Toward Improving the Oral Health of Americans: an Overview of Oral Health Status, Resources, and Care Delivery

ORAL HEALTH COORDINATING COMMITTEE, PUBLIC HEALTH SERVICE

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Synopsis

Dental and oral diseases may well be the most prevalent and preventable conditions affecting Americans. More than 50 percent of U.S. children, 96 percent of employed U.S. adults, and 99.5 percent of Americans 65 years and older have experienced dental caries (also called cavities). Millions of Americans suffer from periodontal diseases and other oral conditions, and more than 17 million Americans, including 10 million Americans 65 years or older, have lost all of their teeth. Preventive dental services are known to be effective in preventing and controlling dental diseases. Unfortunately, groups at highest risk for disease—the poor and minorities—have lower rates of using dental care than the U.S. average.

Cost is the principal barrier to dental care for many Americans. Of the $38.7 billion spent for dental services in 1992, public programs, including Medicaid, paid for less than 4 percent of dental expenditures. More than 90 percent of care was paid for either out-of-pocket by dental consumers or through private dental insurance.

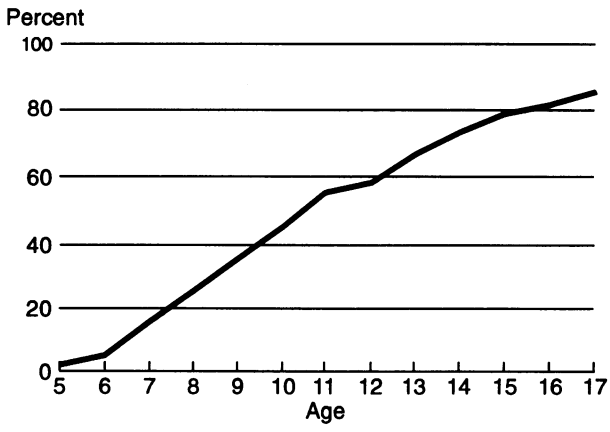
Americans are at risk for other oral health problems as well. Oropharyngeal cancer strikes approximately 30,000 Americans each year and results in an estimated 8,000 deaths annually. Underlying medical or handicapping conditions, ranging from rare genetic diseases to more common chronic diseases, affect millions of Americans and can lead to oral health problems. Among persons with compromised immune systems, oral diseases and conditions can have a significant impact on health.

Oral diseases and conditions, though nearly universal, can be prevented easily and controlled at reasonable cost. Prevention and early, regular primary dental care are the best strategies to improve the oral health and quality of life of all Americans.

JONATHAN KOZOL, in his 1991 book, "Savage Inequalities: Children in America's Schools," describes a picture unseen by most policy makers, but all too common for those who have worked in public programs serving poor, minority, and underserved populations (*1*).

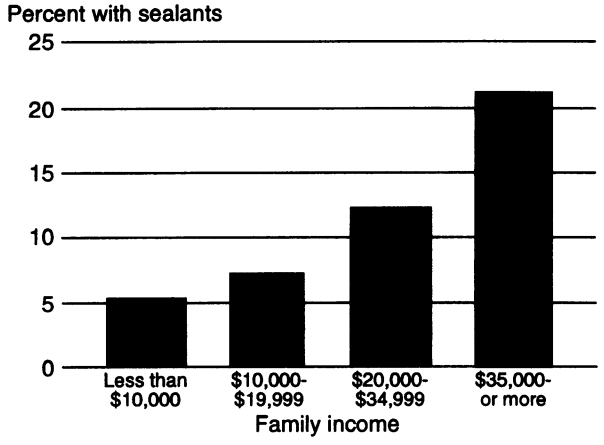
> Although dental problems don't command the instant fears associated with low birth weight, fetal death or cholera, they do have the consequences of wearing down the stamina of children and defeating their ambitions. Bleeding gums, impacted teeth and rotting teeth are routine matters for the children I have interviewed in the South Bronx. Children get used to feeling constant pain. They go to sleep with it. They go to school with it. Sometimes their teachers are alarmed and try to get them to a clinic. But it's all so slow and heavily encumbered with red tape and waiting lists and missing, lost or canceled welfare cards, that dental care is often long

Figure 1. Percentage of U.S. children 5-17 years of age who have experienced dental caries, 1986-87



Reference 2.

Figure 2. Use of dental sealants among U.S. children 5-17 years of age by family income, 1989



SOURCE: Reference 2.

delayed. Children live for months with pain that grown-ups would find unendurable. The gradual attrition of accepted pain erodes their energy and aspirations. I have seen children in New York with teeth that look like brownish, broken sticks. I have also seen teenagers who were missing half their teeth. But, to me, most shocking is to see a child with an abscess that has been inflamed for weeks and that he has simply lived with and accepts as part of the routine of life.

Millions of Americans suffer from diseases and conditions of the oral cavity that result in decreased economic productivity through lost work and school days, needless pain, increased costs, loss of self-esteem, and death. Oral diseases and conditions, including dental caries (also known as cavities), periodontal diseases, and tooth loss afflict more persons than any other single disease in the United States. Americans cannot be truly healthy unless they are free from the burden of oral diseases.

The purpose of this report is to review the epidemiology of dental and oral diseases, including dental caries, periodontal diseases, tooth loss, and oral cancer, and the impact that these diseases and conditions have on Americans. It will describe the need for, and use of, dental services and current expenditures for those services. Finally, it will identify the current gaps in services that need to be addressed to improve the nation's oral health.

Epidemiology of Oral Diseases

Oral diseases among children. Dental caries may well be the most common disease of U.S. children, affecting more than 50 percent of children 5-17 years old (fig. 1) (*2*). Dental caries is a progressive disease process. Unless restorative treatment is provided, the carious lesion will continue to destroy the tooth, eventually resulting in pain, acute infection, and costly treatment to restore the tooth or have it removed. Fortunately, with early professional intervention, caries can either be prevented or treated easily at minimal cost.

During the past 20 years, on average, there has been a dramatic decline in the level of dental caries among school age children (*2*). Many reasons have been suggested for this decline, including (*a*) community water fluoridation (*3*), (*b*) increased use of toothpastes containing fluorides (*4*), (*c*) use of fluoride supplements and mouthrinses (*5*), (*d*) increased availability of fluoride in foods and bottled liquids processed with fluoridated water (*6*), and (*e*) changes in diet (for example, decreased sugar consumption) (*7*).

Although many herald this improvement, millions of children still have significant levels of dental caries. Seventy-five percent of children's dental caries are concentrated in 25 percent of the population (*2*). Higher disease levels generally are found among minorities, children from poor and low-income families, and children whose parents have less than a high school education. Among American Indian and Alaska Native children ages 6 to 8 years, 88 percent have experienced dental caries. By age 15, the disease rate increases to 91 percent in this group.

