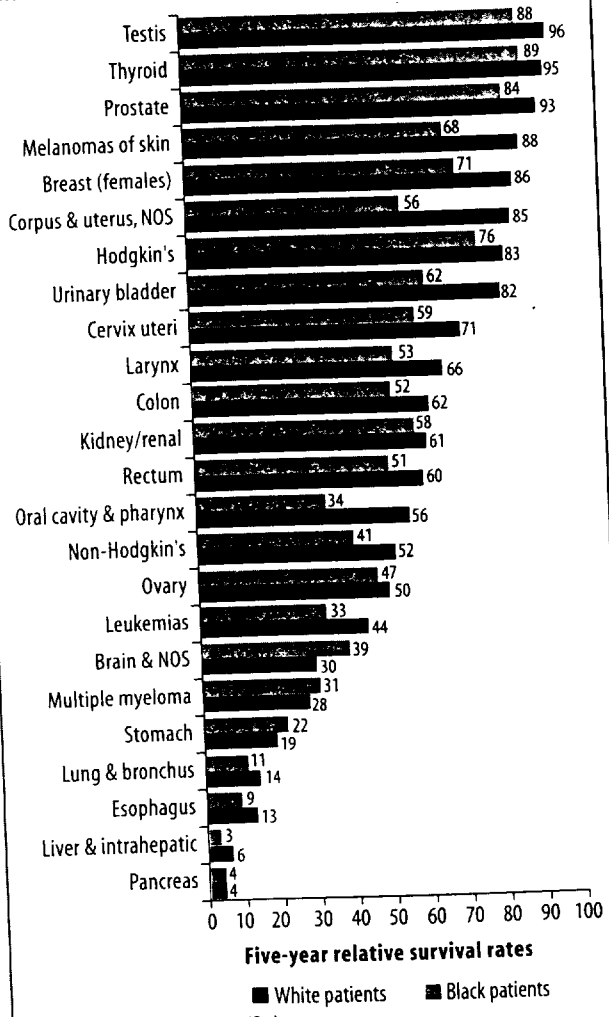
Note: Age adjusted to the 1970 U.S. standard.
Sources: Adapted from Wingo et al. 1999; SEER Program, 1990-96, Ries et al. 1999.

(Ries et al. 1999) (Figure 4.16). However, only 19 percent of blacks with oral and pharyngeal cancers are diagnosed when the cancer is at the local, and more easily treatable, stage, compared to 38 percent for whites (Figure 4.17). At every stage of diagnosis, the survival rate for blacks is lower than for whites (Figure 4.18).

The occurrence of cancers in specific sites within the oral cavity and pharynx varies by sex and race/ethnicity. A relatively rare subtype of pharyngeal cancer, nasopharyngeal cancer, occurs more often in American males and females of Chinese descent than among other racial/ethnic groups (Miller et al. 1996). Blacks are twice as likely as whites to develop cancers of the pharynx: 6.0 and 2.9 per 100,000 per year, respectively (Ries et al. 1999). Individuals with cancers of the pharynx generally have a worse survival rate than those with cancers in oral cavity sites: 5-year pharyngeal cancer survival rates range from 53.3 to 29.5 percent, depending on the subsite, whereas oral cavity cancer survival rates range from 94.3 to 48.3 percent. The incidence of lip cancer, a highly treatable cancer, is more common in whites than among blacks (1.2 per 100,000 persons per year compared to 0.1).

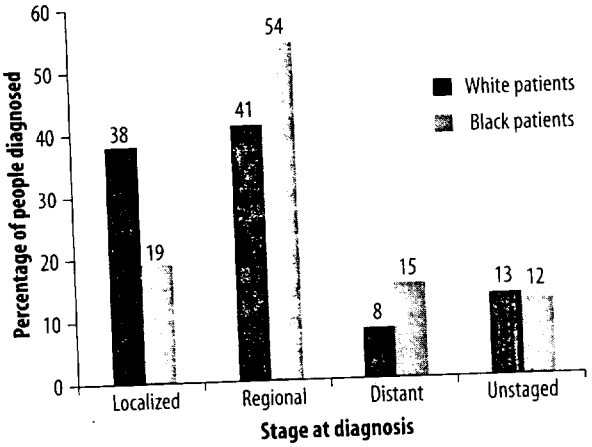
Overall, the incidence rate for oral cavity and pharyngeal cancers is decreasing, with an estimated annual percentage decrease of 0.5 percent per year between 1973 and 1996. There are wide variations in the incidence of site-specific cancers. The largest

