Forward

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This report presents the results of a survey of the oral health status and treatment needs of American Indians and Alaska Natives conducted by the Indian Health Service (IHS) in 1999. Over the past two decades, information obtained from periodic surveys has been extremely valuable to the IHS and tribes as we plan how to address the oral health needs of the Indian people of this Nation.

Good oral health is essential to improving individuals' overall health and well being. The oral health of Indian people has improved in some age groups but has gotten worse in others since the prior survey was conducted in the early 1990's. We need to focus our efforts on these age groups that have shown declines in oral health status. Tribes have identified increasing access to preventive and curative dental care as a major health priority; and the IHS and tribes will continue to advocate for additional resources for oral health.

I am proud of the work that the IHS and tribal dental providers have done on behalf of Indian people. Your dedication to providing both clinical and public health services to our communities continues to improve the overall health of Indian people.

I urge you to take this information and use it for program planning and advocating for the health of Indian people. It is only through working together that we can continue to improve the oral health status and eliminate the health disparities among Indian people.

Acknowledgments

Data Collection

Over 150 dentists and dental hygienists participated as examiners in the 1999 Oral Health Survey. Without their assistance, this survey would not have been possible. A list of the examiners and survey coordinators is located in Appendix A.

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Executive Summary

The 1999 Oral Health Survey is a third look by the Indian Health Service (IHS) at the oral health status and treatment needs of American Indian and Alaska Native (AI/AN) dental patients served by the IHS, urban, and tribal dental clinics. The first Oral Health Survey, which the IHS conducted in 1984, found that 80 percent of AI/AN school children had experienced dental decay and only 28 percent of elders had 20 or more teeth. These findings were used to encourage both IHS and tribal dental programs to expand the use of caries prevention services as similar initiatives were undertaken in the U.S. generally.[1] By 1991, when the second Oral Health Survey was conducted, the benefits of the dental prevention programs implemented during the 1980s were becoming evident. During the 1980s, there was a decline in caries prevalence among children both nationally[2] and among children served by the Indian Health Service. Between 1984 and 1991 the IHS noted a 173 percent increase in the proportion of young dental patients without any tooth decay and an 11 percent increase in the proportion of elderly dental patients with 20 or more teeth.

For the 1999 Oral Health Survey, the IHS collected data from 12,881 dental patients ranging from 2 to 96 years. In some cases, the findings point to conditions that are continuing to improve, such as children's access to preventive dental sealants. But more often, the data reveal stable or even worsening oral health trends for thousands of AI/AN families. We hope that by recognizing and understanding these trends, tribal leaders, the IHS, and other key stakeholders will be able to develop policies and programs that ensure adequate oral health care for all AI/ANs. ***Please note that the information presented in this report reflects the oral health of AI/AN dental patients and may not be representative of the general AI/AN population.***

1. Selwitz RH, Winn DM, Kingman A, Zion GR. The prevalence of dental sealants in the US population: findings from NHANES III, 1988-91. J Dent Res 1996;75(Spec Iss):652-60.
2. Brown LJ, Wall TP, Lazar V. Trends in total caries experience: permanent and primary teeth. J Am Dent Assoc 2000;131:223-31.

Key Findings from the 1999 IHS Oral Health Survey of Dental Patients

- Very young children experience tooth decay.
  Seventy-nine percent of children 2-5 years had a history of tooth decay.

- The majority of children have tooth decay and the prevalence of decay increases with age.
  Eighty-seven percent of the 6-14 year olds and 91 percent of the 15-19 year olds had a history of decay.

- Among Indian children, there are regional differences in the prevalence of tooth decay.
  More children in the Bemidji (Minnesota, Michigan, Wisconsin) and California Areas, compared to children from other Areas, were caries free.

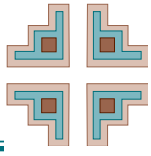
- Most Indian children have dental sealants and those children with sealants have less decay.
  Sixty-three percent of 8 and 15 year olds had sealants. Adolescents with sealants had significantly fewer tooth surfaces that were decayed, missing or filled because of decay (DMFS=9.18 vs. 18.24).

- Individuals who use tobacco are at higher risk of both oral cancer and periodontal (gum) disease. The use of tobacco products among AI/AN youth starts at about 13 years and steadily increases with age.
  Two percent of 13 year olds and 34 percent of the 19 year olds use tobacco on a regular basis.

- Most adults and elders have lost teeth because of dental disease or oral trauma.
  Seventy-eight percent of adults 35-44 years and 98 percent of elders 55 years or older had lost at least one tooth because of dental decay, periodontal (gum) disease or oral trauma.

- Periodontal (gum) disease is a significant health problem for both adults and elders.
  Fifty-nine percent of dentate adults 35-44 years and 61 percent of dentate elders have periodontal disease.

- Among adults with teeth, there are regional differences in the prevalence of periodontal disease.
  Adults and elders in the Portland Area, compared to other Areas, were less likely to have advanced periodontal disease.



- AI/ANs do not have adequate access to preventive and restorative dental care or periodontal disease treatment.
  Sixty-eight percent of the 2-5 year olds, 66 percent of the 6-14 year olds and 68 percent of the 15-19 year olds have untreated decay. In addition, 68 percent of the 35-44 year olds and 61 percent of the elders have untreated dental decay. About 25 percent of all adults and elders with teeth need treatment for advanced periodontal disease.

- There is a tremendous backlog of dental treatment needs among AI/AN dental patients.
  To meet all the dental treatment needs of the dental patients examined, it would take approximately 2.7 hours/person for children 2-5 years, 3.0 hours/person for children 6-14 years, 6.2 hours/person for adolescents 15-19 years, 11.1 hours/person for adults 35-44 years, and 9.1 hours/person for elders age 55 years or older.

- Adults with diabetes were more likely to have periodontal disease.
  Thirty percent of adults with diabetes, who had at least one natural tooth, had advanced periodontal disease compared to only 22 percent for those without diabetes.

- Adults who use tobacco on a regular basis were more likely to have periodontal disease.
  Thirty-eight percent of adults are habitual tobacco users. Of those who use tobacco, 29 percent had advanced periodontal disease compared to only 20 percent for those that did not use tobacco.

- Compared to the general U.S. population, AI/AN dental patients experience more oral disease including both tooth decay and periodontal disease.
  Sixty-eight percent of the AI/AN adolescents had untreated tooth decay compared to 24 percent of similar aged children in the general U.S. population. Almost 32 percent of the AI/AN adults (35-44 years) had advanced periodontal disease compared to only 12 percent of adults in the general U.S. population.

Trends in Oral Health Based on IHS Oral Health Surveys of Dental Patients

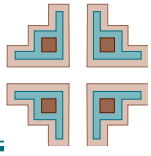
- Since 1991, there has been a significant increase in tooth decay among young AI/AN children between 2-5 years of age.
- From 1984 to 1991, there was a large decrease in overall decay rates in the permanent teeth of school children. Although overall decay rates changed very little from 1991 to 1999, there was a significant increase in the number of decayed teeth. In other words, the same numbers of teeth are getting cavities, but fewer of those cavities are being filled.
- In adults, there has been a slight decrease in decay rates over the last nine years. In addition, adults are losing fewer teeth to dental disease and trauma. Periodontal disease rates, however, have been stable since the 1991 Oral Health Survey.
- More Indian elders are keeping their teeth longer. Since 1984 there has been a continued trend toward fewer elders with no teeth and more elders with 20 or more teeth.

Conclusions

- Dental caries is a significant health problem for AI/ANs of all ages, but the magnitude of the problem is greatest among very young children.
- In addition to dental decay, periodontal (gum) disease is a significant health problem among AI/AN adolescents, adults and elders. This is especially true for those who have diabetes or use tobacco.

Recommendations

- To reduce the burden of dental disease, age-specific prevention programs must be developed and targeted toward those at highest risk. The importance of community water fluoridation, school-based or school-linked dental sealant programs, and tobacco prevention/cessation programs should be stressed.



- In order to treat the underlying burden of dental disease, there must be a significant increase in the number of dental providers available to provide care to AI/AN populations. For the general U.S. population there are approximately 1,500 patients per dentist while there are more than 2,800 AI/AN patients per dentist employed by the IHS and tribal dental clinics.
- More resources are needed to treat the tremendous backlog of dental disease. The average expenditure for oral health care in the IHS is about $50 per person compared to about $300 per person nationally.
- The dental programs must work with other health care providers such as physicians and nurses to help assess, educate and refer individuals in need of dental care.
- The dental programs must work with health care administrators, Service Unit Directors, Area Directors, and tribal administrators to assure adequate funding of dental programs.

A key message from the Surgeon General's report on oral health is that oral health is essential to the general health and well being of all Americans and, given our knowledge of prevention and restorative care, can be achieved by all. However, not all Americans have attained a high degree of oral health. Many, including many within the AI/AN population, still endure needless pain and suffering from oral disease.

To effectively address the oral health disparities outlined in this report, partnerships between public, private, and tribal sectors are essential. By working together, using the information gathered in this oral health survey, and the recommendations that arise from it, we can make excellent oral health a reality for all.

Introduction

The two most common oral diseases are dental caries (tooth decay) and periodontal (gum) disease. Dental caries is a multifactorial disease process initiated by specific bacteria, primarily mutans streptococci, which metabolize carbohydrates to form acids. These acids demineralize the tooth surface and eventually form a cavity. The bacteria that cause decay are usually passed from the mother to a child in the first one to two years of life. For this reason, tooth decay can be a significant problem in infants and toddlers. But tooth decay is not just a childhood disease – it can continue to be a health problem throughout life. Tooth decay is preventable by a combination of community, professional, and individual measures including water fluoridation, dental sealants, use of fluoride toothpastes at home, proper infant feeding practices, and diet.

Periodontal disease is also a multifactorial disease process initiated by oral bacteria. Periodontal disease usually begins in the adolescent years and if left untreated, results in the loss of the tissue (bone and soft tissue) that holds the teeth in the jaw. Over time, the teeth can become loose, painful and may be lost. While the exact etiology of periodontal disease is not completely understood, certain medical and lifestyle conditions increase an individual's likelihood of having advanced periodontal disease, including smoking and diabetes. According to the American Academy of Periodontology (www.perio.org), the best ways to prevent periodontal disease are to avoid smoking, maintain control of diabetes, have regular dental cleanings, and practice good oral hygiene.

Until recently, dental caries and periodontal disease were considered to be very common within the U.S. population. By the late 20th century, however, a significant reduction in the caries experience of children and adolescents was noted throughout the upper socioeconomic strata of America. Unfortunately, only a small reduction in the prevalence or severity of disease was noted in American Indians and Alaska Natives (AI/AN). In contrast to the majority of those residing in the United States, dental caries and periodontal disease remain both widespread and serious in the AI/AN population.

Since common oral health problems seldom result in death or life-threatening impairment, more disabling medical problems often overshadow the importance of preventing and controlling oral disease. However, the true cost of oral disease, including pain and suffering, lost productivity and attendance at work and school, possible contributions to other systemic disease conditions, and the social disability associated with poor oral health cannot easily be ignored. Most oral health problems, however, are preventable and prevention activities are inexpensive, painless, and very effective.

History and Purpose of Survey:

Since the mid-1950's, the Indian Health Service (IHS) dental program has maintained a system for monitoring oral health and estimating the treatment needs of AI/AN dental patients. This system has provided program planners and community leaders with a wide range of information on the oral health status of dental patients. No other system currently exists to monitor the oral health of the AI/AN population on such a broad scale, at such a relatively low cost.

Prior to this 1999 survey, the most recent data were from the 1991 Oral Health Survey. Comparisons to oral disease levels found in 1991 are included throughout this report. The progress and changes that took place throughout almost a decade are displayed and discussed. The ramifications of progress and, in some cases, the relative lack of progress are also discussed.

As with the 1991 survey, the primary purpose of the current effort was to produce and distribute a wide range of information regarding the oral health and estimated treatment needs of American Indians and Alaska Natives. To obtain this information, we used a convenience sample of dental clinic users; therefore, the results obtained may not be representative of the general AI/AN population. The results of this survey will be distributed to tribal leaders and program managers who can use the information in planning interventions and revising public policies on local, regional, and national levels.

Organization of this Report:

This document is organized by life stages. Each section includes information on major oral diseases affecting an individual age group. It also addresses trends over time, comparing oral disease today with levels from previous IHS Oral Health Surveys. Finally, the findings from the current survey are compared to the Healthy People 2010 national health objectives and to national survey data. In order to assist program managers with their planning process, detailed Area specific data are included in the Appendix along with detailed information on the survey methodology.

Disparities:

The Surgeon General's Report on Oral Health points out the disparities in oral health that continue to exist in the U.S., particularly between the population as a whole and minority groups within it. Periodic monitoring by the IHS, as well as several oral health surveys of individual tribes, paint a picture of a population bearing a disproportionate burden of oral disease.

The oral health disparities of AI/AN people are profound when compared to the general U.S. population. Previous studies have shown that fewer AI/AN children have never experienced tooth decay and a greater percentage of older adults have lost all of their teeth.[3,4] Furthermore, AI/AN people have more severe periodontal disease partially due to the high prevalence of diabetes.

These AI/AN specific studies have described considerable variation in oral health status between American Indian tribal groups. Furthermore, historic tribal and regional variations in the prevalence of oral diseases have persisted.

This report of the 1999 IHS Oral Health Survey documents in detail the disparities with respect to the AI/AN population. AI/ANs continue to suffer levels of oral disease that are in many instances much greater than the general U.S. population. The Surgeon General's Report calls for the elimination of these disparities and this report makes several recommendations regarding how these disparities may be eliminated.

3. Grim CW, Broderick EB, Jasper B, Phipps KR. A comparison of dental caries experience in Native American and Caucasian children in Oklahoma. J Public Health Dent. 1994;54:220-7.
4. Phipps KR, Reifel N, Bothwell E. The oral health status, treatment needs, and dental utilization patterns of Native American elders. J Public Health Dent. 1991;51:228-33.

Opportunities:

The 1999 Oral Health Survey and this report give tribal leaders and public health planners an effective tool with which to plan future interventions and revise public policies. This report provides information on opportunities for increased prevention, for engaging tribes and communities, and for interdisciplinary approaches to the problems of oral disease, all of which will be needed if oral health for AI/ANs is to substantially improve in the coming decade.

How this Report will be Used:

Information from this survey will be used in several ways. It will be shared with tribes, Congress, and other parties interested in the IHS dental program and the oral health of American Indians and Alaska Natives (AI/AN). It will be used to document the oral health status of AI/AN dental patients, and to track changes in their oral health over time. It will be used to plan programs and interventions directed toward specific oral health problems. It will also be used to advocate for resources from Congress, tribes and other groups to increase access to care in order to eliminate the oral health disparities of the AI/AN population.

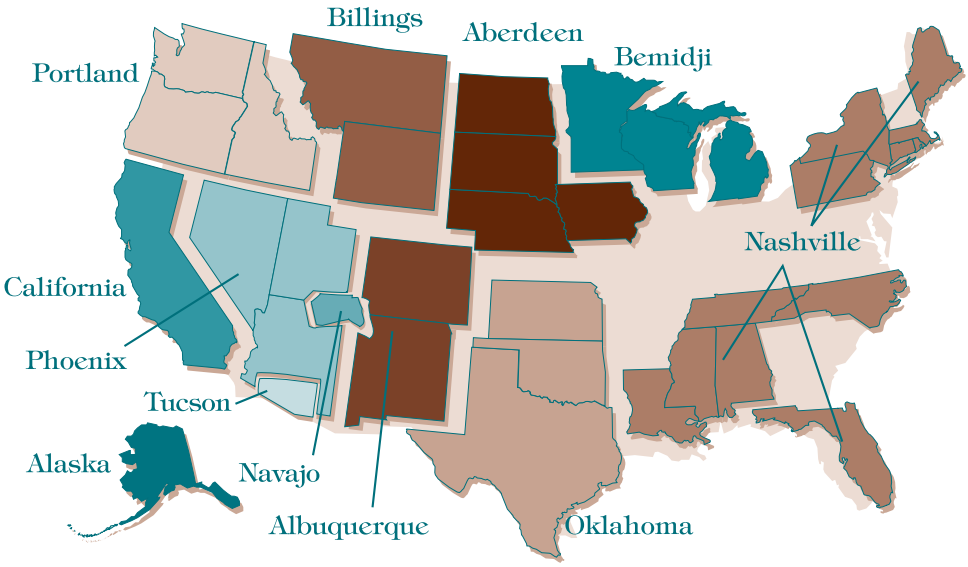
SURVEY METHODS

A Brief History of the IHS Oral Health Monitoring System:

Since 1956, the Indian Health Service (IHS) has maintained a system for monitoring the oral health and treatment needs of American Indian and Alaska Native (AI/AN) dental patients. Although the monitoring system is limited to people who seek dental care, it has provided important information regarding trends in the oral health of the AI/AN population. During the 1970s, the monitoring system changed from an annual reporting system to periodic surveys of dental patients. Previous surveys of dental patients were completed in 1984 and 1991.