When dental caries in permanent teeth does occur among children, minority children are less likely to have their disease treated than white

children, and they have more permanent teeth extracted as a consequence (table 1) (*2*). The level of untreated dental disease among American Indian and Alaska Native children is much higher than that for other minority children (according to the Dental Branch, Indian Health Service, Public Health Service, Rockville, MD, February 1993).

Fluoridation and the use of other fluorides have been successful in decreasing the prevalence of dental caries on the smooth surfaces of teeth. Unfortunately, these efforts have much less effect on dental caries that occur in the pits and fissures of teeth (particularly on the biting surfaces of teeth) where more than 85 percent of dental caries now occur (*2*). Dental sealants (a plastic coating placed on the biting surfaces) applied by a dental professional are an effective, proven preventive intervention for this type of decay. To be effective, however, dental sealants must be applied early, periodically assessed, and reapplied as necessary. Unfortunately, the utilization rate of dental sealants among all children, regardless of ethnic or racial background or income level, is significantly less than the national health promotion and disease prevention target level of 50 percent (*8*).

As of 1989, only 10.9 percent of American children had sealants applied (*9*). The mean charge for dental sealants among a dentally insured population in 1988 was $17.80 (standard deviation $3.74) (*10*). Many poor Americans are unable to afford this relatively inexpensive preventive dental care. Approximately 5.3 percent of children ages 5 to 17 years from families whose incomes are less than $10,000 have dental sealants, compared with more than 21 percent of children in families with incomes in excess of $35,000 (fig. 2). For children ages 9–11, only 6 percent of African American children and 10.3 percent of Hispanic and other minority children have dental sealants, compared with 21 percent of white American children.

Children whose parents and caregivers have less than a high school education or whose parents and caregivers are American Indians or Alaska Natives appear to be at markedly increased risk for developing baby bottle tooth decay (also called nursing caries), a severe form of caries that can destroy primary teeth. This type of dental caries is caused by frequent or prolonged use of baby bottles that contain milk, sugared water, fruit juice, or other sugary beverages during the day or night. The prevalence of baby bottle tooth decay has been estimated at 53 percent among rural American Indian and Alaska Native Head Start children and as high as 11 percent in some urban areas (*11,12*).

Table 1. Mean and percent components of decayed (D), missing (M), and filled (F) permanent teeth for children ages 5–17 years, United States, 1986–87[1]

Age (years)	Mean DMFT	Percent D of DMFT	Percent M of DMFT	Percent F of DMFT
	White Americans			
All ages ...	1.97	11.7	0.8	87.5
5	0.04	76.2	0.0	23.8
6	0.09	54.1	0.0	45.9
7	0.28	38.3	0.1	61.7
8	0.52	25.9	0.7	73.4
9	0.75	21.7	0.7	77.7
10	1.06	17.9	0.8	81.3
11	1.54	14.0	0.7	85.4
12	1.73	15.5	0.5	84.0
13	2.41	13.5	0.6	85.9
14	3.05	10.1	0.6	89.2
15	3.65	11.0	1.0	88.0
16	4.18	8.0	0.9	91.1
17	4.86	6.6	1.0	92.4
	African Americans and other minorities			
All ages ...	1.99	27.2	3.2	69.6
5	0.07	66.7	0.0	33.3
6	0.11	28.7	0.0	71.3
7	0.34	36.0	0.0	64.0
8	0.48	36.7	0.0	63.3
9	0.82	31.5	2.8	65.7
10	1.28	29.4	2.5	68.0
11	1.43	29.7	2.0	68.3
12	2.03	32.7	2.4	64.9
13	2.43	32.2	3.4	64.4
14	3.03	25.6	3.8	70.6
15	3.70	25.4	2.9	71.7
16	4.23	23.5	3.3	73.2
17	5.33	24.6	4.2	71.2

[1] Reference 2.

'The end result of untreated dental caries and periodontal disease is tooth loss. . . . the percent of Americans who have lost all of their teeth increases dramatically after 45 years of age. In 1989, more than 7.2 million Americans (4.8 percent) between the ages of 18 and 64 were edentulous. The poor suffer disproportionately from tooth loss.'

Children who experience baby bottle tooth decay are at increased risk for dental disease throughout their lives. The psychological trauma, health risks, and costs associated with restoration of these grossly carious teeth for children affected by baby

Table 2. Mean and percent components of decayed (D) and filled (F) teeth (T) for employed persons by race, United States, 1985–86[1]

Age (years)	Mean DFT	Percent D of DFT	Percent F of DFT
	White Americans		
All ages	10.316	6.84	93.16
18–19	7.374	12.79	87.21
20–24	7.990	12.91	87.09
25–29	9.159	10.12	89.88
30–34	10.269	7.87	92.13
35–39	11.422	3.92	96.08
40–44	12.198	5.10	94.90
45–49	12.174	4.53	95.47
50–54	11.607	3.96	96.04
55–59	11.075	4.10	95.90
60–64 or older	10.267	3.94	96.06
	African Americans		
All ages	6.839	22.14	77.86
18–19	5.587	52.28	47.72
20–24	6.731	26.46	73.54
25–29	7.723	23.48	76.52
30–34	6.689	20.83	79.17
35–39	7.098	18.44	81.56
40–44	8.407	14.51	85.49
45–49	6.182	22.27	77.73
50–54	6.452	21.15	78.85
55–59	4.986	20.60	79.40
60–64 or older	4.163	43.93	56.07

[1] Reference *13*.

Table 3. Percent of dentate employed persons with at least one decayed (D) or filled (F) root surface by age group, United States, 1985–86[1]

Age (years)	Percent with at least 1 D or F root surface
All ages	21.16
18–19	6.64
20–24	6.30
25–29	9.41
30–34	13.67
35–39	18.30
40–44	25.26
45–49	33.36
50–54	42.14
55–59	42.83
60–64 or older	54.42

[1] Reference *13*.

bottle tooth decay can be substantial, often requiring general anesthesia. Dietary counseling and intervention by dental and other professionals provide the best means of preventing this serious oral disease (*8*).

Oral disease among adults. While the overall oral health of adults is improving, dental caries, gingivitis, and periodontal diseases continue to affect most adult Americans. A recent national survey found that 96 percent of employed adults in the United States—nearly 100 million persons—had experienced dental caries (*13*).

The number of decayed or filled teeth is greater for white Americans than for African Americans and other minorities (10.3 decayed or filled teeth for whites versus 6.8 decayed or filled teeth for African Americans). However, the percent of diseased teeth with untreated decay is greater among African Americans than white Americans at all ages (table 2).