FIGURE 4.16
Five-year relative survival rates for selected cancers for whites and blacks



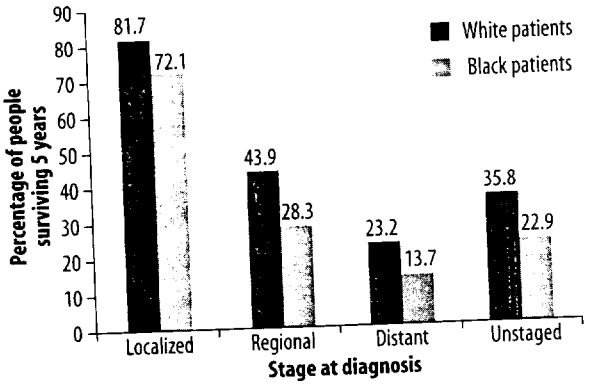
Note: NOS = not otherwise specified.
Source: Kosary 1996.

FIGURE 4.17
Blacks are less likely to be diagnosed with a localized oral or pharyngeal cancer than whites



Source: Adapted from SEER Program, 1989-95, Ries et al. 1999.

FIGURE 4.18
At every stage of diagnosis, the 5-year relative survival rates for blacks with oral and pharyngeal cancers are lower than for whites



Source: Adapted from SEER Program, 1989-95, Ries et al. 1999.

annual declines in incidence were noted for lip cancer (–3.4 percent per year between 1973 and 1996) (Ries et al. 1999). In contrast, the incidence of tongue cancer, the most common form of oral and pharyngeal cancer, may be increasing among young men (Day et al. 1994).

Although overall mortality rates for oral and pharyngeal cancers declined by 1.6 percent per year between 1973 and 1996, the 5-year survival rate for individuals with oral and pharyngeal cancers has shown no improvement for the past 25 years (Ries et al. 1999).

Mortality statistics by state allow for analysis of deaths due to oral cavity and pharyngeal cancers. Table 4.2 highlights the wide variation in mortality found in the country. The highest rate is in the District of Columbia—6.7 per 100,000 population; this is nearly 5 times the lowest rate, 1.4 in Utah. Again, reasons for this variation need to be studied (Ries et al. 1999).

Tobacco-related Lesions

Tobacco use has been estimated to account for over 90 percent of cancers of the oral cavity and pharynx (Peto et al. 1995) and thus represents the greatest single preventable risk factor for oral cancer. Both smoking and spit (smokeless) tobacco (moist snuff and chewing tobacco) are associated with a number of other oral conditions, including oral mucosal lesions, that may progress to oral cancer (Silverman 1998).

One type of tobacco-related lesion is seen in people who use spit tobacco. A national survey of U.S. schoolchildren in 1985-86 showed that 6.1 percent of males and 0.1 percent of females used spit tobacco. The survey also showed that 34.9 percent of current snuff users aged 12 to 17 and 19.6 percent of current adolescent chewing tobacco users had a spit tobacco lesion (Figure 4.19) (Tomar et al. 1997). The prevalence of tobacco-related lesions increased with increasing duration and frequency of spit tobacco use.

In some American Indian tribes, both adolescent males and females commonly use spit tobacco and have an especially high frequency of spit tobacco lesions. On a Sioux reservation, 37.0 percent of students in grades 7 through 12 used spit tobacco. Spit tobacco lesions occurred in over one third of those tobacco-using adolescents (CDC 1988). In another study of Navajo adolescents, three fourths of male adolescents (75.4 percent) and one half of female adolescents (49.0 percent) used spit tobacco. Of Navajo adolescents who used spit tobacco, 25.5 percent had spit tobacco lesions—29.6 percent of males and 17.0 percent of females (Wolfe and Carlos 1987).