The 1999 IHS Oral Health Survey:

The IHS is composed of 12 regional administrative units called Area Programs (Figure). The 1999 IHS Oral Health Survey was designed to estimate the oral health status of dental patients at both the national and Area level. Within each of the 12 Areas, tribal, urban, and/or IHS dental clinics volunteered to participate in the survey. Approximately 36 percent of all tribal, urban, and IHS dental clinics participated.



Five age groups were targeted: 2-5 years, 6-14 years, 15-19 years, 35-44 years, and 55 years and older. Each Area was asked to examine at least 200 patients within each of the five age groups. Clinics were instructed to examine all patients that presented during the data collection period including emergency (walk-in) patients and appointed patients currently receiving care. In addition, clinics could also examine groups of patients such as Head Start and school children if it was part of an on-going dental program. It should be noted that some Areas over-sampled children while others did not examine adults or elders. These sampling differences have been accounted for in the data analysis.

Licensed dentists and dental hygienists completed all of the examinations. The exams were completed using a mounted dental light, front-surface mirror, a World Health Organization disposable probe, and a National Institute of Dental Research periodontal probe. Radiographs were not used during the examination process.

The variables assessed during the examination included:

- Demographic and health factors including tobacco use and diabetes
- Total tooth loss in either or both arches
- Oral prosthetic appliance status
- Oral pathology and trauma
- Dental fluorosis
- Dental caries - coronal and root caries
- Dental sealants
- Periodontal status – probing pocket depth, calculated loss of attachment, and the Community Periodontal Index of Treatment Needs

At least two examiners from each of the 12 Areas attended a two-day training session. These examiners returned to their Area and trained the remaining examiners. Inter- and intra-examiner reliability were not evaluated. The data presented in this report have been adjusted to the FY 1997 Indian Health Service three-year user population – the most current population data available at the time of this report.

Detailed survey methodologies, including diagnostic criteria, are located in Appendix B. It should be noted that while all Areas collected CPITN data, not all Areas collected pocket depth or loss of attachment.

Limitations of Study Design:

This was a survey of dental patients seeking treatment at tribal or IHS dental clinics and it is not representative of the general population of American Indians and Alaska Natives. Because many American Indian/Alaska Natives seek dental care only when there is a problem, this survey may overestimate the prevalence of dental disease among all age groups. In addition, people who have lost all of their teeth do not seek dental care as often as those with teeth. For this reason, the survey may underestimate the prevalence of total tooth loss (edentulism) among both the adults and elders. In addition, with recent advances in dental treatment many more fillings have a natural appearance. Consequently, dental surveys may underestimate the number of filled teeth.

Information on tobacco use was obtained by asking participants if they had used any tobacco product in the last month. If yes, the participant was asked more specific information on type of product and frequency of use. Some children and adolescents may have been reluctant to provide information on actual tobacco use to the dental examiner; therefore, this survey may underestimate the prevalence of tobacco use among children and adolescents.

Comparability to Previous IHS Surveys:

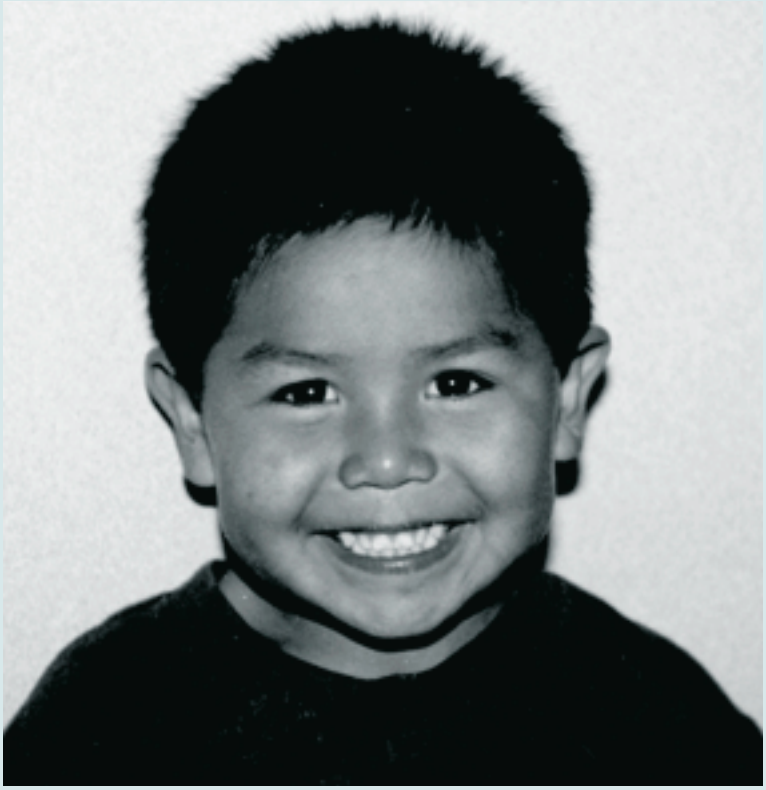
The sampling strategies for the 1984, 1991 and 1999 IHS Oral Health Surveys were similar – with volunteer clinics from each of the 12 Areas collecting data. While the 1984 survey collected tooth specific data only (dmft/DMFT), both the 1991 and 1999 surveys collected surface specific data (dmfs/DMFS). In addition, the 1984 and 1991 surveys used explorers while explorers were not used in the 1999 survey.

In both 1984 and 1991, periodontal disease was assessed using the Community Periodontal Index of Treatment Needs (CPITN). In 1999, periodontal disease was assessed using CPITN plus probing pocket depth and calculated loss of attachment at the mid-buccal and mesio-buccal surface using a random half-mouth design.

As previously mentioned, in 1999 some Areas over-sampled certain population groups. Therefore, the 1999 data were adjusted to the 1997 Indian Health Service three-year user population. Area programs did not over-sample in either the 1984 or the 1991 Oral Health Surveys; therefore, those data were not adjusted.

The Oral Health of Preschool Children

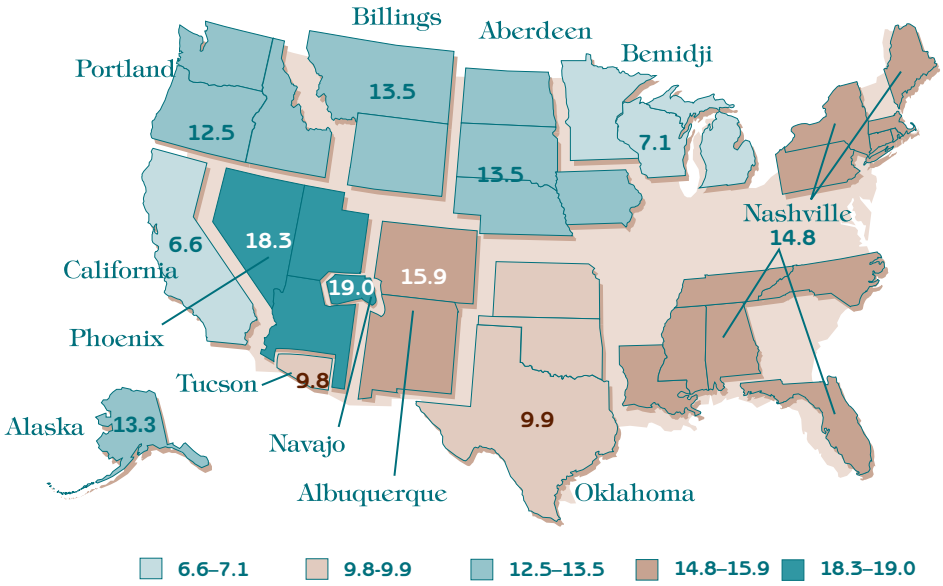
Ages 2–5 Years



Young children start to erupt their teeth at about 6 months of age. The primary teeth, also known as baby teeth, continue to erupt until the child is about 3 years of age. Tooth decay in the primary teeth of children 5 years of age or younger is one of the major health problems in the United States – especially among low-income and some ethnic groups. Although the primary teeth are eventually replaced by permanent teeth, they play a very important role in a child's oral health and development. They save space in the mouth for the permanent teeth to erupt and if extracted prematurely can cause speech or orthodontic problems (the need for braces). In addition, dental decay can be very difficult to treat in young children and sometimes requires hospitalization and the use of general anesthesia.

A total of 2,663 children between the ages of 2-5 years were examined during the 1999 Oral Health Survey. About 79 percent of these children had a history of dental decay (at least one tooth with a filling or untreated decay) and 68 percent had untreated decay at the time of the examination. When stratified by Area, children in the California and Bemidji Areas had the lowest level of decay while children in the Navajo and Phoenix Areas had the highest decay rates.

Mean dmfs by Area for Children 2-5 Years



Early Childhood Caries:

For the last 15 years, IHS has implemented several programs designed to reduce a pattern of tooth decay known as Baby Bottle Tooth Decay (BBTD). This pattern of decay, usually seen in infants and toddlers, was thought to result from putting a child to bed with a baby bottle containing high sugar liquids such as juice, soda, or sugar water. Recent research, however, has shown that the disease process is much more complex, involving transmission of infectious bacteria, dietary habits, and oral hygiene. For this reason, the name of the condition has been expanded to Early Childhood Caries (ECC). Any child age 5 years or younger with decay on their upper front teeth or six or more teeth with decay is considered to have severe ECC. Using this definition, 60 percent of the children examined had severe ECC.

The upper anterior (front) teeth are among the first teeth to erupt and are often used by health professionals to identify children at higher risk of future decay. Of those children with a history of decay on their anterior teeth, 90 percent also had decay on their back (posterior) teeth. It should be noted, however, that 56 percent of the children with no decay on their anterior teeth had decay on their posterior teeth.

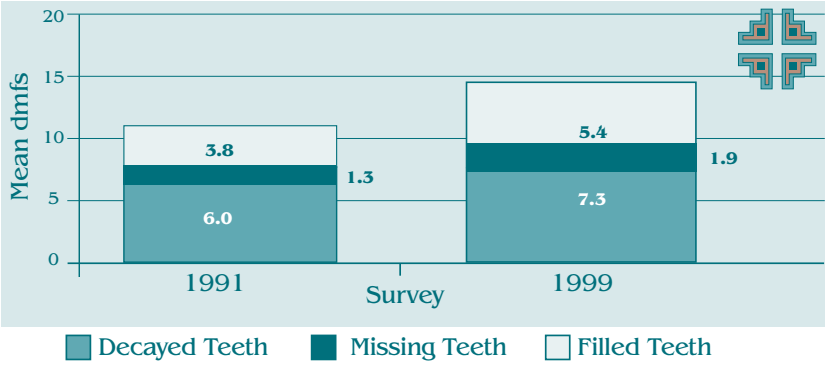
Percent of Children with a History of Decay in Maxillary Incisor and Posterior Teeth		
Posterior Decay	Maxillary Incisor Decay	
	No	Yes
No	21%	5%
Yes	26%	48%
Mean dmfs	5.0	22.8

Trends Over Time:

Based on the results of the 1991 and 1999 Oral Health Surveys, it appears that decay rates have increased in AI/AN preschool children (**Figure 1.1**). Since 1991, there has been a statistically significant increase in the number of decayed tooth surfaces ($p<0.001$), missing tooth surfaces ($p<0.001$), filled tooth surfaces ($p<0.001$), and the total number of decayed, missing and filled tooth surfaces (dmfs, $p<0.001$). While there has been a slight increase in the prevalence of severe Early Childhood Caries – 57 percent in 1991 compared to 60 percent in 1999 – the difference is not statistically significant ($p=0.07$). Anecdotal information from dental clinic staff also indicates an increase in caries rates among preschool children during the last 10 years.

Figure 1.1

Mean Number of Decayed, Missing and Filled Surfaces in the Primary Teeth of Children 3–5 Years from Two IHS Surveys



Comparison to Healthy People 2010:

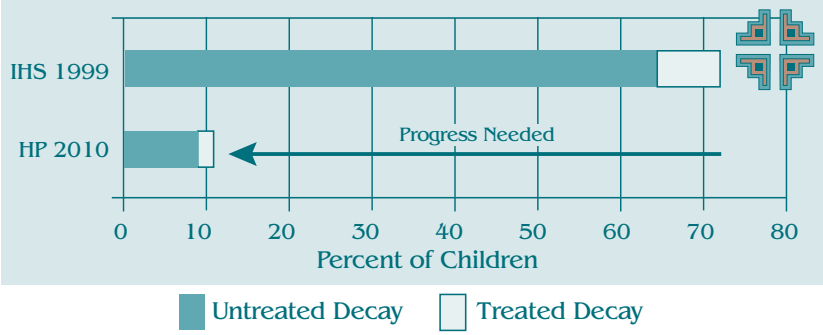
Healthy People 2010 includes several national oral health objectives for preschool children.

- ❖ Reduce the proportion of young children aged 2-4 years with dental caries experience in their primary teeth to 11 percent.
- ❖ Reduce the proportion of young children aged 2-4 years with untreated dental decay in their primary teeth to 9 percent.

If these goals are to be met in the American Indian/Alaska Native population, significant improvements in their oral health status must be accomplished in the next 10 years (**Figure 1.2**).

Figure 1.2

American Indian and Alaska Native Children 2–4 Years Compared to Healthy People 2010 Objectives



Comparison to National Data:

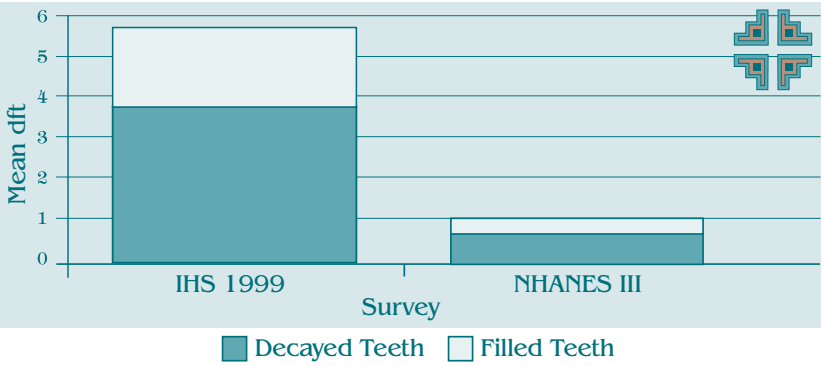
The most current national data on oral health in preschool children are from the third National Health and Nutrition Examination Survey (NHANES III). NHANES III, conducted by the Centers for Disease Control and Prevention between 1988-1994, sampled the U.S. civilian non-institutionalized population. The primary purpose of NHANES III was to collect information on the national prevalence of, trends in, and risk factors for selected diseases including dental disease.

NHANES III examined 3,889 children between the ages of 2-5 years.[5] When compared to NHANES III, the AI/AN children examined by IHS had significantly more dental decay (**Figure 1.3**).

In fact, the percentage of children with untreated decay was more than three times higher in the AI/AN children compared to the NHANES III children (68% vs. 19%). The IHS Area with the lowest proportion of preschool children with untreated decay was Bemidji, and their proportion was still significantly higher than the national average (49% vs. 19%).

Figure 1.3

Mean Number of Decayed and Filled Primary Teeth for Children 2-5 Years
IHS 1999 Compared to NHANES III



5. Vargas CM, Crall JJ, Schneider DA. *Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994.* J Am Dent Assoc 1998;129:1229-38.