Gingivitis and adult-onset periodontitis, two diseases that involve the supporting tissue of teeth, affect nearly half of all employed Americans between 18 and 64 years of age (*13*). Untreated periodontal diseases can lead to tooth mobility; poor esthetics; decreased ability to eat, chew, or speak; and tooth loss. One measure of periodontal diseases is recession, exposure of tooth root surfaces due to a loss of gum tissue. More than 45 percent of employed adults 55–64 years of age had moderate recession. Another measure of periodontal disease is the depth of pockets between the teeth and supporting tissue. Almost 20 percent of employed adults 55–64 years of age have periodontal pockets 4 millimeters or greater, indicating a moderately compromised status of the supporting periodontal tissue.

Untreated periodontal disease can lead to the loss of the supporting tissue from the tooth, exposing the roots of the teeth. Deprived of their protective tissue, root surfaces are more susceptible to dental caries than the crowns of teeth. Because the degree of recession generally increases with age, the rate of decay on the roots of teeth is greater among older Americans. As table 3 illustrates, by 64 years of age, 54 percent of all employed Americans had experienced dental caries on at least one root surface (*13*). The mean number of root surfaces affected by decay among white and African Americans is approximately the same; however, African Americans have a larger percentage of root surfaces with untreated disease (table 4).

The end result of untreated dental caries and periodontal disease is tooth loss. Figure 3 shows that the percent of Americans who have lost all of their teeth increases dramatically after 45 years of age. In 1989, more than 7.2 million Americans (4.8 percent) between the ages of 18 and 64 were edentulous (*9*). The poor suffer disproportionately from tooth loss. Among both employed and unemployed adults 55–64 years of age whose annual income was below the Federal poverty threshold, 35.5 percent were edentulous.

Fortunately, the rate of tooth loss among Americans is declining, resulting in improved esthetics and increased ability to eat and speak. This increase in the number of retained teeth has significant implications for preventive and primary oral health service needs. As figure 4 shows, almost twice as many teeth are projected to be at risk nationally for dental disease in 2030 as in 1972 (*14*). This shift is due to both a decrease in the number of teeth lost to disease, as well as an increase in the population. The largest increase in retained teeth is among persons older than 45 years.

Oral disease and the elderly. Dental caries, gingivitis, and periodontal disease affect almost all Americans older than 65 (*13*). More than 99 percent of the elderly had evidence of dental decay, missing teeth, or filled teeth in 1985. More than 56 percent of Americans older than 65 years had at least one decayed or filled root surface.

Tooth loss among the elderly is significant. A national survey conducted in 1989 found that 5 million Americans (28 percent) 65–74 years and 4.8 million Americans (43 percent) 75 years and older were edentulous (*9*). People with incomes above $35,000 were more likely to have kept their teeth, as the following survey data show (*9*):

	Percent edentulous	
Income	*65–74*	*75 and older*
Less than $10,000	46.1	56.3
$10,000–$34,999	28.8	40.4
$35,000 or more	12.0	30.3

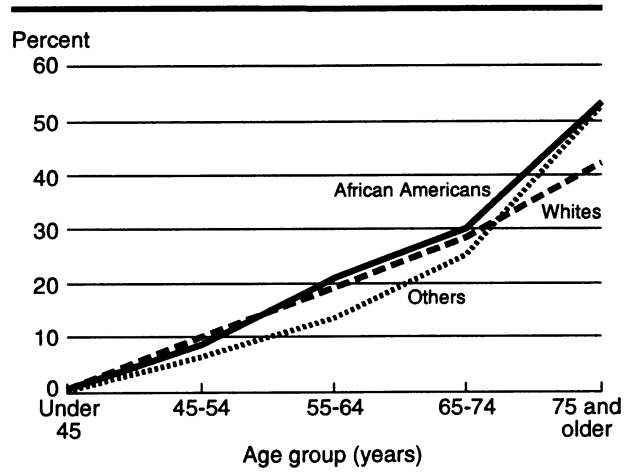
Between 1986 and 1989, the percent of Americans between 55 and 64 years who were edentulous decreased by almost 3 percent, a significant decrease in such a short time (*9,15*). This positive trend means that future cohorts of persons older than 65 years should have more teeth and, given adequate access to care, better oral health.

Gingivitis and periodontitis affect a majority of Americans older than 65 who have teeth (*13*). More than 86 percent of this age group had at least one tooth with moderate or severe recession, increasing the likelihood of root caries. More than 22 percent of the elderly had periodontal pockets 4 millimeters deep or greater.

Oral cancer. In 1992, an estimated 30,000 new cases of oropharyngeal cancer were diagnosed, and more than 8,000 deaths occurred as a result of this disease (*16*). Oropharyngeal cancer is more common than leukemia; Hodgkin's disease; melanoma of the skin; and cancers of the brain, cervix, ovary, liver, pancreas, bone, thyroid gland, testes, or stomach. It is the 6th most common cancer found among U.S. men and the 12th most common among U.S. women. Figure 5 shows the estimated number of new cases of cancer and number of cancer deaths by type of cancer in 1992 (*16*). Use of tobacco products, including smokeless tobacco, and alcohol are associated with more than 70 percent of all oral cancer lesions (*17*). Oropharyngeal cancer is most frequent in men older than 40, but it can be found in teenagers with a history of smokeless tobacco use.

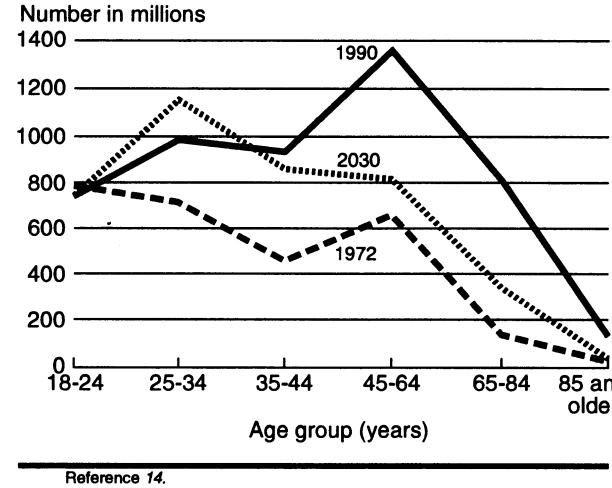
Figure 6 illustrates the differences between white

Figure 3. Percentage distribution of edentulous population by race, United States, 1989



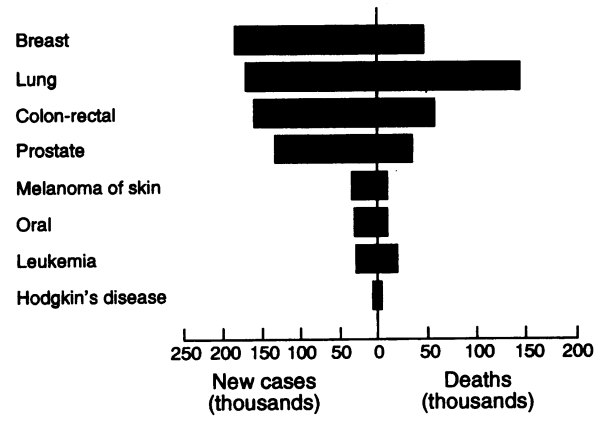
Reference *9*.