Selected Mucosal Infections and Diseases

Oral Herpes Simplex Virus Infections

The prevalence of recurrent herpes lesions is estimated to be between 15 and 40 percent (Scully 1989). The proportion of the U.S. population with herpes simplex virus type 1 (HSV-1) antibodies is 68.2 percent (as evidenced by positive antibody titer). The proportion reporting a history of herpes lesions in the past 12 months is 17.7 percent. The presence of antibodies and occurrence of herpes lesions vary by age (Figure 4.20). The frequency of recurrence also varies greatly, ranging from once to several times per year.

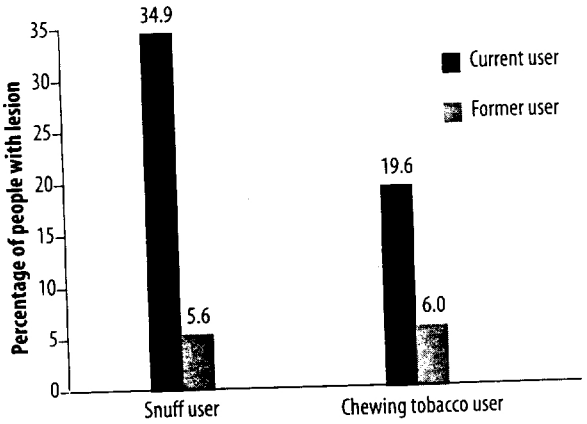
Infection with the oral herpes simplex virus has been related to socioeconomic factors, with 75 to 90 percent of individuals from lower socioeconomic

TABLE 4.2
Five states with highest and lowest oral and pharyngeal cancer mortality rates

States with Highest Rates		States with Lowest Rates	
State	Mortality Rate per 100,000 Population	State	Mortality Rate per 100,000 Population
District of Columbia	6.7	Minnesota	2.0
Delaware	4.0	Wyoming	2.0
South Carolina	3.9	Colorado	2.0
Louisiana	3.5	North Dakota	1.8
Florida	3.4	Utah	1.4

Note: Ages adjusted to the 1970 standard population.
Source: Ries et al. 1999.

FIGURE 4.19
Tobacco-related oral lesions are more common in 12- to 17-year-olds who currently use spit tobacco



Source: Adapted from Tomar et al. 1997.

populations developing antibodies by the end of the first decade of life (Whitley 1993a,b). In comparison, 30 to 40 percent of individuals from middle and upper socioeconomic groups evidence antibodies by the middle of the second decade of life.

The prevalence of one or more herpes labialis lesions within the past 12 months is 8.4 percent for non-Hispanic blacks, 16.2 percent for Mexican Americans, and 19.7 percent for non-Hispanic whites (NHANES III).

Recurrent Aphthous Ulcers

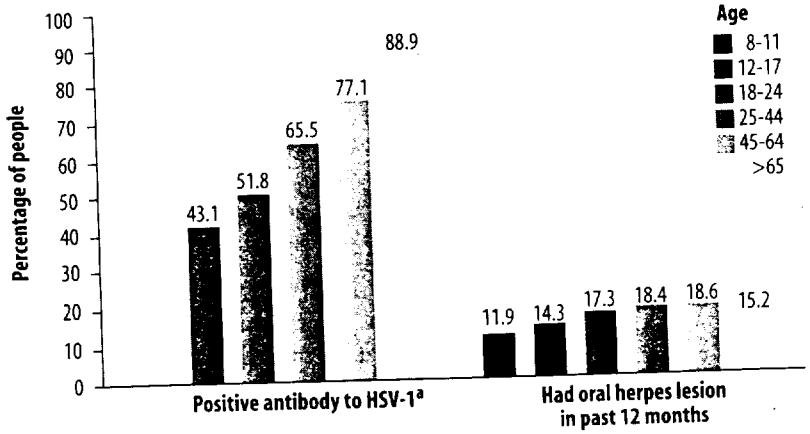
Various epidemiologic studies of recurrent aphthous ulcers have indicated that the prevalence in the general population can vary from 5 to 25 percent (Axéll et al. 1976, Embil et al. 1975, Ferguson et al. 1984, Ship 1972, Ship et al. 1967). In NHANES III, 17.2 percent of persons reported having a recurrent aphthous ulcer within the past 12 months, and occurrences were most common among young adults (18 to 24 years old) (Figure 4.21). In selected population groups, the prevalence of recurrent aphthous ulcers can be as high as 50 to 60 percent (Miller and Ship 1977, Ship et al. 1961, 1977).