Table 1.1

Oral Health Of Preschool Children Stratified by Age

Variable	2 years n=175	3 years n=795	4 years n=1,028	5 years n=665	2-4 years n=1,998	3-5 years n=2,488	2-5 years n=2,663
Percent (SE) Caries Free	30.1	25.1	21.8	15.1	23.8	20.3	20.7
	(4.1)	(2.3)	(2.1)	(1.9)	(1.5)	(1.2)	(1.2)
Percent (SE) with Untreated Decay	68.2	68.3	66.7	69.5	67.5	68.2	68.2
	(4.3)	(2.4)	(2.3)	(2.6)	(1.6)	(1.4)	(1.4)
Mean (SE) number of:							
decayed primary teeth	3.96	4.28	3.62	3.52	3.93	3.77	3.78
	(0.45)	(0.21)	(0.18)	(0.20)	(0.13)	(0.11)	(0.11)
missing primary teeth	0.30	0.35	0.45	0.56	0.40	0.46	0.46
	(0.11)	(0.05)	(0.06)	(0.08)	(0.04)	(0.04)	(0.04)
filled primary teeth	0.25	0.70	1.41	2.30	1.03	1.54	1.48
	(0.10)	(0.10)	(0.12)	(0.18)	(0.07)	(0.09)	(0.08)
dmft	4.51	5.33	5.47	6.38	5.35	5.77	5.72
	(0.46)	(0.24)	(0.22)	(0.25)	(0.16)	(0.14)	(0.14)
Mean (SE) number of:							
decayed primary surfaces	7.90	8.63	6.84	6.71	7.69	7.31	7.34
	(0.96)	(0.52)	(0.43)	(0.48)	(0.32)	(0.27)	(0.27)
missing primary surfaces	1.21	1.42	1.83	2.39	1.61	1.92	1.89
	(0.46)	(0.22)	(0.23)	(0.34)	(0.15)	(0.16)	(0.16)
filled primary surfaces	0.94	2.17	5.02	8.24	3.52	5.38	5.20
	(0.48)	(0.33)	(0.48)	(0.70)	(0.29)	(0.33)	(0.32)
dmfs	10.05	12.22	13.69	17.33	12.82	14.62	14.43
	(1.23)	(0.68)	(0.75)	(0.88)	(0.49)	(0.47)	(0.45)

Table 1.2

Early Childhood Caries Among Preschool Children Stratified by Age

Variable	2 years n=175	3 years n=795	4 years n=1,028	5 years n=665	2-4 years n=1,998	3-5 years n=2,488	2-5 years n=2,663
Percent with caries history on ≥ 1 maxillary incisors	55.8 (4.8)	56.7 (2.5)	49.1 (2.3)	53.1 (2.8)	52.8 (1.6)	52.8 (1.5)	52.9 (1.4)
Percent with caries history on ≥ 2 maxillary incisors	53.7 (4.8)	50.2 (2.5)	43.1 (2.3)	45.1 (2.8)	46.9 (1.6)	45.9 (1.5)	46.2 (1.4)
Percent with caries history on ≥ 1 maxillary incisors OR dmft ≥ 6	56.2 (4.8)	60.1 (2.5)	56.4 (2.3)	64.1 (2.7)	58.0 (1.6)	60.3 (1.5)	60.2 (1.4)
Mean dmfs for							
Maxillary incisors	4.60 (0.58)	4.41 (0.27)	3.11 (0.21)	3.22 (0.24)	3.77 (0.16)	3.53 (0.14)	3.58 (0.14)
Posterior teeth	4.72 (0.73)	6.79 (0.44)	9.42 (0.54)	12.46 (0.64)	7.98 (0.34)	9.78 (0.34)	9.58 (0.33)
Percent with dmfs > 0 with *							
Maxillary incisor decay only	18.7 (5.0)	10.1 (2.0)	8.4 (1.5)	1.5 (0.5)	9.7 (1.2)	6.1 (0.8)	6.6 (0.8)
Posterior decay only	20.2 (6.2)	23.6 (2.5)	37.2 (2.6)	37.5 (3.0)	30.4 (1.8)	33.6 (1.6)	33.1 (1.6)
Posterior & incisor decay	61.0 (6.7)	65.6 (2.9)	54.5 (2.7)	61.0 (3.0)	59.6 (1.9)	60.1 (1.7)	60.2 (1.6)

* Includes only those children with at least one decayed, missing, or filled surface.

Table 1.3

Early Childhood Caries Among Preschool Children 2-5 Years 1991 Compared to 1999

Variable	1991 Percent (SE)	1999 Percent (SE)	p-value
History of decay on ≥ 1 maxillary incisors	50.8 (0.9)	53.0 (1.5)	0.20
History of decay on ≥ 2 maxillary incisors	44.3 (0.9)	46.3 (1.5)	0.24
History of decay on ≥ 1 maxillary incisors OR dmft ≥ 6	57.0 (0.9)	60.3 (1.5)	0.06

The Oral Health of Elementary and Middle School Children

Ages 6–14 Years

In children, the permanent teeth start to erupt at about five or six years of age. The permanent teeth gradually replace the primary teeth and most children will have all of their permanent teeth (except their wisdom teeth) by age 13-14 years. Preventing dental decay in this age group is essential because the permanent teeth that erupt at age six are meant to last a lifetime.

The 1999 survey examined 4,070 children between 6-14 years of age. Almost all of these children (87%) had a history of dental decay (at least one primary or permanent tooth with a filling or untreated decay) and 66 percent had untreated decay at the time of the examination. On average, these children had more than four primary teeth and two permanent teeth that were decayed, filled, or missing because of dental decay.

A high proportion of the children examined had at least one dental sealant (62%). A dental sealant is a plastic-like material that is applied to the chewing surface of

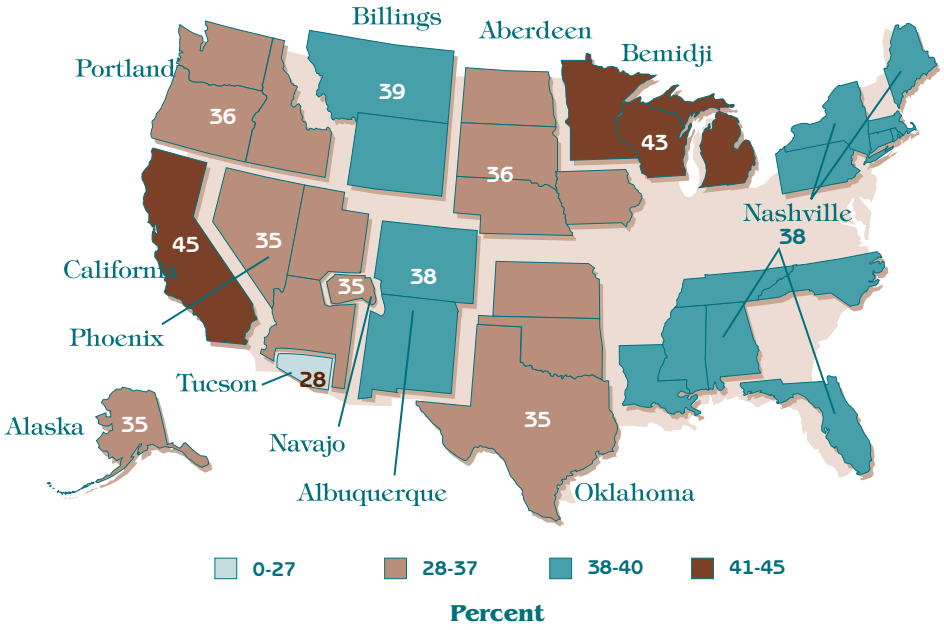
the back teeth. This material covers the depressions and grooves (pits and fissures) of the chewing surfaces and acts as a barrier, protecting the tooth from decay. Sealants are an effective method for preventing tooth decay and those children with sealants had fewer tooth surfaces that were decayed, missing or filled because of decay (DMFS=3.21 vs. 4.02). In this age group the majority of decay in the permanent teeth was on surfaces with pits and fissures (87% of the DFS). Since pits and fissures are the most common areas affected by decay, continued use of sealants is recommended.

Fluoride prevents cavities on the smooth surfaces of teeth. If excessive levels of fluoride are ingested while the teeth are developing, however, a condition known as dental fluorosis can occur. About 20 percent of the 6-14 year old children examined had at least one permanent tooth with very mild or mild dental fluorosis and 3 percent had moderate or severe fluorosis. Although very mild and mild fluorosis are not considered harmful, moderate and severe fluorosis are esthetically displeasing and should be avoided.

A few children under 13 years of age reported using tobacco on a regular basis. However, two percent of the 13-year-olds and seven percent of the 14-year-olds reported regular tobacco use. Habitual tobacco use is strongly associated with oral health problems that often do not appear until adulthood.

When stratified by Area, the Bemidji and California Areas had the highest proportion of children with no history of tooth decay in their permanent teeth while the Tucson Area had the lowest proportion of children with no history of decay.

Percent of 6-14 Year Olds Who Are Caries Free

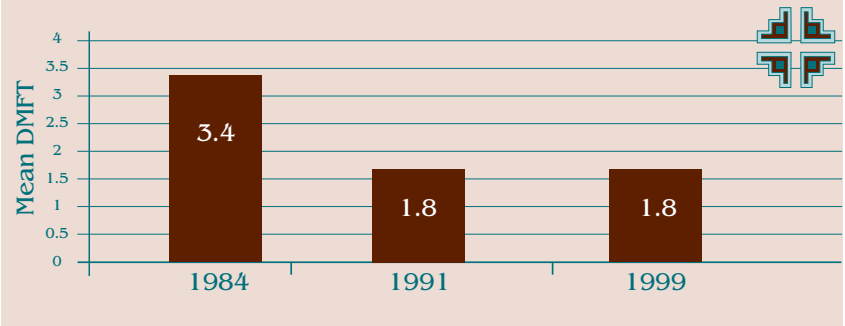


Trends Over Time:

This survey is the third oral health survey of IHS dental patients. The other two surveys were completed in 1984 and 1991. From 1984 to 1991, there was a decrease in decay rates in the permanent teeth of school children, but there has been no change in overall decay rates since 1991 (**Figure 2.1**). While there has been no change in the overall decay rate (DMFS) since 1991, there has been a significant increase in both the number of missing tooth surfaces (0.13 vs. 0.34, $p<0.001$) and decayed tooth surfaces (1.53 vs. 1.78, $p=0.015$). This coincides with a significant decrease in the number of filled tooth surfaces (1.87 vs. 1.41, $p<0.001$). These differences are illustrated in **Figure 2.2**.

Figure 2.1

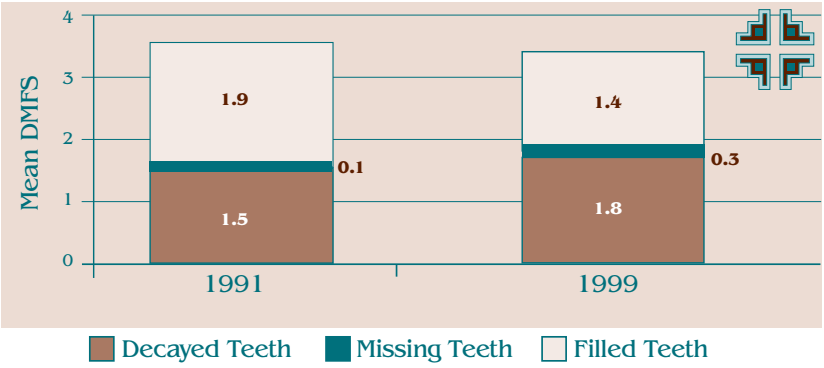
Mean Number of Decayed, Missing and Filled Permanent Teeth for Children 5-13 Years from IHS Patient Surveys



The decline in caries between 1984 and 1991 has been attributed to increased access to dental preventive services during the 1980s (e.g. school-based sealant programs). Since 1991, however, some children have had limited access to community prevention programs (sealants and fluoridation) and there has been an increase in the number of vacant dentist positions. This may partially explain the increase in decayed tooth surfaces and the simultaneous decrease in the number of filled tooth surfaces between 1991 and 1999.

Figure 2.2

Mean Number of Decayed, Missing and Filled Permanent Tooth Surfaces for Children 6-14 Years from IHS Patient Surveys



Comparison to Healthy People 2010:

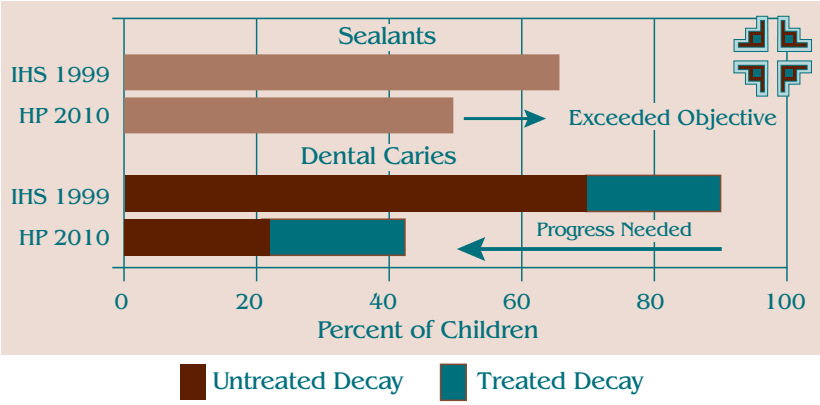
Healthy People 2010 outlines several oral health status objectives for children between the ages of six to eight years. These include:

- Decrease the proportion of children who have experienced dental caries in permanent or primary teeth to 42 percent.
- Decrease the proportion of children with untreated dental caries in permanent or primary teeth to 21 percent.
- Increase the proportion of eight-year-olds receiving protective sealing of the occlusal surfaces of permanent molar teeth to 50 percent.

Almost 91 percent of the six- to eight-year old children examined by IHS had experienced dental caries in their primary or permanent teeth – substantially higher than the Year 2010 objective of 42 percent. Seventy-two percent of the AI/AN children had untreated caries compared to the Year 2010 Objective of 21 percent. Sixty-three percent of the eight-year-old children examined had dental sealants, higher than the objective of 50 percent (**Figure 2.3**).

Figure 2.3

American Indian and Alaska Native Children Compared to Healthy People 2010 Objectives
(6-8 Year Olds for Dental Caries, 8 Year Olds for Sealants)

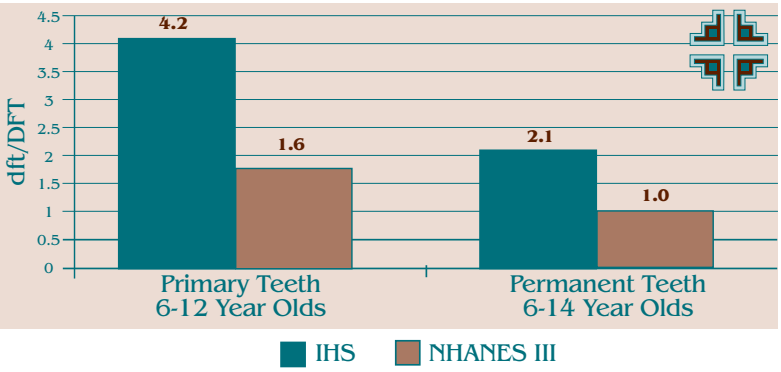


Comparison to National Data:

The most current national data on oral health in children are from NHANES III, which examined 4,116 children between the ages of 6-14 years.[6] When compared to children in NHANES III, the AI/AN children examined by IHS had more dental decay in both their primary and permanent teeth (**Figures 2.4**). In terms of untreated decay, 46 percent of the AI/AN had permanent teeth with untreated decay while only 11 percent of the NHANES III children had untreated decay. The IHS Area with the lowest proportion of children with untreated decay in their permanent teeth was Tucson and their proportion was still more than twice as high as the national average (22% vs. 11%).

Figure 2.4

Mean Number of Decayed and Filled Teeth in School Children
IHS 1999 Compared to NHANES III



6. Vargas CM, Crall JJ, Schneider DA. Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994. J Am Dent Assoc 1998;129:1229-38.