Figure 4. Number of teeth at risk for dental disease among U.S. adult population by age group, 1972, 1990, and 2030



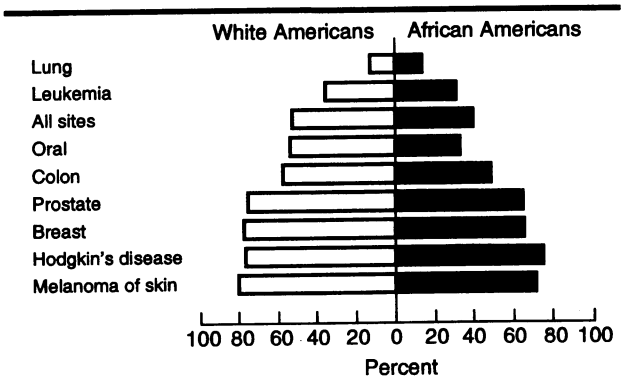
Reference *14*.

Figure 5. Estimated number of new cancer cases and number of cancer deaths by type of cancer, 1992



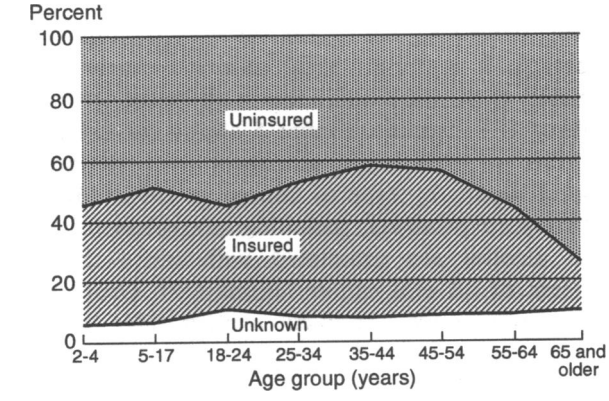
NOTE: Incidence estimates are based on rates from the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER) Program, 1986-88.

Figure 6. Relative 5 years' survival by site of cancer and by race, United States, 1981-87



SOURCE: Reference *16*.

Figure 7. Percentage distribution of persons 2 years and older by private dental insurance status, United States, 1989



SOURCE: Reference *9*.

and African Americans in the relative percent of persons surviving 5 years for selected types of cancer (*16*). For African Americans, the relative 5 years' survival rate for oropharyngeal cancer is only 31 percent, compared with 54 percent for white Americans. This 23 percent is the largest difference for all types of cancers, as the following data show:

Cancer site	*(Percent 5 years' survival rate for white Americans) minus (percent 5 years' survival rate for African Americans)*[1]
All sites	15
Lung	2
Hodgkin's disease	3
Leukemia	7
Colon	11
Melanoma of the skin	12
Prostate	13
Breast	15
Oral	23

[1] Based on cancer mortality data from 1982-88.

A significant portion of this difference in survival can be attributed to delayed detection and treatment of the cancer (*16*).

Those who are treated for oral cancer frequently face significant functional problems, disfigurement that decreases quality of life, and an increased risk of developing new oral cancers, as well as other types of cancer. Annual visits to an oral health professional greatly increase the probability of early detection and successful treatment outcomes.

Impact of Oral Health Problems

Millions of Americans are at high risk for oral health problems because of underlying medical or handicapping conditions, ranging from very rare genetic diseases to more common chronic diseases like arthritis and diabetes (*18*). These conditions not only impact the persons's quality of life (that is, their ability to eat, speak, taste, and swallow), but also they can be a significant source of pain and discomfort. For example, diabetics often experience more severe periodontal disease and delayed wound healing, affecting both their oral health and general health.

Congenital anomalies, like cleft lip and palate, often require extensive surgical repair. Several genetic diseases affect oral health, such as the ectodermal dysplasias, in which essential components of skin and teeth fail to develop properly; scleroderma, a genetic and autoimmune condition affect-

ing the skin, which leads to limited mouth opening; osteogenesis and dentinogenesis imperfecta, in which bones and teeth are poorly developed and subject to fracture; and epidermolysis bullosa, which is characterized by severe blistering of skin and mucous membranes leading to loss of essential body fluids and sometimes fatal secondary infections.

Among persons with compromised immune systems, the presence of oral disease has been linked to opportunistic infections. People who are human immunodeficiency virus (HIV) seropositive or have acquired immunodeficiency syndrome (AIDS) are likely to demonstrate a variety of oral complications associated with their disease. These complications primarily affect the soft tissues of the mouth and include painful oral candidiasis and potential life-threatening fungal infections ("thrush") of the esophagus; hairy leukoplakia (white, raised lesions on the lateral borders of the tongue); herpes (multiple, severe cold sores); and Kaposi's sarcoma, a type of cancer affecting blood vessels (*19,20*). Many HIV-seropositive persons experience very aggressive forms of destructive periodontal diseases, which can significantly compromise their nutritional status and may require hospitalization.

Routine dental examinations can play an important role in the initial diagnosis of HIV infection and in the management of AIDS. In many instances, oral manifestations associated with HIV infection may be an initial presentation of the disease. Because effective drug regimens are now available that can delay the onset of AIDS after the initial HIV infection has occurred, early diagnosis and treatment are imperative. Dental professionals can and do make such diagnoses and refer persons for appropriate medical evaluations (*21*).

Untreated oral infections and dental treatment without adequate antibiotic prophylaxis are associated with infective endocarditis, an infection of the valves of the heart that can occur in people with defective heart valves (*22–24*). Infective endocarditis has a 50 percent mortality rate and is increasing in prevalence, and the elderly are at high risk. Morbidity and costs associated with heart valve replacement after infective endocarditis are substantial.

Similarly, those elderly with prosthetic joints (for example, hip, knee, and shoulder joints) are at risk for costly infections of those joints due to oral bacteria from untreated oral disease. The etiologic bacteria enter the bloodstream from the oral cavity and initiate an infection around the artificial joint (*25–27*). This may necessitate replacement of the infected joint. As the U.S. population ages, more and more hip, knee, and shoulder replacements will be required, potentially increasing the number of complications secondary to untreated oral diseases.