Other Mucosal Lesions

Other mucosal conditions contribute to the burden of oral diseases. The following are among the most common:

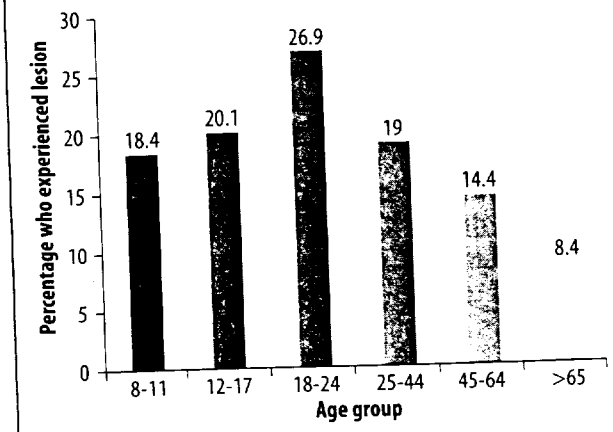
- *Oral candidiasis* (commonly called thrush) is a particular problem for individuals with impaired immune function. A prevalence of 9.4 percent has been reported in renal transplant patients (King et al. 1994); Samaranayake (1992) reports prevalences between 43 and 93 percent among HIV-infected patients. It is estimated that 3.6 percent of full denture wearers have candidiasis.
- *Denture stomatitis*, a condition in which the mucosa underneath a denture becomes inflamed and sometimes painful, affects 25.6 percent of people aged 18 and older who have two full dentures. Additionally, 32.2 percent of those with one full denture are affected, 26.7 percent of those with one or more partial dentures, and 0.87 percent of those who do not have full or partial dentures.
- *Oral human papillomavirus infections*, oral and genital papillomas (or condyloma acuminata, also called venereal warts), are especially common among HIV-positive patients. Human papillomaviruses may be associated with some oral leukoplakias with a high risk for malignant transformation (Palefsky et al. 1995).

FIGURE 4.20
Herpes simplex type 1 virus infection is widespread, and oral herpes lesions (cold sores/fever blisters) are common



[a] Data not available for the 8- to 11-year-old age group.
Source: NCHS 1996.

FIGURE 4.21
A substantial percentage of the population, particularly among young adults, has experienced recurrent aphthous lesions (canker sores) in the past 12 months



Source: Adapted from NCHS 1996.

Developmental Disorders

Numerous developmental disorders affect the oral, dental, and craniofacial complex. These include congenitally missing teeth (all or specific tooth types); congenital problems involving tooth enamel, pulp, or dentin; and craniofacial birth defects or syndromes.

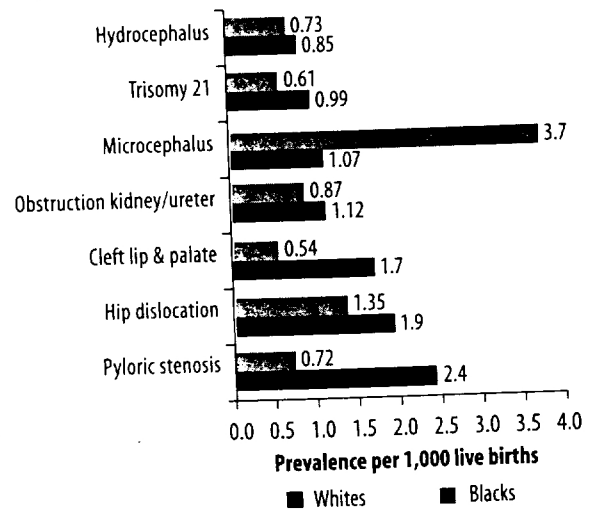
Cleft lip and palate are the most common congenital anomalies and may occur as isolated defects or as part of other syndromes. Other craniofacial defects and syndromes that have been the focus of recent genetics research include ectodermal dsyplasia, Treacher Collins syndrome, Apert's syndrome, and Waardenburg syndrome. Craniofacial defects and syndromes have many serious consequences including unusual facial features; severe functional problems; and the need for extensive surgical, medical, and rehabilitative interventions and prosthetic devices.