Table 2.1

Oral Health Of Elementary and Middle School Children Stratified by Age (Percent plus Standard Error)

Variable	6 years n=487	7 years n=529	8 years n=497	9 years n=489	10 years n=467	11 years n=446	12 years n=418	13 years n=391	14 years n=346
Percent Caries Free									
Primary & Permanent Teeth	11.8 (2.2)	9.9 (2.0)	4.6 (1.3)	7.2 (1.4)	11.7 (2.7)	12.5 (2.9)	19.8 (3.2)		
Percent Caries Free									
Permanent Teeth Only	79.4 (3.2)	58.2 (3.5)	41.9 (3.6)	34.7 (3.4)	32.2 (3.8)	22.5 (3.7)	21.6 (3.3)	23.7 (3.7)	13.3 (3.2)
Percent with Untreated Decay									
Primary & Permanent Teeth	75.4 (2.9)	73.3 (3.1)	67.6 (3.4)	71.7 (3.0)	65.8 (4.1)	59.6 (4.2)	60.9 (3.9)		
Percent with Untreated Decay									
Permanent Teeth Only	17.6 (2.8)	36.3 (3.4)	42.8 (3.6)	39.7 (3.6)	47.5 (4.2)	52.9 (4.4)	57.5 (4.1)	53.5 (4.5)	69.0 (4.6)
Percent with Dental Sealants	18.8 (2.9)	42.7 (3.5)	62.7 (3.3)	63.9 (3.5)	71.1 (3.3)	72.4 (3.7)	66.5 (4.0)	79.5 (3.0)	73.6 (3.9)
Percent with Dental Fluorosis									
Very mild or mild	9.2 (2.2)	18.8 (3.0)	18.6 (3.0)	22.2 (3.4)	25.6 (3.8)	19.6 (3.5)	17.0 (3.0)	23.0 (3.9)	23.1 (4.7)
Moderate or severe	0.4 (0.4)	0.7 (0.5)	4.5 (1.7)	3.4 (1.2)	6.7 (2.3)	2.4 (1.0)	2.0 (1.0)	1.8 (0.8)	3.9 (1.5)
Percent using Tobacco	0.0 (0.0)	0.2 (0.1)	0.0 (0.0)	0.1 (0.1)	0.4 (0.2)	0.3 (0.2)	0.6 (0.4)	2.0 (0.8)	6.8 (1.8)

Table 2.2

Oral Health Of Elementary and Middle School Children Stratified by Age (Mean plus Standard Error)

Variable	6 years n=487	7 years n=529	8 years n=497	9 years n=489	10 years n=467	11 years n=446	12 years n=418	13 years n=391	14 years n=346
Mean (SE) number of									
decayed primary teeth	3.78 (0.29)	2.48 (0.22)	1.73 (0.17)	1.43 (0.12)	1.10 (0.17)	0.63 (0.13)	0.88 (0.28)		
missing primary teeth	0.47 (0.07)	0.64 (0.09)	0.37 (0.06)	0.21 (0.06)	0.24 (0.12)	0.04 (0.02)	0.02 (0.01)		
filled primary teeth	2.54 (0.23)	2.84 (0.20)	3.01 (0.20)	2.14 (0.15)	1.77 (0.19)	1.26 (0.14)	0.77 (0.14)		
dmft	6.79 (0.34)	5.96 (0.28)	5.12 (0.25)	3.79 (0.21)	3.12 (0.29)	1.93 (0.20)	1.67 (0.33)		
Mean (SE) number of									
decayed primary surfaces	7.46 (0.79)	4.94 (0.47)	3.37 (0.45)	2.63 (0.26)	1.93 (0.28)	1.20 (0.24)	1.64 (0.52)		
missing primary surfaces	2.04 (0.31)	2.85 (0.42)	1.79 (0.29)	1.00 (0.27)	1.13 (0.55)	0.21 (0.12)	0.11 (0.07)		
filled primary surfaces	8.92 (0.82)	10.34 (0.87)	10.60 (0.86)	7.01 (0.61)	5.40 (0.72)	3.69 (0.58)	2.03 (0.47)		
dmfs	18.42 (1.11)	18.12 (1.05)	15.76 (0.97)	10.63 (0.78)	8.46 (0.97)	5.11 (0.64)	3.78 (0.68)		
Mean (SE) number of									
decayed permanent teeth	0.30 (0.05)	0.62 (0.07)	0.73 (0.07)	0.77 (0.08)	0.99 (0.10)	1.18 (0.11)	2.01 (0.22)	1.89 (0.26)	2.70 (0.34)
missing permanent teeth	0.01 (0.00)	0.01 (0.01)	0.03 (0.01)	0.04 (0.02)	0.07 (0.03)	0.07 (0.04)	0.10 (0.03)	0.10 (0.03)	0.20 (0.08)
filled permanent teeth	0.03 (0.02)	0.20 (0.04)	0.40 (0.06)	0.66 (0.07)	0.72 (0.08)	0.97 (0.09)	1.25 (0.11)	1.51 (0.18)	2.00 (0.20)
DMFT	0.34 (0.05)	0.84 (0.09)	1.15 (0.09)	1.46 (0.09)	1.78 (0.14)	2.22 (0.16)	3.36 (0.23)	3.50 (0.29)	4.91 (0.42)
Mean (SE) number of									
decayed perm surfaces	0.42 (0.08)	0.90 (0.10)	1.01 (0.12)	1.07 (0.13)	1.39 (0.15)	1.58 (0.16)	2.89 (0.36)	2.73 (0.40)	4.00 (0.55)
missing perm surfaces	0.02 (0.01)	0.06 (0.05)	0.12 (0.05)	0.18 (0.11)	0.33 (0.14)	0.34 (0.18)	0.50 (0.15)	0.48 (0.16)	1.02 (0.38)
filled perm surfaces	0.04 (0.02)	0.32 (0.07)	0.60(0.09)	1.01 (0.13)	1.22 (0.15)	1.45 (0.13)	2.13 (0.22)	2.48 (0.29)	3.41 (0.37)
DMFS	0.49 (0.08)	1.28 (0.15)	1.73 (0.16)	2.26 (0.19)	2.94 (0.28)	3.37 (0.30)	5.52 (0.48)	5.69 (0.50)	8.43 (0.91)
Mean (SE) # of sealed teeth									
In all children	0.45 (0.07)	1.25 (0.12)	1.84 (0.11)	1.89 (0.12)	2.02 (0.13)	2.23 (0.15)	2.29 (0.19)	3.12 (0.24)	2.99 (0.25)
In children with sealants	2.41 (0.21)	2.93 (0.13)	2.93 (0.10)	2.96 (0.10)	2.84 (0.14)	3.08 (0.13)	3.44 (0.22)	3.93 (0.26)	4.06 (0.22)

Note: Patients are only included in the calculation of means for primary or permanent teeth if they have at least one primary or permanent tooth.

Table 2.3

Oral Health Of Elementary and Middle School Children Stratified by Age Cohort (Percent or Mean plus Standard Error)

Variable	6-8 years n=1,513	9-11 years n=1,402	12-14 years n=1,155	6-14 years n=4,070
Percent Caries Free				
All Teeth	8.9 (1.1)	10.6 (1.4)		
Percent Caries Free				
Permanent Teeth Only	59.6 (2.1)	29.9 (2.1)	19.8 (2.0)	36.1 (1.3)
Percent with Untreated Decay				
All Teeth	72.3 (1.8)	65.6 (2.2)		
Percent with Untreated Decay				
Permanent Teeth Only	32.5 (2.0)	46.8 (2.4)	59.7 (2.6)	46.5 (1.4)
Percent with Dental Sealants on				
1st molars	41.7 (2.1)	68.7 (2.0)	66.5 (2.4)	59.2(1.3)
2nd molars	NA	6.4 (1.2)	41.7 (2.7)	16.1 (1.2)
1st or 2nd molars	41.7 (2.1)	69.3 (2.0)	73.3 (2.1)	61.7 (1.3)
Mean number of sealed teeth in children with sealants	2.86 (0.08)	2.95 (0.08)	3.82 (0.14)	3.27 (0.07)
Percent with Dental Fluorosis				
Very mild or mild	15.5 (1.6)	22.7 (2.1)	20.9 (2.2)	19.8 (1.2)
Moderate or severe	1.8 (0.6)	4.3 (1.0)	2.5 (0.6)	2.9 (0.4)
dmft (primary teeth)	5.99 (0.17)	3.10 (0.15)		
dmfs (primary teeth)	17.49 (0.60)	8.51 (0.52)		
d/dmfs (primary teeth)*	0.37 (0.02)	0.31 (0.02)		
DMFT (permanent teeth)	0.78 (0.05)	1.82 (0.08)	3.89 (0.18)	2.17 (0.08)
DMFS (permanent teeth)	1.18 (0.08)	2.87 (0.15)	6.49 (0.37)	3.52 (0.15)
D/DMFS (permanent teeth)*	0.71 (0.03)	0.50 (0.03)	0.48 (0.02)	0.53 (0.02)
Percent using tobacco	0.1 (0.04)	0.3 (0.1)	3.0 (0.6)	1.1 (0.2)

* If this proportion is 0.0, all teeth with a history of decay have been treated — includes only those children with a history of decay.

The Oral Health of Adolescents

Ages 15–19 Years

By the time a child is 15 years of age, they should have all of their permanent teeth except their wisdom teeth, which erupt at about 18 years of age. In addition to the problems associated with dental decay, the risk of developing periodontal (gum) disease begins in adolescence.

A total of 2,061 adolescents between 15-19 years of age were examined during the 1999 Oral Health Survey. About 91 percent of these individuals had a history of dental decay (at least one tooth with a filling or untreated decay) and 68 percent had untreated decay at the time of the examination. On average, these adolescents had almost seven permanent teeth that were affected by dental decay.

A high proportion of the adolescents examined had at least one dental sealant on a first or second molar (64 percent). Dental sealants are effective in preventing decay and those adolescents with sealants had signifi-

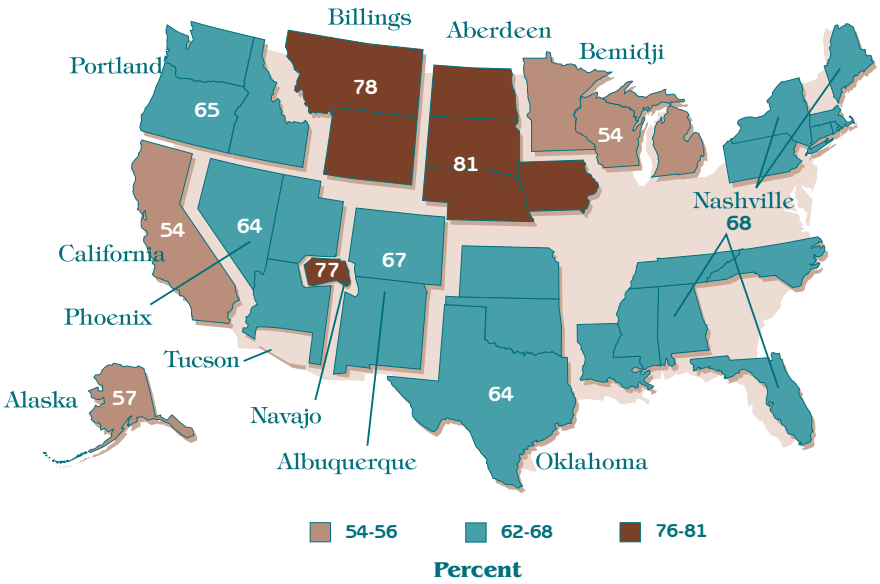
cantly fewer tooth surfaces that were decayed, missing or filled because of decay (DMFS=9.18 vs. 18.24). In this age group a large proportion of decay occurred in pits and fissures (75% of DFS). For this reason, continued use of sealants should be encouraged. Twenty-five percent of the decay, however, was on the smooth surfaces between the teeth – considerably higher than this proportion in 6-14 year olds (13%). Since smooth surface decay is best prevented by using fluorides, expanding fluoride rinse and/or fluoride tooth brushing programs into middle schools is recommended.

When stratified by Area, adolescents in the California, Bemidji, and Alaska Areas are the least likely to have untreated decay while adolescents in the Aberdeen, Billings and Navajo Areas are the most likely to have untreated decay.

Periodontal (gum) disease begins in the adolescent years. It is caused by a bacterial infection that, if left untreated, can result in the loss of tissue (bone and soft tissue) that hold the teeth in the jaw. The teeth can eventually become loose, painful and may be lost. Almost all of the adolescents (92%) had bleeding gums, calculus, or periodontal pockets. Eighteen percent had the first stages of gum disease (periodontal pockets of 3.5-5.4 mm) while two percent had advanced periodontal disease (periodontal pockets > 5.5 mm).

Localized Juvenile Periodontitis (LJP) is a rare form of inherited periodontal disease that affects only adolescents. It has been reported in several, but not all, Areas of the IHS. Because it is such a rare disease, it is difficult to evaluate patterns of LJP through oral health surveys such as this. Some of the advanced periodontal disease found in the AI/AN adolescents, however, may be due to LJP.

Percent of Adolescents 15-19 Years with Untreated Decay by Area



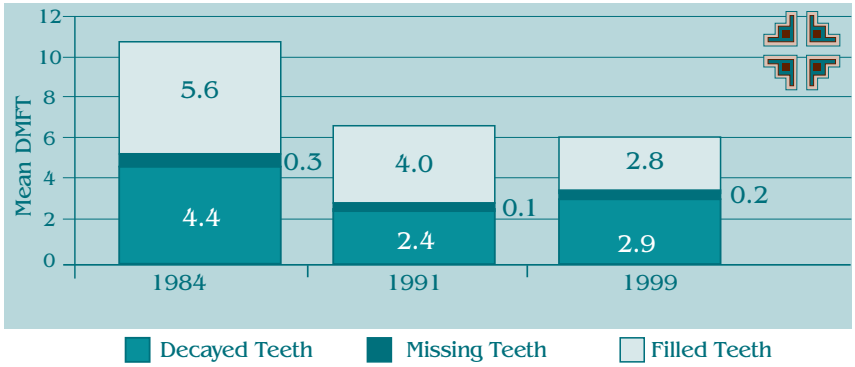
Since tobacco use is a known risk factor for periodontal disease, oral cancer and other systemic diseases, the survey gathered information on current tobacco use. Approximately 23 percent of the young adults used tobacco on a regular basis and the prevalence increased with age ranging from 14 percent in 15-year olds to 34 percent in 19-year olds. For those that use tobacco, 52 percent smoke daily, 40 percent smoke on some days, 4 percent use smokeless tobacco daily, and 12 percent use smokeless on some days.

Trends Over Time:

The 1984 IHS Oral Health Survey gathered information on 13-19 year olds rather than 15-19 year olds. For this reason, comparisons with 1984 are based on adolescents between 13-19 years of age. Decay rates have steadily declined in this age group since 1984 with the majority of the decline occurring between 1984 and 1991 (**Figure 3.1**). Since 1991, the overall decay rate (DMFT) in 13-19 year olds has decreased slightly from 6.52 to 5.89 ($p<0.001$). There has, however, been an increase in both the number of decayed teeth (2.37 vs. 2.88, $p<0.001$) and the number of missing teeth (0.14 vs. 0.25, $p<0.001$). There has also been a concurrent decrease in the number of filled teeth (4.00 vs. 2.76, $p<0.001$).

Figure 3.1

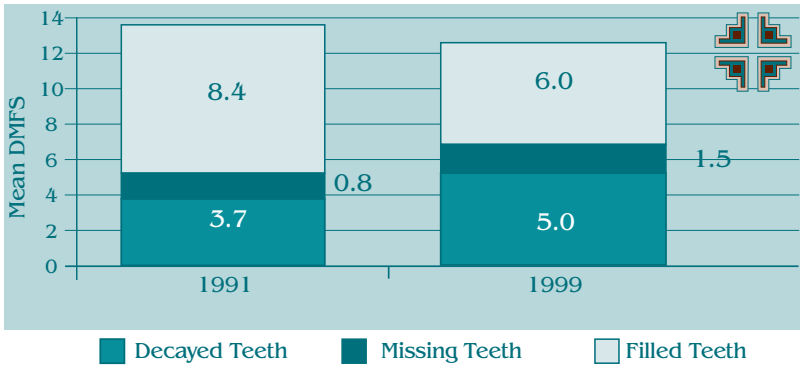
Mean Number of Decayed, Missing and Filled Permanent Teeth for Adolescents 13-19 Years from Three IHS Patient Surveys



In adolescents between 15-19 years, there was no change in the overall number of tooth surfaces with a history of decay between 1991 and 1999 (**Figure 3.2**). There was however, a significant increase in the number of decayed and missing tooth surfaces ($p<0.001$) along with a significant decrease in the number of filled tooth surfaces ($p<0.001$). This suggests that, compared to 1991, adolescents today are having more difficulty accessing or receiving restorative dental care.

Figure 3.2

Mean Number of Decayed, Missing and Filled Permanent Tooth Surfaces for Adolescents 15-19 Years from Two IHS Patient Surveys



As with decay rates, there has been a slight decrease in the prevalence of tobacco use since 1991. In 1991, 25 percent used tobacco compared to 23 percent in 1999 ($p=0.12$). There has been a slight shift however, from smokeless tobacco use toward cigarette smoking.

Comparison to Healthy People 2010:

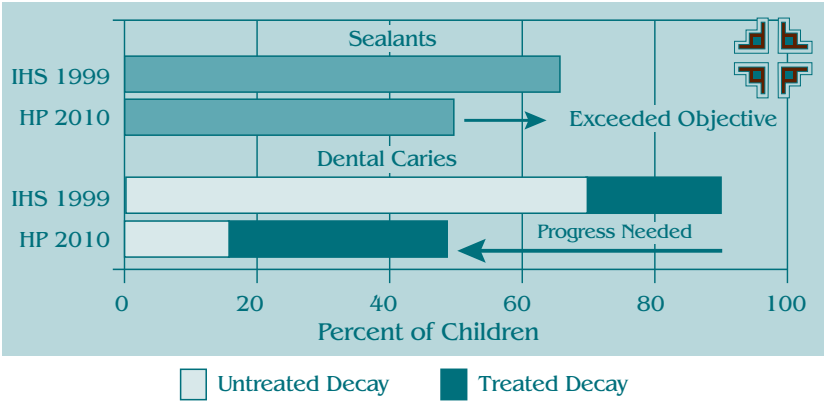
There are several oral health objectives for adolescents aged 15 years of age outlined in Healthy People 2010.