Table 4. Mean and percent components of decayed (D) and filled (F) root surfaces (S) in employed persons by race, United States, 1985–86[1]

Age	Mean DFS	Percent D of DFS	Percent F of DFS
	White Americans		
All ages	1.025	39.62	60.38
18–19	0.176	58.68	41.32
20–24	0.358	59.23	40.77
25–29	0.627	64.13	35.87
30–34	0.788	49.87	50.13
35–39	0.757	28.53	71.47
40–44	1.309	43.78	56.22
45–49	1.448	35.41	64.59
50–54	1.742	31.86	68.14
55–59	1.850	28.19	71.81
60–64 or older	2.644	29.81	70.19
	African Americans		
All ages	0.927	70.26	29.74
18–19	0.445	100.00	0.00
20–24	0.326	84.44	15.56
25–29	0.421	70.73	29.27
30–34	0.496	64.38	35.62
35–39	1.008	54.21	45.79
40–44	0.896	43.81	56.19
45–49	1.507	76.03	23.97
50–54	1.735	74.28	25.72
55–59	1.336	69.19	30.81
60–64 or older	3.992	91.41	8.59

[1] Reference *13*.

Untreated dental disease also complicates the treatment of patients undergoing organ and bone marrow transplants, sometimes resulting in death (*28,29*). Dental disease also has been associated with severe complications including pneumonia, urinary tract infections, fever, and septicemia.

Poor oral health and untreated oral diseases and conditions can have a significant impact on quality of life. Oral and facial pain affects a substantial proportion of the general population. Studies to determine the number of persons experiencing oral pain have found that, at any given time, between 29 percent and 50 percent of those surveyed reported some dental and oral pain (*30–36*). In these same surveys, the percentage of people who reported moderate to severe dental pain ranged from 9 percent to 26 percent (*30,32–34*). The type of pain experienced by people varied by population groups. Among the elderly, dry mouth pain (xerostomia) and denture pain were common. Temporomandibular joint pain was common among young women. Patients seeking emergency dental

Table 5. Percentage of national expenditures in billions of dollars for all health and dental services, 1960–2000[1]

Year	Total health expenditures	Personal health expenditures	Expenditures for dental services	Dental services as a percent of personal health expenditures
1960.....	$27.1	$23.9	$2.0	8.4
1965.....	41.6	35.6	2.8	7.9
1970.....	74.4	64.9	4.7	7.2
1975.....	132.9	116.6	8.2	7.1
1980.....	250.1	219.4	14.4	6.5
1985.....	422.6	369.7	23.3	6.3
1990.....	675.0	591.5	34.1	5.8
1995.....	1,101.9	986.7	46.5	4.7
2000.....	1,739.8	1,572.1	62.3	4.0

[1] References *44* and *45a*.

Table 6. Consumer Price Index for hospital, physician, and dental services compared with all goods and services in urban areas, United States, 1981–92 (1982–84 = 100)[1]

Year	All goods and services in urban areas	Hospital services	Physician services	Dental services
1981.....	90.9	78.1	84.9	86.5
1982.....	96.5	90.4	92.9	93.1
1983.....	99.6	100.6	100.1	99.4
1984.....	103.9	109.0	107.0	107.5
1985.....	107.6	115.5	113.3	114.2
1986.....	109.6	122.3	121.5	120.6
1987.....	113.6	131.1	130.4	128.6
1988.....	118.3	143.4	139.8	137.5
1989.....	124.0	158.1	150.1	146.0
1990.....	130.7	175.4	160.8	155.8
1991.....	136.2	191.9	170.5	167.4
1992.....	140.3	208.7	181.2	178.7

[1] Reference *46*.

care were often in pain from acute dental and oral infections (*34,37–41*).

Dental disease also has an impact on the economic productivity and on the ability of American children to learn. In 1989, more than 164,175,000 hours were missed from work (an average of 1.48 hours per employed U.S. adult), and more than 51,679,000 hours of school were lost (117,000 hours missed per 100,000 school age children) because of dental treatment and problems (*42*). Many of those who missed work or school hours could least afford it, including younger workers, minorities, low-wage earners, and those with severe dental disease.

Dental treatment may be delayed, ultimately requiring more extensive and costly treatment and resulting in restricted activity days and bed days. In 1991, for example, U.S. school age children experienced more than 4,794,000 restricted activity days (7.3 days per 100 school age children) and 2,200,000 bed days (3.36 days per 100 school age children) as a result of dental conditions (*43*). Americans 18–64 years of age reported more than 8 million restricted activity days (5.2 days per 100 adults) in 1991 and 3.9 million bed days (2.56 days per 100 adults).

Expenditures, Costs, and Sources of Payment

In 1992, an estimated $38.7 billion was spent on dental services, representing about 5.3 percent of all expenditures for personal health care in the United States, up from only $2 billion in 1960 (*44,45a*). By the year 2000, an estimated $62.3 billion will be spent for dental services (table 5). While total expenditures for dental services continue to increase, the level of spending for dental services as a percent of personal health care continues to decline. Since 1960, this proportion has fallen from more than 8 percent to 5.3 percent in 1992. This trend is projected to continue, so that by the year 2000, dental expenditures will represent about 4 percent of personal health expenditures.

Growth in the price of dental services has outpaced the consumer price index for urban areas (CPI–U) for all goods and services since the early 1980s, but the growth continues to be lower than the CPI for physician and hospital services (table 6) (*46*). In part, this trend has resulted in the decrease in relative spending for dental services. It is estimated that the inflation of dental services will continue to outpace the inflation of all goods and services for the next 10 to 15 years (*47*).

In 1987, an average of $295 was spent for dental services for those Americans with a dental expense (*48*). More than 90 percent of these expenditures for dental services were paid by private sources, either out-of-pocket by dental consumers (56 percent) or through private health insurance (34 percent). Less than 4 percent of dental expenditures come from public sources, principally Medicaid.

Out-of-pocket payments. The primary source of payment for dental services is out-of-pocket. In 1987, the mean annual out-of-pocket expense for dental services was $165.20 (*48*). On average, Americans paid almost $50 more out-of-pocket annually for dental services than for ambulatory physician services.

The out-of-pocket cost of dental services can have a significant impact on the poor (that is, those Americans below the Federal poverty level). The poor who sought dental care in 1987 paid an average of $113 per year out-of-pocket, while

middle income people paid an average of $164.60 per year out-of-pocket.

Out-of-pocket payments represent a significant source of payment for dental services for two reasons. First, approximately 150 million Americans have no private third-party dental insurance coverage, and there is limited payment for dental services under public programs (*48*). Second, even for those with dental insurance, the number of covered services may be limited depending on the plan. Copayments and deductibles under some insurance plans may be as high as 50 percent for many dental procedures.

The large proportion of out-of-pocket payments for dental services results in significant amounts of bad debt and free care. In 1987, for example, more than $2 billion of dental services were provided as either bad debt or free care, representing approximately 7 percent of the costs associated with providing dental services (*48*). Five percent of charges for inpatient hospital services and ambulatory physician services and 1 percent of charges for outpatient prescribed medicines were paid by workers' compensation, private charity, other similar sources, and free care from the provider including bad debt.