Cleft Lip/Palate

Oral clefts are one of the most common classes of congenital malformations in the United States, with prevalence rates in the general population of 1.2 per 1,000 births for cleft lip with or without cleft palate and 0.56 per 1,000 births for cleft palate alone (Schulman et al. 1993). These conditions affect facial appearance throughout life.

The rate of oral clefts for whites is more than 3 times that for blacks (1.7 versus 0.5 per 1,000 live births) (Figure 4.22). Oral clefts are more common among North American Indians (3.7 per 1,000 births) (Lowry et al. 1989). Cleft palate occurs more frequently in females, whereas cleft lip or cleft lip/palate is more common in males (Burman 1985, Fraser and Calnan 1961, Habib 1978, Owens et al. 1985).

FIGURE 4.22
Cleft lip and cleft palate are among the most common congenital malformations, and prevalence varies by race



Source: Schulman et al. 1993.

Malocclusions

Malocclusions can occur due to congenital or acquired misalignments (crowding) of the teeth or jaws. In a national study of individuals between 8 and 50 years old, 25 percent were found to have no crowding of the incisors (front teeth), whereas 11 percent were found to have severe crowding (Brunelle et al. 1996). About 9 percent had a posterior crossbite, where there is poor contact of the back upper and lower chewing surfaces. This crossbite was most common in non-Hispanic whites. Severe overjet—where the upper front teeth project far forward—was found in approximately 8 percent of this population, with a similar percentage demonstrating a severe overbite—where the front top and bottom teeth greatly overlap when the mouth is closed. Less than 5 percent of non-Hispanic whites had an open bite, an inability to bring the upper and lower front teeth together.

Injury

Injuries to the head, face, and teeth are very common. They can range in severity from the very mild to those that cause death. Although injuries have a major impact on oral health, data on the number and severity of head and face injuries in the United States are very limited.[2] Most of our knowledge about the number of injuries that occurs comes from more severe injuries that involve a visit to the emergency room.

In 1993 and 1994, there were 20 million visits per year to emergency departments for craniofacial injuries. Less serious injuries can be treated on an outpatient basis. More than 5.9 million injuries in 1991 were treated by dentists in private offices (Gift and Bhat 1993). Overall, 25 percent of all persons aged 6 to 50 have had an injury that resulted in damage to one or more anterior teeth (Kaste et al. 1996a). An estimated 2.9 million emergency room visits for all age groups related to tooth or mouth injuries between 1997 and 1998. Twenty-five percent of these injuries were seen in children under the age of 4 (NCHS 1997b).

The leading causes of head and face injuries that result in emergency room visits include falls, assaults,

[2]This section reports national data that should provide some estimation of the scope of craniofacial injuries in the population. However, the findings may not be directly comparable because they are from different sources at different times, and because those at risk for each type of injury are not quantified in most cases.

sports injuries, and motor vehicle collisions (De Wet 1981, Pinkham and Kohn 1991, Sane 1988). In the National Health Care Survey of emergency rooms, assaults and falls each accounted for 31 percent of visits related to head and face injury. Other studies have reported that up to 19 percent of head and face injuries are sports-related (McDonald 1994), and 5 percent of head and 19 percent of face injuries result from riding bicycles and tricycles (U.S. Consumer Product Safety Commission 1987).

There are differences in rates of emergency room visits for head and face injuries among demographic groups. Males had higher rates than females, except among older adults. The rates of injury were higher for younger and older adults than for those in the middle years.