- Decrease the proportion of adolescents who have experienced dental caries in permanent teeth to 51 percent.
- Decrease the proportion of adolescents with untreated dental caries in permanent teeth to 15 percent.
- Increase the proportion of adolescents receiving protective sealing of the occlusal surfaces of permanent molar teeth to 50 percent.
- Reduce tobacco use by adolescents (grades 9-12) to 21 percent for all tobacco products.

Eighty-seven percent of the AI/AN 15-year-olds had experienced dental caries – substantially higher than the Year 2010 objective of 51 percent. Sixty-nine percent of the AI/AN 15-year-olds had untreated caries compared to the Year 2010 Objective of 15 percent. Sixty-three percent of the 15-year-olds examined had dental sealants on their first or second molars, much higher than the objective of 50 percent (**Figure 3.3**). In terms of tobacco use, 23 percent of the AI/AN 15-19 year-olds reported using tobacco compared to the Year 2010 objective of 21 percent (for students in grades 9-12).

Figure 3.3

American Indian and Alaska Native Adolescents 15 Years
Compared to Healthy People 2010 Objectives

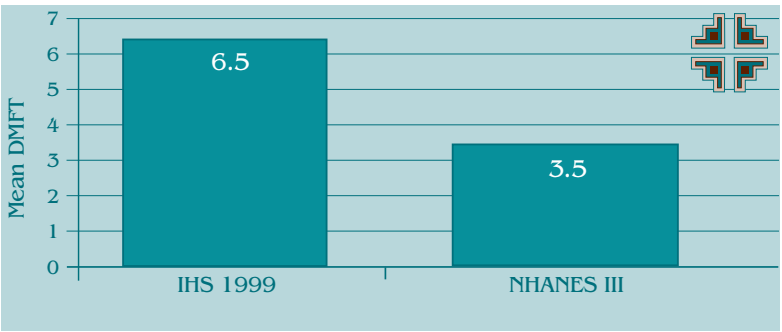


Comparison to National Data:

The most current national data on the oral health of young adults are from NHANES III, which examined 1,381 teenagers between the ages of 15-18 years.[7] When compared to the teenagers in NHANES III, the AI/AN teenagers examined by IHS had more dental decay in their permanent teeth (DMFT=3.5 and 6.5 respectively). In terms of untreated decay, 68 percent of the AI/AN teenagers had permanent teeth with untreated decay while only 24 percent of the NHANES III teenagers had permanent teeth with untreated decay. The IHS Area with the lowest proportion of adolescents with untreated decay was California and their proportion was still more than twice as high as the national average (54% vs. 24%).

Figure 3.4

Mean Number of Decayed, Missing and Filled Permanent Teeth for Adolescents 15-18 Years IHS 1999 Compared to NHANES III



7. Vargas CM, Crall JJ, Schneider DA. Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994. J Am Dent Assoc 1998;129:1229-38.

Table 3.1

Oral Health Of Adolescents Stratified by Age (Percent or Mean plus Standard Error)

Variable	15 years n=527	16 years n=485	17 years n=449	18 years n=316	19 years n=283	15-19 years n=2,061
Percent Caries Free	12.7 (2.1)	8.8 (1.9)	9.3 (2.0)	6.8 (1.9)	4.0 (1.2)	8.9 (0.9)
Percent with Untreated Decay	68.7 (2.7)	63.9 (2.9)	70.4 (2.9)	70.6 (3.4)	68.0 (3.8)	68.1 (1.4)
Percent with Dental Sealants						
1st molars	53.6 (3.0)	59.8 (3.0)	48.8 (3.1)	53.9 (3.7)	48.0 (3.9)	53.3 (1.5)
2nd molars	46.4 (3.0)	51.9 (3.0)	47.8 (3.1)	50.6 (3.8)	42.4 (3.9)	48.1 (1.5)
1st or 2nd molars	63.3 (2.9)	68.5 (2.8)	61.6 (3.1)	65.3 (3.6)	56.5 (4.0)	63.5 (1.4)
Number of sealed molars in those with sealants	3.73 (0.16)	4.06 (0.19)	3.73 (0.18)	3.48 (0.20)	3.37 (0.20)	3.73 (0.08)
Mean number of						
decayed permanent teeth	3.04 (0.20)	2.86 (0.19)	3.44 (0.25)	3.27 (0.28)	3.22 (0.27)	3.14 (0.10)
missing permanent teeth	0.19 (0.03)	0.20 (0.04)	0.39 (0.07)	0.32 (0.06)	0.46 (0.08)	0.30 (0.02)
filled permanent teeth	2.93 (0.20)	3.03 (0.17)	3.11 (0.21)	3.52 (0.25)	3.79 (0.27)	3.20 (0.10)
DMFT	6.16 (0.29)	6.09 (0.25)	6.94 (0.32)	7.11 (0.36)	7.47 (0.40)	6.64 (0.14)
Mean number of						
decayed permanent surfaces	4.74 (0.41)	4.40 (0.36)	5.61 (0.49)	5.30 (0.54)	5.04 (0.49)	4.98 (0.20)
missing permanent surfaces	0.96 (0.16)	0.98 (0.19)	1.97 (0.33)	1.61 (0.28)	2.28 (0.38)	1.47 (0.12)
filled permanent surfaces	5.47 (0.45)	5.28 (0.33)	6.02 (0.44)	7.06 (0.59)	7.30 (0.62)	6.04 (0.21)
DMFS	11.17 (0.71)	10.66 (0.54)	13.59 (0.83)	13.98 (0.91)	14.61 (1.03)	12.48 (0.35)

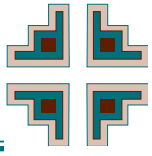


Table 3.1 cont'd

Oral Health Of Adolescents Stratified by Age (Percent or Mean plus Standard Error)

Variable	15 years n=527	16 years n=485	17 years n=449	18 years n=316	19 years n=283	15-19 years n=2,061
Percent with highest CPITN of						
0	9.4 (1.6)	7.8 (1.5)	8.0 (1.7)	7.5 (2.1)	5.9 (1.7)	7.9 (0.8)
1	40.4 (2.9)	38.8 (3.0)	26.9 (2.7)	27.4 (3.3)	24.5 (3.3)	32.8 (1.4)
2	34.6 (3.0)	36.2 (3.0)	42.5 (3.2)	37.8 (3.8)	48.1 (4.0)	39.1 (1.5)
3	13.6 (2.1)	15.4 (2.4)	21.2 (2.7)	22.7 (3.2)	19.1 (3.1)	18.0 (1.2)
4	2.0 (0.9)	1.8 (0.8)	1.3 (0.7)	4.6 (1.7)	2.3 (1.2)	2.2 (0.5)
Percent with periodontal pockets						
< 4 mm	68.1 (2.9)	71.7 (2.8)	58.9 (3.2)	64.5 (3.5)	60.2 (4.1)	65.2 (1.5)
≥4 and < 6 mm	29.5 (2.8)	24.2 (2.7)	39.2 (3.2)	31.5 (3.4)	37.4 (4.1)	31.8 (1.4)
≥ 6 mm	2.4 (0.8)	4.1 (1.3)	1.9 (0.9)	4.1 (1.4)	2.4 (1.2)	3.0 (0.5)
Percent with loss of attachment						
< 3 mm	63.5 (2.8)	59.8 (3.0)	58.2 (3.1)	53.6 (3.8)	56.6 (3.7)	58.9 (1.4)
≥ 3 and < 5 mm	33.2 (2.8)	33.4 (2.9)	34.6 (3.0)	37.6 (3.7)	35.6 (3.6)	34.6 (1.4)
≥ 5 mm	3.3 (0.8)	6.8 (1.8)	7.1 (1.9)	8.8 (2.2)	7.8 (2.1)	6.5 (0.8)
Percent using Tobacco	14.1 (1.9)	18.8 (2.1)	24.0 (2.4)	30.3 (3.4)	33.8 (3.5)	22.6 (1.1)

The Oral Health of Adults
Ages 35–44 Years

Once thought to be a disease of children, we now realize that dental decay also has a significant impact on adults. Untreated dental decay can lead to extensive dental treatment and can be quite costly. Left untreated, dental disease can lead to pain, abscess, and tooth loss. It should be noted that dental decay is just as preventable in adults as it is in children.

During the adult years, periodontal (gum) disease also becomes a significant oral health problem. The infection of the gums that begins in adolescence progresses over time leading to a significant rate of advanced periodontal disease in adults. In addition, tooth loss due to both decay and periodontal disease increases during this life phase.

A total of 2,021 adults between the ages of 35-44 years were examined during the 1999 survey. Almost 79 percent of the adults had lost at least one tooth while two percent had lost all of their teeth. On average, the

adults examined had lost four teeth because of decay, trauma or gum disease. About one percent of the adults had an oral lesion that the dentist felt needed to have a biopsy.

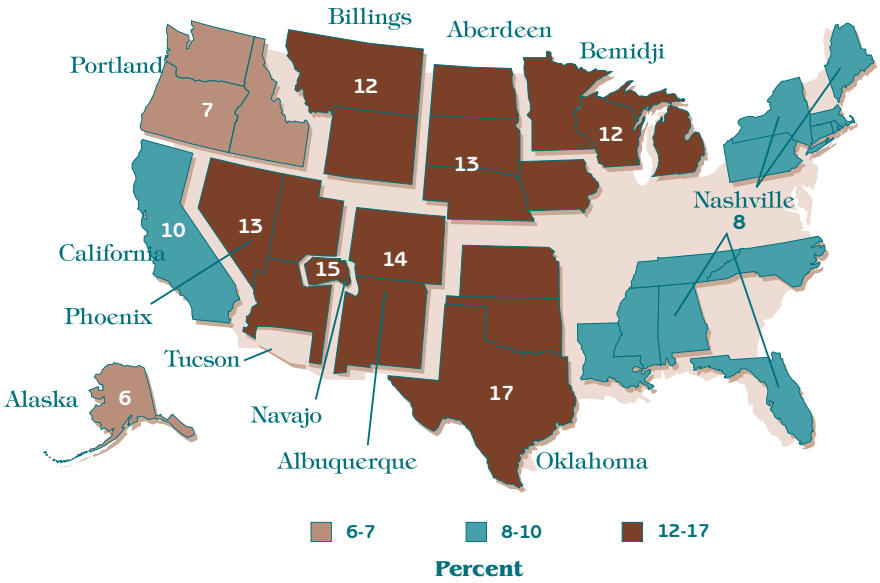
Sixty-eight percent of the adults with at least one natural tooth had untreated decay at the time of the examination. When stratified by Area, adults in the Alaska and Portland Areas had the lowest proportion of their total caries experience due to untreated decay while Oklahoma and Navajo had the highest proportion. As a person ages, the gum tissue recedes which exposes the root surface and makes a person susceptible to root decay. Of the adults examined, 15 percent had at least one root surface with a history of tooth decay.

Periodontal disease was prevalent among the adults examined with 96 percent having gingivitis (bleeding gums), 36 percent showing signs of early periodontal disease (periodontal pockets 3.5-5.4 mm) and 23 percent showing signs of advanced periodontal disease (periodontal pockets > 5.5 mm). Approximately 32 percent of the adults had lost five or more millimeters of tooth support (loss of attachment). Continued loss of attachment may eventually lead to tooth loss.

When both untreated decay and periodontal disease are taken into consideration, only 17 percent of the adults examined had "good" oral health – with good defined as no untreated decay and no periodontal disease. Forty-three percent of the adults had both untreated decay and periodontal disease.

Percent of Adults with Untreated Decay and Periodontal Disease		
Perio Disease CPITN = 3 or 4	Untreated Decay	
	No	Yes
No	17.2%	24.0%
Yes	15.5%	43.3%

Percent of DMFS due to Decayed Surfaces



Impact of Diabetes on Periodontal Status:

Diabetes is a significant risk factor for periodontal disease. The age of onset of type 2 diabetes occurs in the late third and forth decades of life. Therefore, diabetes becomes an important oral health issue during adult life. The presence of periodontal disease, like other infections, can contribute to higher blood sugar levels or poorer blood sugar control in patients with diabetes. The risk of periodontal disease also increases with both the severity (poor blood sugar control) and the length of time or duration since the diagnosis of diabetes.

Of the adults examined, about 11 percent were diabetic. Thirty percent of the adults with at least one tooth and diabetes had advanced periodontal disease compared to only 22 percent of the adults without diabetes. This means that diabetics between 35-44 years are 38 percent more likely to have advanced periodontal disease compared to those without diabetes (prevalence ratio=1.38, 95% CI=1.26-1.51). Further, a higher proportion of diabetic patients with high blood sugar, or poor blood sugar control, had advanced periodontal disease (31%) compared to those with controlled blood sugar (18%).

Impact of Tobacco Use on Periodontal Status:

Tobacco use, especially cigarette smoking, is another known risk factor for periodontal disease.[8] As with diabetes, periodontal disease risk increases with the length of time and the amount an individual has smoked or used smokeless tobacco. Of the adults examined, 38 percent used tobacco on a regular basis – with 87 percent of the tobacco users smoking cigarettes and 16 percent using smokeless tobacco.

Twenty-nine percent of the tobacco users with teeth had advanced periodontal disease compared to 20 percent of the non-tobacco users. This means that tobacco users between 35-44 years are 46 percent more likely to have advanced periodontal disease compared to those that do not use tobacco on a regular basis (prevalence ratio=1.46, 95% CI=1.36-1.55).

8. American Academy of Periodontology, www.perio.org, 2000.

Trends Over Time:

As previously stated, this is the third oral health survey of IHS dental patients, with the other two surveys completed in 1984 and 1991. Between 1984 and 1991 the number of decayed and missing teeth in adults declined while the number of filled teeth increased (**Figure 4.1**). This suggests that there was an increase in access to dental care between 1984 and 1991. Between 1991 and 1999 there was a slight, yet statistically significant decrease in the overall decay rate (DMFT) among adults (15.07 vs. 14.40, p=0.001). There was a non-significant increase in the number of decayed teeth (p=0.053), a significant decrease in the number of missing teeth (p=0.002) along with a significant decrease in the number of filled teeth (p=0.02). This occurred during a time when access to dental care declined because of an increasing number of vacant dental positions.

Although decay rates decreased slightly in adults, there has been no change in the prevalence of periodontal disease among adults 35-44 years since the 1991 Oral Health Survey (**Figure 4.2**). In addition, there has been no change in the average number of teeth in dentate adults between 1991 and 1999 – 24.2 and 24.4 respectively.

Figure 4.1

Mean Number of Decayed, Missing and Filled Teeth in Adults 35-44 Years from Three IHS Patient Surveys

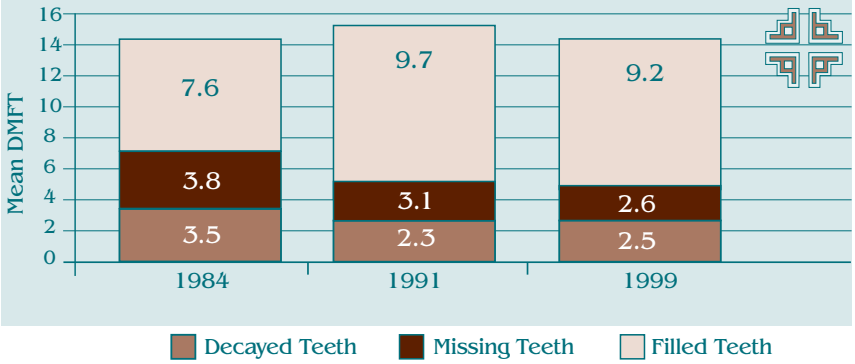
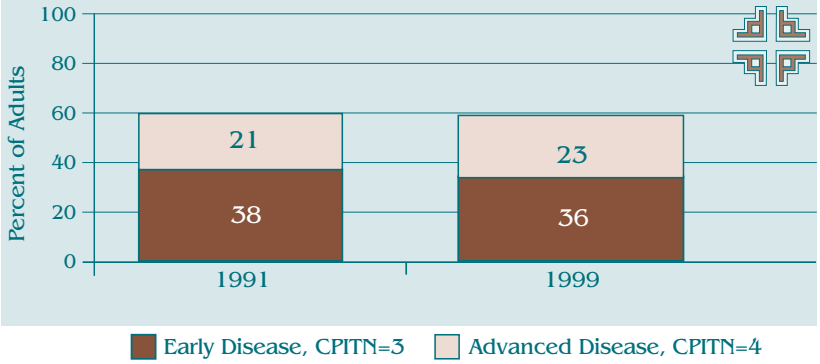


Figure 4.2

Prevalence of Periodontal Disease by Severity for Adults 35-44 Years from Two IHS Patient Surveys



Comparison to Healthy People 2010:

The National Oral Health Objectives for the Year 2010 (Healthy People 2010) outline several oral health status objectives for adults 35-44 years. There is also one objective on tobacco use in adults.