Dental insurance. Approximately 95 million Americans have some form of dental insurance (*9*). The distribution of dental insurance by age group is shown in figure 7. Most persons who have dental insurance are between 25 and 54 years of age or are the dependents of employed adults with dental insurance. Since dental insurance coverage is usually employment-based, persons who do not work or who work part-time are less likely to be insured.

The proportion of dentally insured people decreases in two age groups. Nearly 12 million previously insured young adults lose their dental insurance between the ages of 18 and 24. The percent of people with insurance increases until age 54, when workers begin to retire. By the age 65, only 15 percent have dental insurance—a decrease of more than 33 percent from the 45–54 age group.

Whether a person has dental insurance is associated with the annual income level. Approximately 10 percent of people with annual incomes of less than $10,000 have private dental insurance (*9*). However, almost 60 percent of people with annual incomes of $35,000 or more have private dental insurance. For those below the poverty threshold, only 10.6 percent have dental insurance, while 47.7 percent of those above the poverty level are insured.

Table 7. Sources of payment and percentage for dental and ambulatory physician services, United States, 1987[1]

Source of payment	Dental services		Ambulatory physician services	
	Poor[2]	U.S. average	Poor[2]	U.S. average
Out-of-pocket	56	56	19	26
Private insurance	16	34	10	38
Medicare	0	0	22	14
Medicaid	15	2	31	8
Other public programs	3	1	12	10
Workers' compensation, private charity, and free from provider including bad debt	10	7	5	5

[1] Reference *48*.
[2] Poor are those persons earning less than 100 percent of the Federal poverty level.

Table 8. Public health and oral health expenditures in billions and percent of oral health to public health expenditures, fiscal years 1984, 1986, 1988, and 1989[1]

Fiscal year	States reporting	Public health expenditures	Oral health expenditures	Oral health as a percent of public health expenditures	States without categorical oral health expenditures
1984	43	$5.3	$0.0381	0.72	3
1986	48	6.9	0.0491	0.71	6
1988	50	7.7	0.0531	0.69	8
1989	50	8.95	0.0557	0.62	8
Percent change 1984–89		68.87	46.19	...	...

[1] Reference *51*.

Table 9. Percent of persons 2 years and older with dental visits in past year, by selected characteristics, United States, 1983, 1986, and 1989[1]

Characteristic	1983	1986	1989
All ages[2]	55.0	57.1	57.2
2–4 years	28.4	31.3	32.1
5–17 years	67.0	70.3	69.0
18–34 years	57.0	58.0	56.9
35–54 years	57.4	60.5	61.4
55–64 years	51.3	51.2	54.0
65 years and older	38.6	41.7	43.2
Race:			
White	57.0	59.2	59.3
African American	41.8	43.6	44.5
Family income:			
Less than $10,000	38.8	40.9	40.9
$10,000–$19,999	47.5	47.5	43.4
$20,000–$34,999	61.4	61.0	58.3
$35,000 and more	74.0	73.5	73.0

[1] Reference *9*.
[2] Includes persons of other races and unknown income (not shown separately).

Table 10. Interval since last dental visit for percent of persons by selected characteristics, 1989[1]

Characteristic	Less than 2 years	2 years or more	Never
Race:			
White	68.6	22.1	4.4
African American	55.5	32.0	5.8
Other	61.3	24.8	6.7
Hispanic origin:			
Non-Hispanic	67.9	22.8	4.1
Hispanic	56.5	27.6	9.7
Mexican American	49.4	31.1	13.1
Other Hispanic	65.5	23.6	5.1
Education level:			
Less than 9 years	39.6	49.0	5.9
9–11 years	49.7	43.8	1.3
12 years	65.2	29.4	0.5
13 years or more	78.7	17.2	0.2
Family income:			
Less than $10,000	53.1	36.4	7.0
$10,000–$19,999	55.7	33.5	6.6
$20,000–$34,999	68.7	23.6	4.6
$35,000 or more	80.3	14.0	2.9
Dental insurance coverage:			
Yes	79.1	15.8	3.3
No	61.5	29.6	6.0

[1] Reference 9.
NOTE: Rows do not sum to 100 percent because "unknowns" are not included in table.

Table 11. Age-adjusted dental visits per person per year and percent with dental visit in previous year among persons with dental insurance by selected characteristics, 1989[1]

Characteristic	Visits per person per year	Percent with 1 or more visits in previous year
Race:		
White	2.9	71.6
African American	1.7	57.6
Family income:		
Less than $10,000	2.0	59.4
$10,000–$19,999	2.2	54.8
$20,000–$34,999	2.5	66.2
$35,000 and more	3.2	77.3

[1] Reference 9.

Medicaid. In fiscal year 1991, more than $709 million was spent to provide dental services to approximately 5.2 million Medicaid recipients (*49*). Medicaid recipients receiving dental services represented less than 17 percent of all Medicaid-eligible people, and expenditures for these services represented less than 1 percent of the $77 billion spent on Medicaid in 1991. Expenditures for dental services are the only health service expenditures that have decreased since 1975—by 29.7 percent (*45b*). Medicaid payments for dental services were principally for children receiving benefits through the Aid to Families with Dependent Children (AFDC) Program (48.6 percent). Yet, only about 20 percent of Medicaid eligible children receive any dental services.

Nationwide in 1991, an average of $136 was spent per recipient for dental services under Medicaid. However, because benefit levels for dental services are determined by each State, there is significant variability in the per capita spending. For example, in 1991, the reported per capita expenditures for dental services ranged from $73 in Pennsylvania, $124 in Georgia, $169 in New York, $223 in California, to $328 in Alaska (*49*). This considerable variability is due, in part, to differences in covered services, eligibility criteria, and reimbursement levels. In most States, for example, dental services for adults are extremely limited or are not covered.

In 1990, the Office of Technology Assessment (OTA), U.S. Congress, issued a report entitled "Children's Dental Services Under the Medicaid Program" (*50*). This report included seven States that represent about 45 percent of Medicaid total payments for dental services and about 43 percent of dependent children younger than 21 years enrolled in the program nationwide. The report was prepared in response to a request from the U.S. House of Representatives' Committee on Energy and Commerce and sought to determine whether the dental care programs for Medicaid beneficiaries, particularly children eligible for the Early and Periodic Screening, Diagnosis, and Treatment Program, conform to a minimum level of dental care. The OTA found that

- There are significant differences among those States surveyed in the dental services offered through their Medicaid programs.
- Each of the States surveyed failed to adequately cover "basic" dental services in its Medicaid program.
- Some dentists believed that their Medicaid patients younger than 18 years did not receive services equal to those provided young non-Medicaid patients.
- A variety of barriers restrict the low-income child's access to dental services under State Medicaid programs (including administrative problems, paperwork associated with claims submission and prior approval, and low reimbursement rates for dental services).