Chronic and Disabling Conditions

Oral-Facial Pain

Oral-facial pain can greatly reduce quality of life. These types of pain may be due to tooth-related infections, mucosal sores, and irritations, and may include burning sensations, pain in the jaw joint area, and aching pain across the face or cheek. Over 39 million people, or 22 percent of adults 18 years of age and older in the civilian U.S. population, experienced at least one of five types of oral-facial pain during a recent 6-month period (Lipton et al. 1993). Based on the results of a national study of the prevalence and distribution of oral-facial pain, it is estimated that during a 6-month period, 1 American adult in 8 (12.2 percent) suffers from toothache, 1 in 12 (8.4 percent) from painful oral sores, 1 in 19 (5.3 percent) from jaw joint pain, and 1 in 71 (1.4 percent) from face or cheek pain (Lipton et al. 1993).

The prevalence of toothache and pain due to oral sores decreases with age, whereas the prevalence of burning mouth pain increases with age. Women are twice as likely as men to report two specific types of oral-facial pain: jaw joint pain and face/cheek pain (Figure 4.23). Non-Hispanic blacks and Hispanics were slightly more likely to report toothache than non-Hispanic whites (Lipton et al. 1993). Adults living in poverty were more likely to report toothaches than adults living above the poverty level (Vargas et al. 2000).

Temporomandibular Disorders

Symptoms of temporomandibular disorders (TMDs) vary but may include severe pain in the jaw musculature, severe pain or difficulty when opening the mouth and chewing, headaches, and ear pain. Based upon assessments of pain in or around the jaw joint, these disorders are estimated to affect 10 million Americans (Lipton et al. 1993).

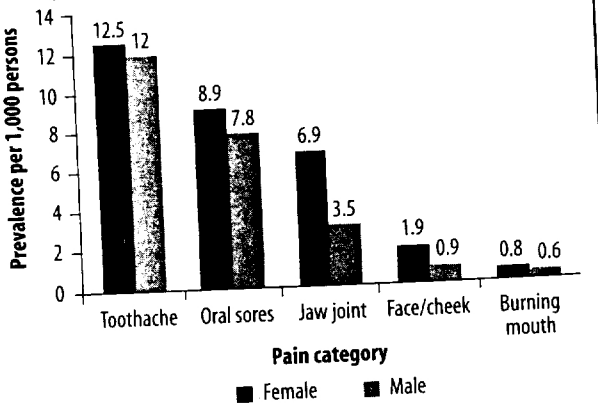
Data from the few available population-based epidemiologic studies indicate that the prevalence of self-reported pain symptoms and clinical signs of TMD pain is between 5 and 15 percent, with peak prevalence in young and middle-aged adults (20 to 40 years of age) (Von Korff 1995).

Although physical signs associated with TMDs have been shown to occur with nearly equal frequency among men and women, clinical studies have found that women in the third and fourth decades of life were much more likely than men of the same age to have sought care for reported facial pain in the temporomandibular region (Carlsson and LeResche 1995).

Sjögren's Syndrome

Sjögren's syndrome, an autoimmune disorder that causes xerostomia (dry mouth), difficulty in swallowing, and xerophthalmia (dry eyes), is estimated to affect 1 to 2 million people in the United States (Talal 1992). The diagnosis is most often made in women in middle age. One estimate of the average annual incidence rate for Sjögren's syndrome, based on the Olmsted County, Minnesota, medical database, is about 3 to 5 cases per 100,000 population; this may be low, however (Pillemer et al. 1995). As with most other autoimmune conditions (e.g., rheumatoid arthritis, systemic lupus erythematosis), Sjögren's syndrome affects more women than men. The female-to-male ratio depends on the study, but may be as high as 9:1 (Fox 1996).

FIGURE 4.23
Toothache is the most common source of oral-facial pain among adults



Note: Data are for persons aged 18 and older looking back over the past 6 months.
Sources: Adapted from NCHS 1989, Lipton et al.1993.