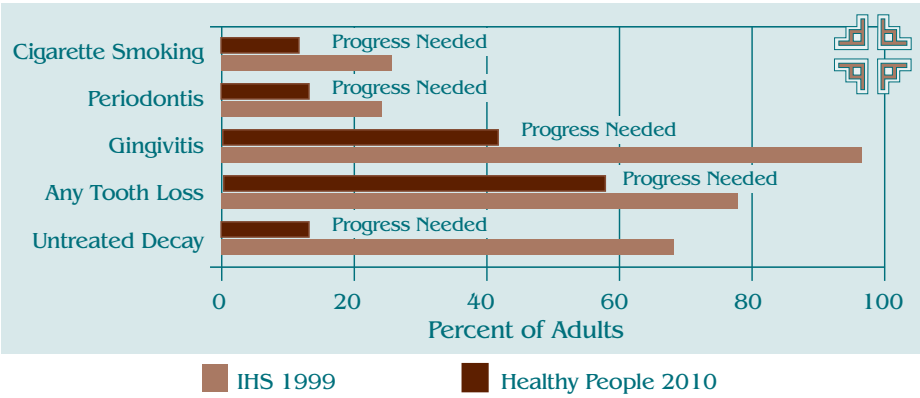
- Reduce the proportion of adults with untreated decay to 15 percent.
- Increase to at least 42 percent the proportion of people aged 35-44 years who have never lost a permanent tooth due to dental caries or periodontal disease.
- Reduce the prevalence of gingivitis among adults aged 35-44 years to no more than 41 percent.
- Reduce advanced periodontal disease to a prevalence of no more than 14 percent among people aged 35-44 years.
- Reduce tobacco use by adults 18 years and older to 12 percent for cigarette smoking and 0.4 percent for smokeless tobacco.

Sixty-eight percent of the AI/AN adults with teeth had untreated decay compared to a Year 2010 objective of 15 percent. Seventy-eight percent of the 35-44 year olds had lost at least one tooth to decay or gum disease compared to a Year 2010 Objective of 42 percent. In terms of periodontal health – both gingivitis and advanced periodontal disease were higher than the Year 2010 Objectives (**Figure 4.3**).

Among AI/AN adults, the prevalence of smoking (33%) and smokeless tobacco use (6%) are both higher than the Year 2010 objectives of 12 percent and 0.4 percent.

Figure 4.3

American Indian and Alaska Native Adults aged 35-44 Years
Compared to Healthy People 2010 Objectives



Comparison to National Data:

The most current national data on oral health in adults are from NHANES III, which examined approximately 1,415 adults between the ages of 35-44 years.[9,10] When compared to adults in NHANES III, the AI/AN dentate adults had more tooth surfaces with untreated decay but fewer missing surfaces and a similar number of filled surfaces (**Figure 4.4**). In terms of tooth loss, the AI/AN adults had the same number of teeth present as the NHANES III adults (24.4 vs. 24.3). While the AI/AN adults had significantly more periodontal disease (pockets > 6 mm), the prevalence of root caries was less than that found in NHANES III (**Figure 4.5**). The IHS Area with the lowest proportion of adults with advanced periodontal disease (pockets > 6mm) was Nashville, and their proportion was still three times higher than the national average (9% vs. 3%).

Figure 4.4

Mean Number of Decayed, Missing and Filled Tooth Surfaces for Dentate Adults 35-44 Years IHS Compared to NHANES III

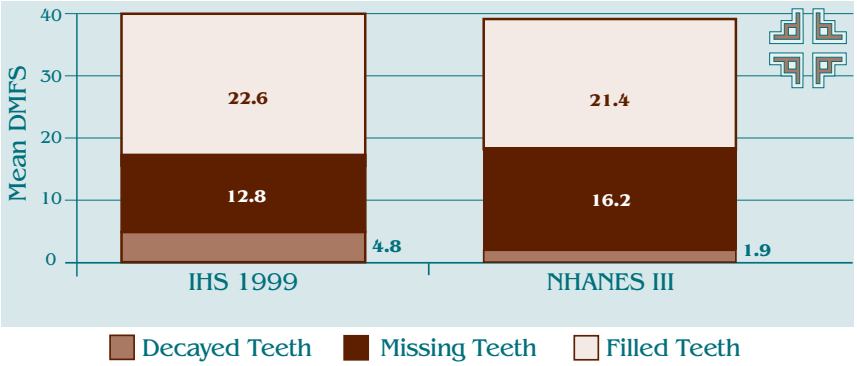
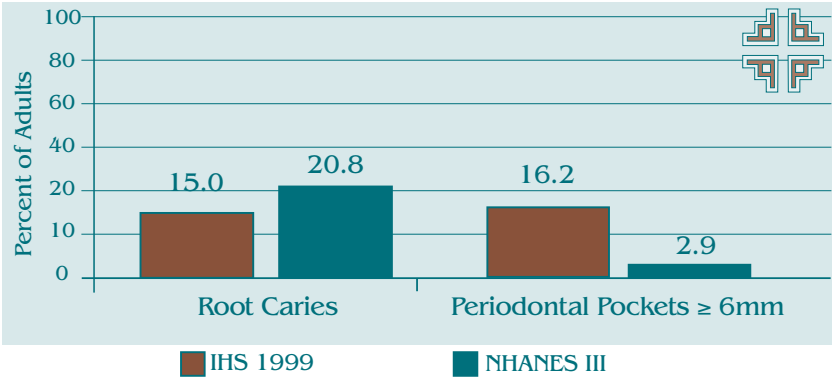


Figure 4.5

Proportion of 35-44 Year Olds with Root Caries and Advanced Periodontal Disease IHS 1999 Compared to NHANES III



9. Winn DM, Brunelle JA, Selwitz RH, et al. Coronal and root caries in the dentition of adults in the United States, 1988-1991. J Dent Res 1996;75(spec Iss):642-51.
10. Brown LJ, Brunelle JA, Kingman A. Periodontal status in the United States, 1988-91, prevalence, extent, and demographic variation. J Dent Res 1996;75(spec Iss):672-83.

Table 4.1

Oral Health Of Adults 35-44 Years of Age (Percent or Mean plus Standard Error)

Variable	35-44 Years
Total number examined — unadjusted	2,021
Percent using tobacco	37.8 (1.5)
Percent of tobacco users (n=817) that:	
smoke cigarettes daily	63.1 (2.6)
use smokeless tobacco daily	7.8 (1.4)
smoke pipe/cigar daily	0.2 (0.2)
Percent with diabetes	10.8 (1.0)
Percent needing biopsy	1.0 (0.3)
Percent with all 28 teeth	21.6 (1.3)
Percent with 20 or more teeth	86.4 (1.2)
Percent with no natural teeth	2.4 (0.4)
Number of dentate* adults examined — unadjusted	1,979
Percent of dentate adults with untreated decay (coronal or root decay)	67.6 (1.5)
Percent of dentate adults with root caries (a history of root caries)	15.0 (1.4)
Mean number of teeth present	24.35 (0.14)
Mean number of:	
Decayed teeth	2.55 (0.10)
Missing teeth	2.64 (0.12)
Filled teeth	9.20 (0.16)
DMFT	14.40 (0.17)
Mean number of:	
Decayed surfaces	4.85 (0.25)
Missing surfaces	12.85 (0.57)
Filled surfaces	22.60 (0.50)
DMFS	40.30 (0.71)

* Dentate: People are considered to be dentate if they have at least one natural tooth other than a third molar.

Table 4.2

Periodontal Status Of Dentate Adults 35-44 Years of Age (Percent plus Standard Error)

Variable	Number	All 35-44 Year Olds	Diabetic		Tobacco User	
			No	Yes	No	Yes
Percent with highest CPITN score	**1,924**					
0		3.8 (0.6)	3.8 (0.6)	4.2 (2.3)	5.2 (0.9)	1.4 (0.4)
1		10.1 (0.8)	10.5 (0.9)	5.7 (1.7)	11.3 (1.1)	8.1 (1.2)
2		26.8 (1.4)	27.2 (1.4)	24.0 (4.6)	28.1 (1.8)	24.7 (2.2)
3		36.3 (1.6)	36.5 (1.7)	35.8 (5.0)	35.7 (2.0)	37.2 (2.7)
4		23.0 (1.5)	22.0 (1.6)	30.3 (4.8)	19.7 (1.7)	28.6 (2.8)
Percent with pocket depth	**1,878**					
< 4 mm		44.6 (1.6)	44.6 (1.7)	42.2 (5.1)	48.7 (2.0)	37.6 (2.7)
≥ 4 and < 6 mm		39.2 (1.6)	39.3 (1.8)	39.8 (5.2)	36.1 (2.0)	44.3 (2.9)
≥ 6 mm		16.2 (1.2)	16.0 (1.2)	18.1 (3.8)	15.2 (1.5)	18.1 (2.0)
Percent with loss of attachment	**1,871**					
< 3 mm		22.6 (1.4)	22.6 (1.5)	23.0 (4.7)	25.2 (1.7)	18.2 (2.5)
≥ 3 and < 5 mm		45.7 (1.6)	46.6 (1.8)	36.7 (5.0)	47.0 (2.0)	43.4 (2.8)
≥ 5 mm		31.7 (1.5)	30.8 (1.6)	40.4 (5.3)	27.7 (1.8)	38.4 (2.7)

The Oral Health of Elders

Ages 55+ Years

In terms of oral health needs, elders are a particularly vulnerable population. They are at higher risk for certain diseases such as periodontal (gum) disease, root decay and oral cancer. Ill-fitting dentures, or the lack of dentures, can prevent elders from eating, resulting in malnutrition and other health problems. As with other age groups, elders need regular dental care in order to assure that their oral health status is maintained and their general health is not compromised by untreated oral problems.

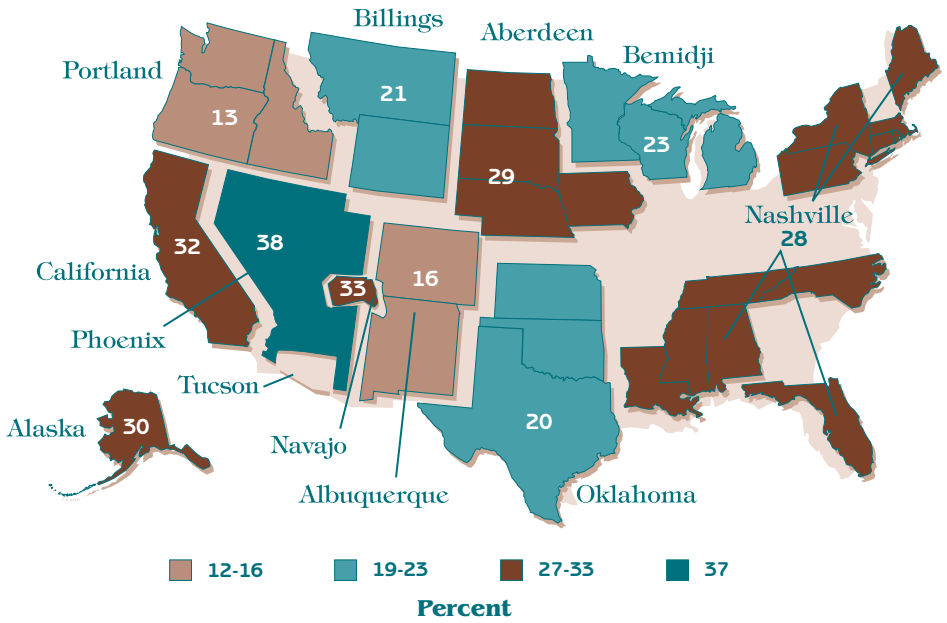
A total of 2,066 adults age 55 years or older were examined during the 1999 Oral Health Survey. About two percent of the elders had an oral lesion that the dentist felt needed to have a biopsy. Of the elders examined, 21 percent had lost all of their natural teeth. It is well documented that people who have lost all of their teeth seek dental care less often than those with teeth. For this reason, this survey probably underestimates the prevalence of total tooth loss (edentulism)

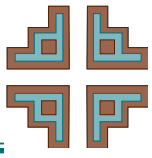
among AI/AN elders. Of the elders without any natural teeth (n=487), 20 percent had no dentures at all and an additional four percent were missing either an upper or lower denture.

Of the remaining elders with at least one tooth (n=1,579), 61 percent had untreated decay, 33 percent had a history of root caries, and 23 percent had lost all of their upper teeth. On average, each of these elders had lost eight teeth because of dental decay, periodontal (gum) disease or trauma. Of the elders with lower teeth but no upper teeth, 20 percent did not have an upper denture.

Information on periodontal (gum) disease was available for 1,500 of the elders examined. Approximately 98 percent of the elders examined had gingivitis (bleeding gums), 34 percent had signs of early periodontal disease (periodontal pockets 3.5-5.4 mm) and 27 percent had signs of advanced periodontal disease (periodontal pockets > 5.5 mm). Approximately 56 percent of the elders had lost five or more millimeters of tooth support (loss of attachment). Continued loss of attachment can eventually lead to tooth loss. When stratified by Area, elders in the Portland and Albuquerque Areas had the lowest prevalence of advanced periodontal disease while elders in the Phoenix Area had the highest prevalence.

Prevalence of Advanced Periodontal Disease by Area





When both untreated decay and periodontal disease are taken into consideration, only 17 percent of the elders examined had "good" oral health – with good defined as no untreated decay and no periodontal disease. Forty percent of the adults had both untreated decay and periodontal disease.

Percent of Elders with Untreated Decay and Periodontal Disease		
Perio Disease CPITN = 3 or 4	Untreated Decay	
	No	Yes
No	16.9%	21.9%
Yes	20.9%	40.3%

Impact of Diabetes on Periodontal Status:

Compared to other age groups, the impact of diabetes on periodontal disease status is greatest among elders because the risk for periodontal disease increases the longer an individual has diabetes. The risk of periodontal disease is even higher in those with uncontrolled diabetes. Of the elders with teeth, approximately 33 percent had diabetes.

Thirty-one percent of the elders with teeth and diabetes had advanced periodontal disease compared to 25 percent of the elders without diabetes. This means that diabetics age 55 years or older are 24 percent more likely to have advanced periodontal disease compared to those without diabetes (prevalence ratio=1.24, 95% CI =1.16–1.34).

Impact of Tobacco Use on Periodontal Status:

Tobacco use, especially cigarette smoking, is another known risk factor for periodontal disease. As with diabetes, periodontal disease risk increases with the length of time an individual has smoked. Of the elders with teeth, 16 percent used tobacco on a regular basis – with 80 percent of the tobacco users smoking cigarettes and 22 percent using smokeless tobacco.

Forty-two percent of the tobacco users had advanced periodontal disease compared to 24 percent of the non-tobacco users. This means that tobacco users age 55 years or older are 74 percent more likely to have advanced periodontal disease compared to those that do not use tobacco on a regular basis (prevalence ratio=1.74, 95% CI=1.61-1.88).

Impact of Tooth Loss on Periodontal Status:

Tooth loss for elders was found to be a major oral health problem, and tooth loss increased dramatically with age. The average number of remaining teeth for individuals at age 55 was 17. However, by age 70, an average of only 11 teeth remained.

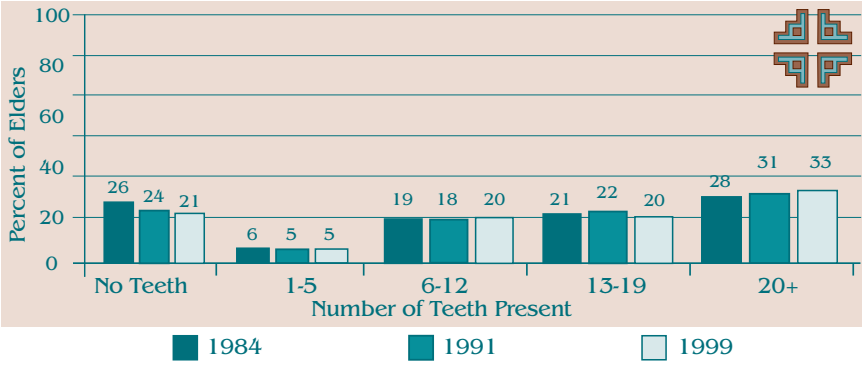
Tooth loss and periodontal disease status in elders are strongly linked. Certain teeth (molars and lower front teeth) are more susceptible to periodontal disease. As these teeth are lost due to advanced periodontal disease, the relative status of periodontal disease improves. That is, as the unhealthy teeth are lost, the remaining dentition is healthier. This contradictory relationship between tooth loss and periodontal disease tends to underestimate the devastating impact of periodontal disease in this oldest age group.