Medicare. With Medicare, payment for routine dental services is prohibited under statute except in very limited circumstances (for example, medically necessary dental care and surgery on the jaw not

involving the teeth). As a result, essentially no Federal dollars are expended for dental services under Medicare.

Comparison of source of payment for dental services and ambulatory physician services. As table 7 illustrates, the distribution of sources of payment for dental services differs from that for ambulatory physician services (*48*). A much larger percentage of dental services than physician services are paid for out-of-pocket. For example, the poor paid 56 percent of the cost of dental care out-of-pocket, compared with only 19 percent out-of-pocket for physicians' ambulatory care. Medicaid paid for only 15 percent of the expenditures for dental services among the poor in 1987, compared with 31 percent for physicians' ambulatory services in the same group. Medicare paid 22 percent of the expenses for physicians' ambulatory services for the poor in 1987, but zero percent for dental services.

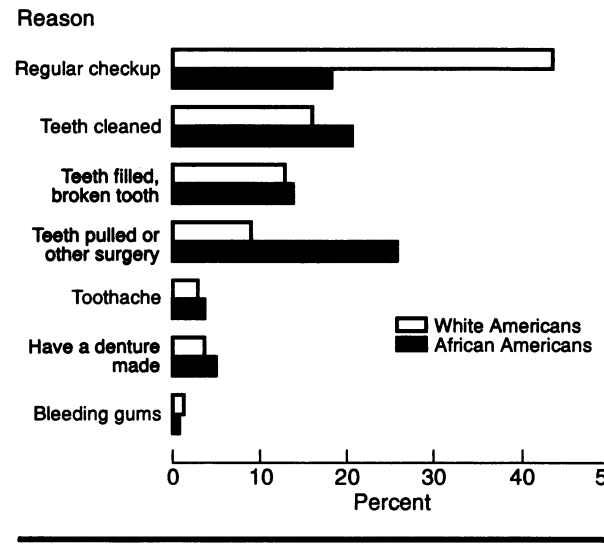
Dental expenditures under other public programs. Dental services and other oral health programs are covered under several other public programs as well. For example, in 1991, approximately $60 million was spent by the Indian Health Service (IHS) to provide dental services to more than 355,000 Native Americans (according to the Dental Branch, IHS, Public Health Service, Rockville, MD, February 1993). Total expenditures for dental services in the IHS are projected to increase to $70 million by the year 2000.

Public expenditures for oral health services at the State and territorial level totaled approximately $55.7 million in 1989 (*51*). Information collected by the Public Health Foundation shows the growth in dental expenditures from 1984 to 1989 for both dental health and fluoridation programs (table 8). Oral health comprised less than 1 percent of all public health expenditures in this period. While absolute expenditures for oral health services increased between 1984 and 1989, oral health spending as a percent of total public health expenditures actually declined (*51*).

Use of Dental Services

Since 1983, the proportion of Americans with at least one dental visit per year has increased modestly from 55 percent to 57.3 percent, representing about 135 million persons in 1989 (*9*). As table 9 illustrates, from 1983 to 1989, African Americans and poor and low-income persons were less likely to have had a dental visit in the past year when compared with white Americans or higher income groups.

Figure 8. Main reason given by employed persons for last visit for dental care by race, United States, 1985



SOURCE: Reference *13*.

Use of dental services remains quite variable throughout the population (*9*). Race and ethnicity, age, and income were significant factors in use of dental services. Those with a dental visit in the past 2 years were more likely to be white, non-Hispanic, have a higher income, have at least a high school education, and have dental insurance (table 10). Unfortunately, poor and low-income groups—the same groups that have the highest levels of dental disease—have the lowest utilization rates.

Among edentulous Americans older than 35, less than 13 percent had a dental visit during the year preceding the interview, and more than 60 percent had not been to a dentist in more than 5 years.

While dental insurance increased the utilization rate for all groups, differences in utilization among the insured were also found (*9*). African Americans and persons with lower incomes who had dental insurance had less utilization and fewer visits than similarly covered white Americans (table 11). Indeed, African American children with dental insurance had fewer visits (1.6 visits per child) than white children without dental insurance (2.0 visits per child) (*9*).

Reasons for seeking dental care vary according to the individual person. According to a national survey, in 1985–86, nearly 3 million African Americans (29.7 percent) sought dental care most recently for either a toothache or to have a tooth extracted (*13*). Less than 13 percent of white Americans sought care for these reasons (fig. 8).

Table 12. Percent of persons reporting various reasons for no dental visits in past year, according to selected demographic characteristics, United States, 1989[1]

Characteristic	Fear	Cost	Access problem	No perceived dental problem	No teeth	Not important	Other reasons
Age (years):							
All ages	4.3	13.7	1.7	46.8	14.3	2.3	8.7
2–17	1.3	15.0	1.5	56.8	0.2	1.9	11.9
18–34	5.9	19.1	2.4	52.4	0.7	3.2	9.5
35–64	5.8	12.8	1.5	43.3	17.8	2.2	8.4
65 and older	2.2	4.1	1.1	31.2	49.7	1.1	3.9
Family income:							
Less than $10,000	3.8	19.7	1.7	42.8	22.5	1.4	6.4
$10,000–$19,999	4.0	18.8	1.5	47.0	17.4	1.7	6.5
$20,000–$34,99	4.8	13.7	1.7	51.3	11.5	2.3	11.1
$35,000 or more	5.9	6.8	2.6	52.3	8.1	4.1	14.1
Dental insurance coverage:							
Have dental insurance	6.2	7.2	2.5	53.2	10.1	3.4	15.2
Without dental insurance	4.0	18.5	1.5	48.7	17.2	2.0	7.0
Insurance status unknown	1.6	3.9	0.7	23.8	9.3	0.8	2.9

[1] Reference 9.

Table 13. Oral health status and use of dental services among U.S. children (percent or number)

Condition	Poor[1]	African American	Hispanic	U.S. average
5–17-year-olds with untreated dental caries	...	35.1	37.6	24.0
Any private dental insurance	7.8	31.9	28.7	44.3
Dental sealants	4.3	4.2	5.1	10.9
At least 1 dental visit in the preceding year	48.8	49.9	47.9	61.7
Average number of dental visits per year	1.1	1.0	1.6	2.1

[1] Family income under $10,000.

There are many explanations for differences in not using dental services. About one-half of those surveyed who had not seen a dentist in the previous year did not perceive they had a dental problem (table 12) (*9*), although epidemiologic data would suggest that this perception is incorrect. Cost was the second most common reason offered for not visiting the dentist for persons up to the age of 35 years. Fear of the dentist did not appear to be a major factor in failure to seek care.