WHAT IS THE BURDEN OF DISEASE IN SELECTED POPULATIONS? CHALLENGES AND OPPORTUNITIES

The national data provide a broad-brush picture of America's oral health. For selected populations, however, oral health and disease status has a different profile. By 2050 about 50 percent of the U.S. population is expected to be Asian, non-Hispanic black, Hispanic, and American Indian (Council of Economic Advisers 1998). Currently available data for these groups present a picture of disease that is generally poorer than that for non-Hispanic whites. These subgroups present a unique cluster of health, socioeconomic, and cultural issues. At the same time, data for the subgroups within each of these categories are lacking. In addition to racial/ethnic groups, other groups such as individuals with disabilities, the homeless, incarcerated individuals, and migrant workers have unique needs and challenges. Cutting across all subgroups are gender-specific health issues. For improvements to be made in America's overall health, a better understanding of the full dimension of the problems faced by these populations and development of specific solutions are needed. This part of the chapter examines each subgroup in greater depth.

Racial and Ethnic Minorities

Although there have been gains in oral health status for the population as a whole, they have not been evenly distributed across subpopulations. Non-Hispanic blacks, Hispanics, and American Indians and Alaska Natives generally have the poorest oral health of any of the racial and ethnic groups in the U.S. population. Other health statistics, such as life expectancy and infant mortality, indicate that the general health of these groups is varied and also poor compared to other population groups (Council of Economic Advisers 1998). To address the elimination of these disparities in health—and also in housing, education, and other indicators of social and economic well-being—the administration has launched "The President's Initiative on Race: One America in the 21st Century." Recommendations for improving the oral and general health status of racial and ethnic minorities are also a prominent feature of Healthy People 2010, the goal-setting health agenda developed for the decade by the USDHHS (2000).

African Americans

Numerous studies over the decades have compared the health status of blacks and whites in American society, but relatively little systematic attention has been focused on the oral health of blacks. Although the overall oral health status of Americans has been improving, many oral diseases and conditions among blacks remain a serious problem—despite the fact that for almost three decades these disparities have been highlighted and recommendations made for addressing health issues including research, education, human resources, and delivery systems (National Dental Association 1972). These recommendations still represent opportunities for improvement in the oral health status of African Americans.

Baseline data for the Healthy People 2010 objectives establish that, for children aged 2 to 4 years, 24.0 percent of non-Hispanic blacks have experienced dental caries in their primary teeth, compared to 15.0 percent for their non-Hispanic white counterparts. For children aged 6 to 8, there were no differences among the races; but for 15-year-olds, a higher percentage of non-Hispanic blacks were affected than of whites. In addition the percentage of people of all ages who had untreated caries was substantially higher for blacks than for whites—about twice as many. Higher levels of gingivitis and periodontal loss of attachment were also seen in non-Hispanic blacks as compared to non-Hispanic whites.

A greater percentage of non-Hispanic blacks 18 years and older have missing teeth when compared to non-Hispanic whites. Relative to non-Hispanic whites, however, non-Hispanic blacks aged 18 and older are less likely to have lost all their teeth (edentulism) regardless of whether they are poor.

African American males have the highest incidence rate of oral cavity and pharyngeal cancers in the United States compared with women and other racial/ethnic groups (Wingo et al. 1999). The distribution of oral cancer cases reveals that blacks also have a higher proportion of pharyngeal cancer than oral cavity cancer compared to whites. Also, the 5-year relative survival rate (1989-95) for oral cancer was much lower among blacks than whites: 34 versus 56 percent (American Cancer Society (ACS) 1999). This latter finding may be related to the fact that a high percentage of these cancers are diagnosed in later stages of disease in blacks as compared to whites (ACS 1999).

On the other hand, for several conditions, African Americans have a lower disease burden than do whites. The incidence rate for cleft lip and cleft palate in African Americans is 0.54 per 1,000, about a third the rate for whites (1.70 per 1,000). Also the prevalence of having one or more herpes labialis lesion within the past 12 months is 50 percent less

than that for Mexican Americans and non-Hispanic whites.