Trends Over Time:

Two previous IHS dental patient surveys were completed in 1984 and 1991. Since 1984, the proportion of elder dental patients without any teeth has decreased slightly while the proportion with 20 or more teeth has increased from 28 percent in 1984 to 33 percent in 1999 (**Figure 5.1**).

Figure 5.1

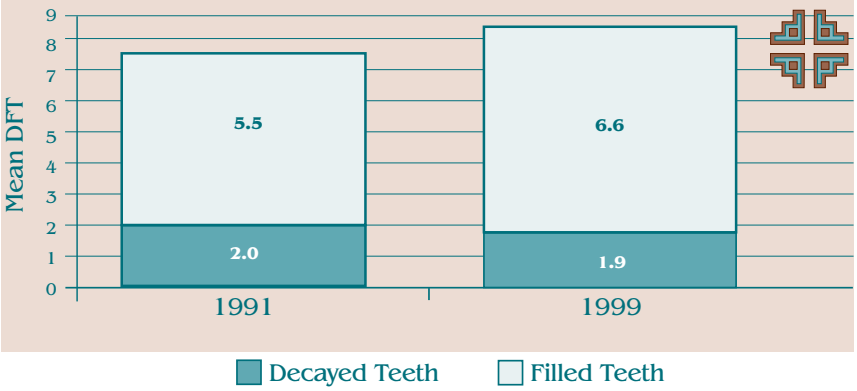
Distribution of Teeth in Elders Age 55 Years or Older from Three IHS Surveys



Along with the increase in the proportion of elders with 20 or more teeth, was a significant increase in the number of filled teeth from 1991 to 1999 (5.48 vs. 6.56, $p<0.001$). (**Figure 5.2**) This suggests that more elders are receiving both preventive and restorative dental care.

Figure 5.2

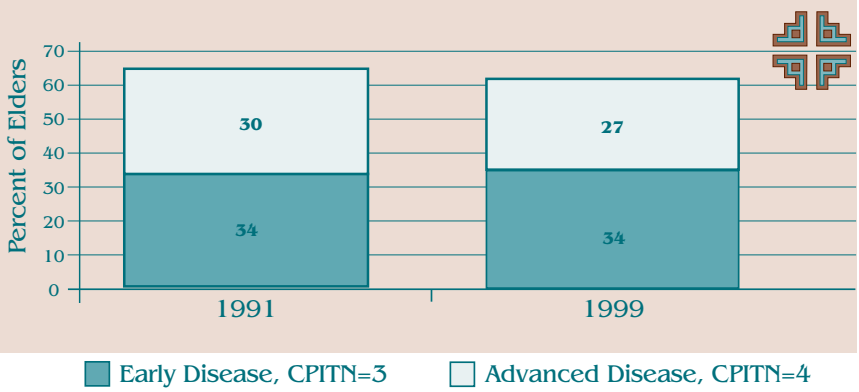
Mean Number of Decayed and Filled Teeth Among Dentate Elders Age 55 Years or Older from Two IHS Surveys



As with the younger adults, there has been no change in the prevalence of periodontal disease among elders since the 1991 Oral Health Survey (**Figure 5.3**, $p=0.17$).

Figure 5.3

Distribution of Periodontal Disease by Severity in Dentate Elders Age 55 Years or Older from Two IHS Surveys



Comparison to Healthy People 2010:

The National Oral Health Objectives for the Year 2010 (Healthy People 2010) has one objective for older adults. There is also one objective for tobacco use in adults.

- Reduce the proportion of older adults aged 65-74 years who have had all of their natural teeth extracted to 20 percent.
- Reduce tobacco use by adults 18 years and older to 12 percent for cigarette smoking and 0.4 percent for smokeless tobacco.

As previously stated, people who have lost all of their teeth seek dental care less often than individuals with teeth. For this reason, this survey of dental patients probably underestimates the true prevalence of total tooth loss among elders. Regardless of this fact, 25 percent of the elders between 65-74 years had lost all of their teeth. This is higher than the Year 2010 objective of 20 percent. In terms of tobacco use, the elders examined by IHS met the Year 2010 goal for smoking but not smokeless tobacco use. While only 11 percent of the elders reported smoking on a daily basis, two percent reported using smokeless tobacco on a daily basis.

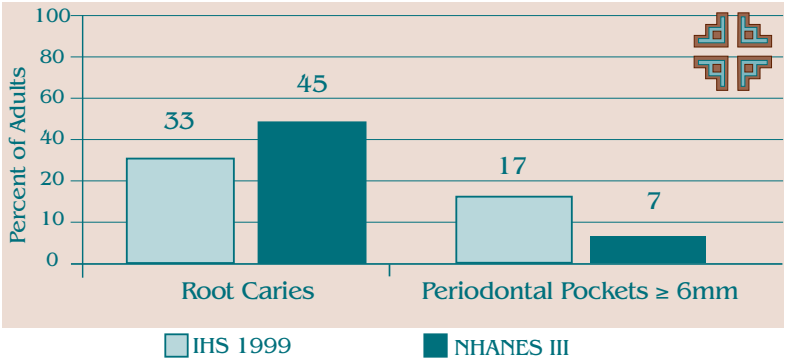
Comparison to National Data:

The most current national data on oral health in adults are from NHANES III, which examined approximately 3,108 adults age 55 years or older.[11,12]

When compared to older adults in NHANES III, the AI/AN elders examined by IHS had fewer teeth (16.8 vs. 18.4). In addition, the AI/AN elders had a higher proportion of their tooth surfaces that were decayed – 17.5 percent compared to 5.6 percent for those examined by NHANES III. While the AI/AN elders had significantly more periodontal disease (pockets > 6mm), the prevalence of root caries was less than that found in NHANES III (**Figure 5.4**). The IHS Area with the lowest proportion of elders with advanced periodontal disease (pockets > 6mm) was Portland, and their proportion was almost twice as high as the national average (12% vs. 7%).

Figure 5.4

Proportion of Older Adults (≥ 55 Years) with Root Caries and Periodontal Disease IHS 1999 Compared to NHANES III



11. Winn DM, Brunelle JA, Selwitz RH, et al. Coronal and root caries in the dentition of adults in the United States, 1988-1991. J Dent Res 1996;75(spec Iss):642-51.
12. Brown LJ, Brunelle JA, Kingman A. Periodontal status in the United States, 1988-91, prevalence, extent, and demographic variation. J Dent Res 1996;75(spec Iss):672-83.

Table 5.1

Oral Health Of Elders Age 55 Years or Older (Percent or Mean plus Standard Error)

Variable	Number 55 + Years
Number Examined — unadjusted	2,066
Percent with diabetes	35.6 (1.7)
Percent using any tobacco products	16.4 (1.2)
Percent of tobacco users (n=379) that:	
smoke cigarettes daily	66.1 (3.7)
use smokeless tobacco daily	14.4 (2.8)
smoke pipe/cigar daily	0.8 (0.5)
Percent with all 28 teeth	2.5 (0.5)
Percent with 20 or more teeth	33.2 (1.7)
Percent with no natural teeth	21.0 (1.2)
Number of elders with teeth (dentate*) — unadjusted	1,579
Percent of dentate elders with untreated decay (coronal or root decay)	61.3 (2.0)
Percent of dentate elders with root caries (a history of root caries)	32.6 (1.9)
Mean (SE) number of (dentate only):	
Decayed teeth	1.90 (0.09)
Missing teeth	7.71 (0.30)
Filled teeth	6.56 (0.21)
DMFT	16.16 (0.28)
Mean (SE) number of (dentate only):	
Decayed surfaces	3.98 (0.24)
Missing surfaces	36.48 (1.38)
Filled surfaces	18.91 (0.72)
DMFS	59.37 (1.28)

* Dentate: People are considered to be dentate if they have at least one natural tooth other than a third molar.

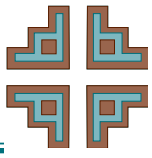


Table 5.2

Periodontal Status Of Dentate Elders Age 55 Years or Older (Percent plus Standard Error)

Variable	55+ Years	Diabetic		Tobacco User	
		No	Yes	No	Yes
Percent with highest CPITN score (n=1,500)					
0	2.5 (0.5)	2.7 (0.7)	2.1 (0.8)	2.6 (0.6)	2.0 (0.8)
1	9.4 (1.0)	9.2 (1.1)	9.7 (2.1)	10.3 (1.2)	3.6 (1.0)
2	26.9(2.0)	28.2 (2.2)	24.6 (4.4)	28.8 (2.3)	17.2 (3.5)
3	34.3 (2.0)	35.0 (2.4)	32.7 (3.5)	34.1 (2.2)	35.2 (5.0)
4	26.9 (1.8)	24.9 (2.1)	31.0 (3.4)	24.1 (1.9)	41.9 (5.1)
Percent with periodontal pockets (n=1,476)					
< 4 mm	48.3 (2.1)	48.8 (2.4)	47.3 (4.1)	51.1 (2.3)	32.5 (4.6)
≥ 4 and < 6 mm	33.5 (2.0)	34.0 (2.4)	32.5 (3.6)	31.9 (2.2)	42.5 (5.1)
≥ 6 mm	18.2 (1.5)	17.2 (1.8)	20.1 (2.8)	17.0 (1.6)	25.0 (4.1)
Percent with loss of attachment (n=1,462)					
< 3 mm	11.6 (1.2)	13.1 (1.6)	8.7 (1.8)	12.8 (1.4)	5.0 (1.4)
≥ 3 and < 5 mm	32.8 (2.1)	31.1 (2.1)	36.4 (4.3)	34.7 (2.3)	22.7 (4.0)
≥ 5 mm	55.6 (2.1)	55.8 (2.4)	54.9 (4.1)	52.4 (2.3)	72.3 (4.2)

TREATMENT NEEDS

Background:

One of the many reasons the IHS conducts oral health surveys is to estimate the treatment needs of the eligible American Indian and Alaska Native population. Estimates of treatment needs are used for assessing work force need, developing budget requests, and general program planning. Before 1983, treatment needs were based on individual dental patient treatment plans prepared by clinical dentists throughout the IHS. Beginning in 1983, estimates of treatment needs were prepared from data obtained in periodic oral health status surveys, which also represented dental patients. During the 1991 IHS Oral Health Survey, trained examiners recorded both oral health status and treatment needs for each participant.

While the 1999 IHS Oral Health Survey collected surface specific oral health status data, it did not collect information on individual treatment need. For this report, algorithms were used to estimate treatment needs. These algorithms, which were developed by a workgroup of IHS dental specialists and senior general dentists, used oral health status data to estimate restorative, periodontal and full denture treatment need. The method used to assign bridge and removable partial denture need was developed using a combination of data from the 1991 Oral Health Survey and recommendations from IHS specialists. The need for root canals and extractions could not be determined solely from tooth status recorded in the 1999 survey. Therefore, 1991 treatment recommendations were used to calculate the percentage of teeth needing these services. Individual teeth were grouped by tooth type and caries status. The percent of teeth needing root canals and extractions by group was calculated and applied to the aggregated 1999 survey data. The 1999 survey did not collect data on periodontal treatment needs for children under age 15. The need for oral prophylaxis for children age 6-14 was estimated through a two-step procedure. The change in prophylaxis need from 1991 to 1999 among children age 15-19 was calculated. The percentage of adolescents with a CPITN ≥ 2 increased 144% or approximately 30 percentage points (from 23.6% to 53.76%). The need for oral prophylaxis in the 6-14 age group was conservatively estimated. The proportion of children needing this service reported in the

1991 survey (11%) was increased by five percentage points to 16 percent. This represents a 44% increase over 1991. The following services were not included in an estimate of treatment needs: orthodontics, pre-prosthetic oral surgery, surgical extractions, surgical endodontic treatment, general anesthesia and oral sedation, limited examinations for episodic users, and emergency services.

The treatment needs estimates presented in this report assume that all eligible individuals receive all necessary dental treatment in order to eliminate or control disease and restore function. The control of disease includes targeted recall for patients needing topical fluoride treatment and/or prophylaxis. Services counted for targeted recall include a periodic oral exam and bitewing radiographs, oral hygiene instruction, prophylaxis, periodontal maintenance, and topical fluoride.

Overall Treatment Need:

The IHS reports dental workload and production using units of dental services and service minutes. Each individual dental service is reported when the treatment is completed. A person may receive many services at a dental visit; for example an examination, oral hygiene instruction, cleaning and several fillings can be done at one visit. Alternatively, a person may have no services completed at a visit such as when a full denture is fitted. Each service is assigned service minutes; an estimate of the time needed based on the complexity of the service. Service minute values range from four minutes for x-rays taken at a recall visit to 160 minutes for an upper denture.

The 1999 IHS Oral Health Survey collected oral health status information for five age groups: 2-5 years, 6-14 years, 15-19 years, 35-44 years, and 55 years and older. Treatment needs for people age 20-34 and 45-54 were estimated by interpolation. Total treatment needs for each 5-year age interval were plotted on a graph. A straight line connecting the end points of the missing age intervals was used to estimate the values for the non-participating age groups. The 1991 IHS oral health status survey collected data from all age groups. An examination of the 1991 data confirmed that this method of interpolation approximates the actual variation in treatment need and does not overestimate

need. **Table 6.1** shows overall treatment needs by age group with both Number of Service and Service Minute estimates presented. The mean value is the value calculated directly from the health status data for the 1999 survey. The adjusted mean includes estimates for endodontics, extractions and child prophylaxis. The actual number of Services and Service Minutes were calculated for each age group based on the 1997 IHS user population for that age group. For each age group, the percentage of the total services and service minutes is shown.

Table 6.1

Estimated Service and Service Minute need by age group.

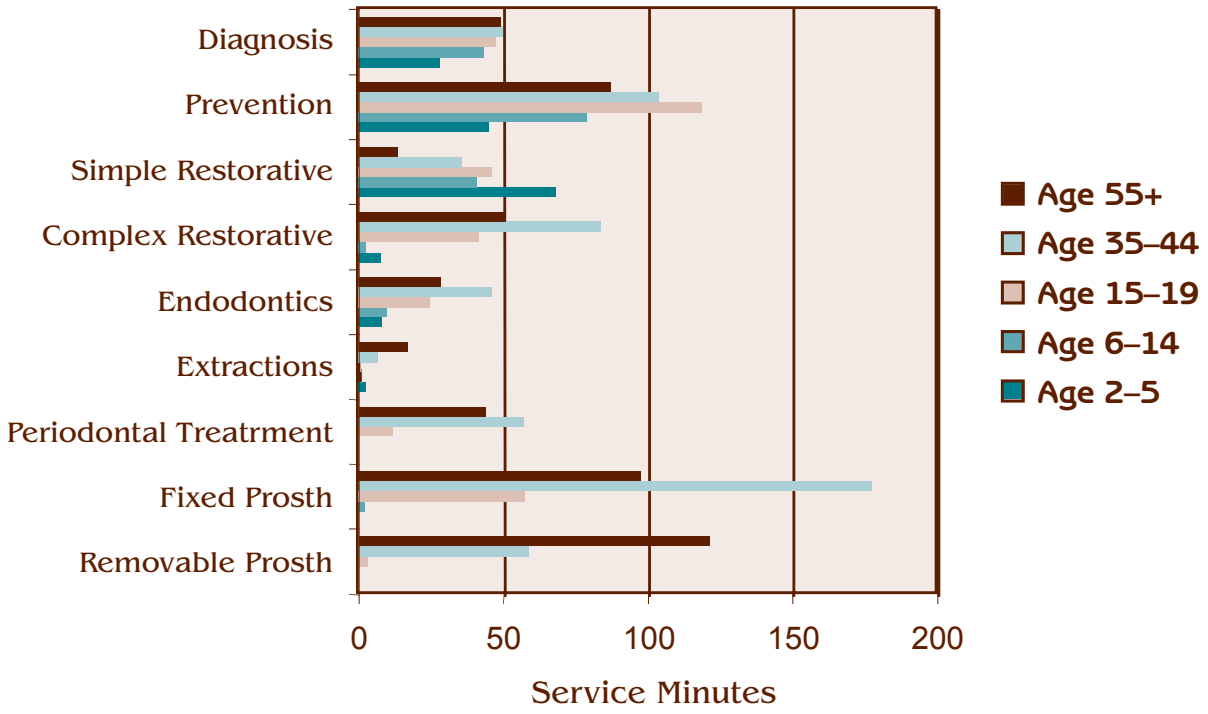
Age Group	Population	% of Total Population	Number of Services				Service Minutes			
			Mean	Standard Error	Estimated Mean*	% of Total	Mean	Standard Error	Estimated Mean*	% of Total
2-5	125,886	9.5	10.7	0.2	11.3	7.0	152.8	3.2	161.7	3.7
6-14	262,960	19.9	11.6	0.2	12.3	15.9	159.1	2.1	178.1	8.6
15-19	139,288	10.5	16.6	0.2	17.0	11.7	328.1	6.9	372.2	9.5
20-34	335,478	25.4			17**	28.7			455**	22.0
35-44	186,252	14.1	16.6	0.2	17.8	16.3	582.0	10.3	665.2	22.7
45-54	117,374	8.9			16**	9.3			558**	12.0
55+	155,879	11.8	13.1	0.2	14.3	11.0	497.4	10.7	543.9	15.5
TOTAL	1,323,117	100.0			15**				412**	

* The Estimated Mean includes estimates for endodontics, extractions and child prophylaxis

** Interpolated values for the age groups 20-34 and 45-54 years.

Figure 6.1 shows the mean service minute need for different types of services by age group. The five age categories with actual data from this survey are presented. The need for preventive services increases in childhood and remains high throughout the lifetime. The need for simple restorative services declines with age while the need for complex restorative services increases. The need for endodontics, periodontal services and fixed prosthodontics also increases with age until the oldest age group. The elderly have a higher need for extractions and removable prosthetics that is consistent with higher levels of tooth loss among AI/AN elders.