Summary

Tables 13–15 summarize information on the oral health of children, adults, and the elderly and their use of dental services. Major findings for children (table 13) follow:

- African Americans and other minorities have a higher percentage of untreated disease than the U.S. average.
- Poor children and minorities have less private dental insurance than the average for all children.
- Smaller proportions of minority and poor children have dental sealants.
- Ten percent fewer minority and poor children had a dental visit in the preceding year compared with the U.S. average, although these groups have a higher percent of untreated disease.
- The average number of dental visits per year for poor and minority children is less than the U.S. average.

The findings for adults (table 14) follow:

- The level of untreated dental caries among minorities is greater than the national average.
- Smaller proportions of minorities and poor adults have dental insurance than the national average.
- Smaller proportions of minorities and poor adults had a dental visit in the preceding year.
- The average number of dental visits for poor and minority adults is less than the average for all U.S. adults.
- Almost 9 percent of poor adults are edentulous compared with 4.8 percent of the adult population.

Major findings among U.S. elderly include these observations (table 15):

- Only 15 percent of the elderly have any private

dental insurance, and Medicare does not reimburse for routine dental services.

- More than 22 percent of elderly African Americans, and 26 percent of poor elderly had at least one dental visit in the preceding year, about one-half of the national average for all elderly.
- Minority and poor elderly have fewer visits than the U.S. average; elderly African Americans have less than one-half the average number of visits among the elderly.
- More than one-half of the poor elderly had lost all their teeth.

Conclusion

While significant improvements have been made in preventing and controlling dental caries and periodontal diseases during the past two decades, millions of Americans have been left behind, resulting in needless pain, increased cost, decreased health, and loss of self-esteem. Almost all Americans have been affected by oral diseases; however, poor and low-income persons, minorities, and persons with little education are particularly at risk. Oral diseases remain an unnecessary obstacle to better health.

Access to primary and preventive dental care can be difficult, especially for those that cannot afford dental care. Regrettably, Americans for whom the burden of oral disease is greatest often have the most difficulty gaining access to the dental care system. Access to needed services is critical to narrow the disparity in disease between the poor and the middle class and among whites, African Americans, and other minorities. Access to dental care for elderly Americans is particularly difficult, since they often lose their dental benefits at retirement, and Medicare does not pay for dental services. The elderly are at risk of losing a lifetime's worth of investment in oral health.

Regular dental care is important for a number of other oral diseases besides dental caries and periodontal diseases. Oral cancer, which affects primarily adults older than 55, results in significant morbidity and disfigurement associated with treatment, substantial cost, and more than 8,000 deaths annually. The percent of persons with oral cancer who survive 5 years is 22 percent lower among African Americans than whites. Routine dental examinations are the best strategy to narrow the gap in survival between African Americans and whites, since early detection and treatment are imperative. Yet, African Americans are less likely to have a dental visit than whites.

Table 14. Oral health status and use of dental services among U.S. adults 18–64 years of age (percent or number)

Condition	Poor[1]	African American	Hispanic	U.S. average
18–64-year-olds with untreated dental caries	...	50.43	42.86	29.69
Any private dental insurance	13.3	35.6	31.2	43.9
At least 1 dental visit in the preceding year	43.5	44.9	46.0	58.3
Edentulous	8.5	4.2	2.3	4.8
Average number of dental visits per year	1.4	1.3	1.5	2.1

[1] < $10,000.

Table 15. Oral health status and use of dental services among U.S. adults 65 years and older (percent or number)

Condition	Poor[1]	African American	Hispanic	U.S. average
Any private dental insurance	5.7	11.1	15.6	15.0
At least 1 dental visit in the preceding year	25.8	22.5	40.2	43.2
Edentulous	51.1	37.9	[2]24.9	34.1
Average number of dental visits per year	1.3	0.6	1.2	2.0

[1] < $10,000.
[2] For ages 65–74 years only.

Dental and oral diseases have a significant impact on general health. For example, dental and oral diseases and treatment associated with these diseases can result in infective endocarditis (which has a 50 percent mortality rate); infections of artificial knee, hip, or shoulder joints; and in complications associated with organ and bone marrow transplantations. Oral complications associated with HIV infection also can have a significant impact on overall health, resulting in loss of appetite, painful mouth sores, hospitalization, and potentially life-threatening fungal infections. Most of these complications among people with HIV-AIDS can be managed by a dentist in an outpatient setting. However, because many people with AIDS cannot afford dental care, access is often compromised. As the number of AIDS cases continues to rise, barriers to obtaining oral health care can only exacerbate the problem.

One of the principal barriers to dental care is cost. More than 150 million Americans have no

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dental insurance coverage. Public programs pay for less than 3 percent of all dental services, and eligibility for these programs is highly variable. Most States provide only limited dental services for adults, or none at all. In many States, benefits available to children covered by the Medicaid Program do not even include basic dental services. The 30 percent decrease in per capita payments for dental services under Medicaid between 1975 and 1990 stands in stark contrast to all other medical expenditure categories under Medicaid, none of which declined during this period.

For persons who do not have access to physician or other primary health care services, hospital emergency rooms provide a safety net to ensure that at least some level of care, albeit expensive, is available. For oral health problems, however, no such mechanism exists. Few hospitals provide dental services, and those that do offer only emergency services to relieve pain and provide palliative treatment for injuries and infections.

Dental schools and hospital-based postdoctoral dental education programs are a source of care for some of those who cannot afford to pay, but not all people, especially poor people, have the time, resources, or transportation necessary to seek care at dental education institutions. The additional financial burden "free care" places on these schools can be significant.

Community and migrant health centers (CMHCs) may be a source of dental care but are not found in every community. Further, only about one-half of existing CMHCs provide basic dental care services (according to the Bureau of Primary Health Care, Health Resources and Services Administration, Public Health Service, Rockville, MD, Febru-

ary 1993). More importantly, CMHCs do not have the resources to meet this need alone. The unfortunate reality is that people who cannot afford routine dental care and who are not covered by either public programs or private dental insurance do not receive care.

Fiscal crises in many of the States place ever-increasing burdens on the poor. The Center for Budget and Policy Priorities recently found that during each of the last 2 years, State programs assisting the poor were cut more deeply than at any time since the early 1980s (*52*). The center reported that during the last 2 years, reductions in general assistance benefits, a program of last resort for the nonelderly poor who do not quality for AFDC, affected more than half a million recipients. In addition, seven States made cuts in their general medical assistance programs for low-income people who do not qualify for Medicaid. Given that Medicaid beneficiaries eligible for dental services have restricted or no access to dental care currently and that such a substantial proportion of dental services are paid for out-of-pocket, these reductions by the States can only mean less access to dental care for those most at risk for disease.

The current dental care delivery system has not adequately met the oral health needs of *all* Americans, especially those who are unable to afford dental care, who have no dental insurance, and who are at high risk of dental and oral diseases. Further improvement of the oral and general health of Americans can be accelerated by ensuring improved access to primary preventive and early intervention services for all and the removal of barriers to the care system.

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