Hispanics

Disparities in oral and general health status between Hispanic and non-Hispanic populations in the United States have been long recognized. Yet the health profile of Hispanics is incomplete due to insufficient sampling of subgroups in national surveys, inconsistent or inadequate assessment of ethnicity, or ambiguities in reporting of ethnic identity (Hahn 1992). Recent efforts to improve data collection, identify subgroups, and provide more baseline data for Hispanics have addressed the situation somewhat, but much work remains to ensure accurate data for health planning and research (Delgado and Estrada 1993).

Among preschool Hispanic children early childhood caries is a particular concern. Two reports have documented early childhood caries among 12.9 percent of Hispanic children examined in San Antonio and 37 percent of predominantly Hispanic children in San Francisco (Garcia-Godoy et al. 1994, Ramos-Gomez 1999). Most recently, national survey data suggest that a higher proportion of Mexican American children ages 12 to 23 months may experience dental caries than other race/ethnicity groups (Kaste et al. 1996b).

Preliminary data from NHANES III indicate that young Mexican American children aged 2 to 4 are more likely to have experienced dental caries in their primary teeth, have on average more decayed and filled tooth surfaces, and have more untreated disease than either non-Hispanic white or non-Hispanic black children (Kaste et al. 1996b). Mexican American children aged 2 to 5 years—especially those from lower-income households—were more likely than their African American and non-Hispanic white counterparts to have one or more decayed primary teeth (Vargas et al. 1998).

Dental caries continues to affect large numbers of school-age children and youth, as only 30 percent of Mexican Americans, 32 percent of non-Hispanic whites, and 41 percent of non-Hispanic blacks 12 to 17 years of age were free of caries in their permanent teeth (USDHHS 1996). However, most of the dental caries in the permanent teeth of non-Hispanic white children aged 12 to 17 had been treated or filled (87 percent), compared to 63 percent for Mexican Americans and 60 percent for non-Hispanic blacks.

The only large-scale survey that permits comparison among Hispanic subgroups is the Hispanic Health and Nutrition Examination Survey (HHANES 1982-84). After controlling for age, sex, income, and education, HHANES results show that Cuban American and Puerto Rican adults had about twice as many missing teeth as Mexican Americans. Puerto Ricans and Cuban Americans also had on average more filled teeth than Mexican Americans. Puerto Rican children and adults under 45 years old had more gingivitis than Cuban Americans and Mexican Americans; the highest prevalence of periodontal disease was reported among Puerto Ricans compared to the two other Hispanic groups (Ismail and Szpunar 1990).

A national survey found that employed Hispanic adults were twice as likely to have untreated dental caries as non-Hispanic whites. In this study, gingivitis and periodontal problems (attachment loss and pockets) were also among the more common problems among the Hispanic adults studied (Watson and Brown 1995).

Analysis of a more recent survey (NHANES III) that sampled Mexican Americans is particularly revealing. After adjusting for age, sex, educational attainment, and annual family income, Mexican American adults are similar to their white non-Hispanic counterparts on most oral health indicators. However, among Mexican Americans, individuals in families with less than $20,000 annual income were 1.6 times less likely to have an intact dentition, 3.1 times more likely to have any untreated decay on the crowns of their teeth, and 4.2 times more likely to have severely decayed teeth (very large cavities or only the roots of teeth remaining) than non-Hispanic whites (Garcia and Drury 1999). Also, Mexican Americans were less likely to be edentulous regardless of poverty status than either non-Hispanic whites or non-Hispanic blacks (Drury et al. 1999).

These findings confirm the importance of controlling for sociodemographic factors in reporting on oral health status as well as the need to assess other factors related to health status. As a group, Hispanics have lower median incomes, higher poverty rates, more unemployment, and less education than non-Hispanic whites (Ramirez 1999). However, sociodemographic factors are just one aspect of the questions raised when attempting to understand differences in oral health. The effect of financial barriers and nonfinancial factors such as language, culture, dietary patterns, and behaviors on access, care seeking, and health outcomes must also be examined. Variations in conditions such as diabetes also may contribute to differences in oral health.

It is estimated that Hispanics will surpass African Americans as the country's largest minority group by 2020 (U.S. Bureau of the Census 2000). Aggregate statistics obscure substantial variations within