Figure 6.1
Treatment by Types of Service



Maintenance services:

People with dental disease benefit from regular preventive services designed to control or arrest disease. The IHS recommends targeted recall for individuals at high risk of oral disease onset or progression. For the purpose of this report, preventive service need was calculated using the following assumptions: examination and preventive services are provided at recall visits, those with smooth surface caries receive topical fluoride applications every six months, those with calculus and periodontal disease (CPITN ≥ 2) receive a cleaning every six months. If a patient had calculus (CPITN=2) a prophylaxis was counted. If a patient had periodontal pockets of 4 mm or more (CPITN=3 or 4) a periodontal maintenance service was counted. Services for one visit every six months were counted. **Table 6.2** shows the annual preventive maintenance treatment needs by age group. As expected, need increases with age as more people have periodontal treatment needs. There was a slight decline in the mean treatment needs for the elderly who had fewer teeth.

Table 6.2

Annual Preventive Maintenance Treatment Needs by Age Group

Age Group	Number of Services		Service Minutes	
	Mean	Standard Error	Mean	Standard Error
2-5 years	4.6	0.1	50.3	1.3
6-14 years*	3.5	0.1	38.7	1.2
15-19 years	6.2	0.1	110.2	2.3
35-44 years	8.3	0.1	161.9	1.9
55 years or older	6.7	0.1	131.2	2.7

*Includes an adjustment for prophylaxis

Patient Burden of Care:

Dental disease, and consequently the need for dental treatment, is unevenly distributed within the population – some individuals experience no disease while others experience a large amount of disease. The more treatment needs a person has, the more they will need to return to the clinic for dental care. Multiple visits to the dental clinic entail personal costs for both the patient and their family.

In order to estimate a patient's burden of care for the completion of dental treatment, service minutes of treatment need were categorized according to the number of visits a person might expect in order to complete the treatment. **Table 6.3** shows the percentage of AI/AN dental patients by categories of visits needed. The number of dental visits needed to complete treatment is partially dependent on the patient's age and mix of services. For example, preschool children need more visits to complete care because they are unable to sit for prolonged periods of time.

Table 6.3

Service Minutes of Treatment Need by Age Group

Visits Required	Percent of Population with Service Minutes (SM) of Treatment Need									
	2-5 Years		6-14 Years		15-19 Years		35-44 Years		55+ Years	
	SM	%	SM	%	SM	%	SM	%	SM	%
1-2	0-59	34.7	0-119	34.9	0-119	14.2	0-179	10.8	0-179	24.4
2-3	60-119	10.5	120-179	30.5	120-239	28.0	180-359	17.1	180-359	17.8
> 3 routine	120-179	18.9	180+	34.6	240-359	25.5	360-588	26.8	360-599	36.9
> 4 complex	180+	35.9			360+	32.2	600+	45.3	600+	20.8

When the number of dental visits is estimated from service minute need, almost 36 percent of preschool children need more than three dental visits to meet their need for treatment (> 120 service minutes) while 35 percent of children 6-14 years of age need multiple visits for fillings and preventive services (> 180 service minutes). For the adolescents 15-19 years of age, 28 percent have a moderate amount of treatment needs (120-239 service minutes) requiring two to three visits to the dental clinic for fillings and preventive services while 30 percent of adolescents have extensive treatment needs that would require more than three visits (> 360 service minutes).

Most of the AI/AN adults examined had significant treatment needs. More than two thirds of adults had complex treatment needs that would require more than three or four visits to the dental clinic. In addition, 45 percent of the adults needed more than four visits because of extensive and complicated treatment needs. As with the adults, most of the elders examined also had substantial treatment needs. More than one third of the elders had complex treatment needs requiring more than three or four visits to the dental clinic while almost 21 percent had extensive and complex treatment needs that would take many visits to complete dental care.

SUMMARY AND RECOMMENDATIONS

The results of the 1999 Oral Health Survey indicate that, regardless of age, oral disease is a significant health problem for American Indians and Alaska Natives. Dental decay starts at a very young age (2-5 years) and continues throughout life. Periodontal disease becomes evident during adolescence and increases in prevalence with age. In order to address these problems, significant steps must be taken to prevent and treat oral disease. Because disease prevalence along with prevention and treatment strategies are age specific, recommendations by life stages are presented.

PRESCHOOL CHILDREN

Very young AI/AN children experience tooth decay and do not have adequate access to preventive and restorative dental treatment. To make the problem worse, decay rates in this youngest age group have increased significantly in the last nine years. Because tooth decay begins early and is severe among young Indian children, it affects their oral health for a lifetime.

Recommendations for Prevention Programs

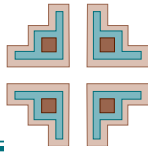
- Encourage communities and tribal utilities to fluoridate their water supplies in order to reduce the rates of dental disease among AI/AN populations.
- Develop and target preventive interventions for children beginning at approximately 6-months of age including, but not limited to, use of fluoridated toothpaste and fluoride varnishes.
- Encourage the use of dental sealants in children ages 2-5 years, behavior permitting.

Recommendations for Access to Dental Care

- Encourage the first dental visit at age one.
- Incorporate caries risk assessments into all preventive as well as restorative treatment plans.
- Increase the number of dental providers who are comprehensively trained and comfortable treating very young children.
- Increase the number of dental providers (dentists, dental hygienists, and dental assistants) that can provide preventive and restorative services.
- Increase enrollment of eligible families into publicly financed programs such as Medicaid and State Children's Health Insurance Program (SCHIP) and utilize third party reimbursement to contract for more dental providers.

Recommendations for Collaboration with and Education of Health Care Providers

- Encourage health care providers who see very young children to assess the oral health of infants and toddlers, provide education to the parents or caregivers, and refer children in need to the dental clinic.
- Provide training to health care providers on appropriate dental screening techniques and referrals.
- Train health care providers to provide oral health educational messages and apply fluoride varnishes to high-risk children.
- Assure that medical care providers appropriately prescribe fluoride supplements.
- Work with nutritionists and WIC program staff to help educate families and individuals about the relationship of dental decay and sugars.
- Collaborate with Head Start and Early Head Start and day care programs to educate families and staff about the importance of oral health and primary prevention and access to care.



Recommendations for Education of Parents, Caregivers, and the Community

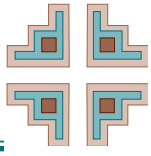
- Develop and implement education and intervention programs for mothers beginning with prenatal care since the bacteria that cause tooth decay are usually transmitted from the mother to the child at about age one.
- Educate community members, administrative and program staff, and tribal health boards and advocacy groups about the oral health of very young children.
- Teach parents and caregivers to brush their children's teeth daily.
- Encourage parents and caregivers to reduce their child's sugar consumption in bottles, tippy cups, foods, and beverages.
- Teach parents and caregivers to be aware of early signs of dental decay – white or brown spots and to seek dental care.
- Educate community members, tribal health boards, and other advocacy and policy groups about the prevention of dental disease in very young children.

Recommendations for Advocacy

- Share information with the U.S. Congress, foundations, and advocacy groups about the tremendous oral health disparities that exist between Indian people and the general U.S. population. Develop partnerships to address these health disparities.
- Educate tribal leaders about the oral health needs of Indian people and encourage their advocacy efforts with the Congress and other organizations and agencies.

Recommendations for Research

- Identify characteristics of AI/AN preschool children that contribute to the high prevalence of tooth decay and test and evaluate programs to reduce the incidence and severity of tooth decay in this age group.



ELEMENTARY AND MIDDLE SCHOOL CHILDREN

The prevalence and severity of tooth decay increases with age and older children also have inadequate access to preventive and restorative dental treatment. Although a large proportion of AI/AN children have dental sealants, not all children have access to this valuable service. Preventing tooth decay in this age group is extremely important because the permanent teeth that erupt at age six are meant to last a lifetime. Tobacco use also starts to increase among middle school children – putting these children at risk of periodontal disease, cancer, and heart disease in later life.

Recommendations for Prevention Programs

- Encourage communities and tribal utilities to fluoridate their water supplies in order to reduce the rates of dental disease among AI/AN populations.
- Encourage schools to implement fluoride programs that include daily brushing with a fluoridated toothpaste, or weekly fluoride rinses in areas without a fluoridated water supply.
- Implement and evaluate school-linked and school-based sealant programs in both elementary and middle schools.
- Implement and evaluate tobacco education programs in elementary and middle schools to prevent initiation of habitual tobacco use.

Recommendations for Access to Dental Care

- Increase enrollment of eligible families into publicly financed programs such as Medicaid and State Children's Health Insurance Program (SCHIIP) and utilize third party reimbursement to contract for more dental providers.
- Increase the number of dental providers (dentists, dental hygienists, and dental assistants) that can supply preventive and restorative services.
- Recruit and train non-dental personnel, such as Community Health Representatives, to assist in the placement of sealants.

Recommendations for Collaboration with and Education of Health Care Providers

- Provide training to health care providers on appropriate screening techniques and referrals.
- Train health care providers to provide educational messages and apply fluoride varnishes to high-risk children.
- Work with nutritionists to help educate families and individuals about the relationship of dental decay and sugars.

Recommendations for Education of Children, Parents, and the Community

- Encourage children and parents to practice preventive hygiene procedures including daily brushing with fluoridated toothpaste.
- Encourage children and parents to limit consumption of foods and beverages containing sugar.
- Educate community members, administrative and program staff, and tribal health and advocacy groups about the oral health of children.

Recommendations for Advocacy

- Share information with the U.S. Congress, foundations, and advocacy groups about the tremendous oral health disparities that exist between Indian people and the general U.S. population. Develop partnerships to address these health disparities.
- Educate tribal leaders about the oral health needs of Indian people and encourage their advocacy efforts with the Congress and other organizations and agencies.

Recommendations for Tobacco Use

- Establish tobacco use cessation programs for young adolescents.
- Raise awareness of community and tribal health leaders about the harmful effects of habitual tobacco use.
- Establish school tobacco-free policies.

Recommendations for Research

- Identify characteristics of AI/AN children that contribute to the high prevalence of tooth decay and test and evaluate programs to reduce the incidence of tooth decay in this age group.

ADOLESCENTS

American Indian and Alaska Native adolescents are a high-risk group for dental decay and most are likely to have experienced tooth decay by the time they reach their late teenage years. Since the prevalence of tooth decay continues to increase with age, some adolescents do not develop decay until their later teenage years. Access to restorative dental care continues to be a problem with 68 percent of the adolescents having untreated tooth decay. Even though a high proportion of adolescents have had access to caries prevention services (64% had at least one dental sealant), there remain a significant number of children who do not receive preventive services or who do not receive adequate preventive services. For example, those adolescents that had sealants averaged only fours sealants when there are eight eligible molars. Periodontal disease begins in adolescence. For a small number of individuals, gum disease may advance rapidly during their teenage years. Because of habitual tobacco use, a significant proportion of adolescents are at risk for developing severe periodontal disease, cancer, and heart disease later in life. People who begin smoking early in life have the highest risk of developing smoking related oral disease.

Recommendations for Prevention Programs

- Encourage communities and tribal utilities to fluoridate their water supplies in order to reduce the rates of dental disease among AI/AN populations.
- Implement caries prevention programs specifically for adolescents.
- Assess all adolescents for both caries and periodontal disease risk. Provide all adolescents at risk with preventive services such as topical fluorides, sealants and periodontal maintenance.
- Collaborate with middle schools and high schools to improve access to preventive services for adolescents.

Recommendations for Access to Dental Care

- Increase enrollment of eligible families into publicly financed programs such as Medicaid and State Children's Health Insurance Program (SCHIP) and utilize third party reimbursement to contract for more dental providers.
- Collaborate with middle schools and high schools to improve access to treatment services.
- Use auxiliary personnel such as dental hygienists and expanded functions dental assistants to improve the efficiency of the delivery of dental services.
- Provide adolescents and young adults (age<35 years) with advanced periodontal disease special access to dental clinics, aggressive periodontal therapy, and routine recall appointments.
- Increase the number of dental providers (dentists, dental hygienists, and dental assistants) that can supply preventive and restorative services.

Recommendations for Collaboration with and Education of Health Care Providers

- Provide training to health care providers on appropriate screening techniques and referrals.
- Train health care providers to provide educational messages and apply fluoride varnishes to high-risk adolescents.

Recommendations for Education of Adolescents and the Community

- Encourage adolescents to practice preventive hygiene procedures including daily brushing with fluoridated toothpaste.
- Encourage adolescents to reduce their consumption of foods and beverages that contain sugar.
- Educate community members, administrative and program staff, and tribal health and advocacy groups about the oral health of adolescents.

Recommendations for Advocacy

- Share information with the U.S. Congress, foundations, and advocacy groups about the tremendous oral health disparities that exist between Indian people and the general U.S. population. Develop partnerships to address these health disparities.
- Educate tribal leaders about the oral health needs of Indian people and encourage their advocacy efforts with the Congress and other organizations and agencies.

Recommendations for Tobacco Use

- Establish a tobacco control program for adolescents and children.
- Implement community-based smoking prevention and smoking cessation initiatives targeted to adolescents and children.
- Support legal and regulatory action to reduce tobacco sales to minors.

Recommendations for Research

- Identify characteristics of AI/AN adolescents that contribute to the high prevalence of tooth decay and test and evaluate programs to reduce the incidence and severity of tooth decay in this age group.
- Evaluate the prevalence and distribution of Localized Juvenile Periodontitis in AI/AN adolescents.

ADULTS

AI/AN adults continue to experience tooth decay. In addition to tooth decay, periodontal disease prevalence and severity increases with age and advanced periodontal disease is relatively common among AI/AN adults. Because of tooth loss, plus a considerable burden of untreated decay and periodontal disease, AI/AN adults have complex dental treatment needs that require many different types of dental services to restore the dentition to a healthy, functional state. A small but significant number of adults, however, are able to maintain a healthy dentition with 17 percent of those examined having no untreated decay or periodontal disease. Even though a large percentage of adults have periodontal disease, an unexpectedly small proportion of adults have root caries. There may be environmental and behavioral factors that are protecting this population against root caries. Adults with diabetes are at a higher risk for both advanced periodontal disease and tooth loss when compared to those without diabetes. In addition, tobacco use (particularly smoking) significantly increases the risk of advanced periodontal disease and tooth loss as well as cancer and heart disease.

Recommendations for Prevention Programs

- Encourage communities and tribal utilities to fluoridate their water supplies in order to reduce the rates of dental disease among AI/AN populations.
- Provide comprehensive preventive dental services to all adult dental patients, including topical fluorides, oral hygiene education, dietary counseling, and preventive sealants.
- Establish recall and maintenance programs for adults at high risk of dental caries and periodontal disease.
- Test and evaluate community-based interventions to reduce the incidence of tooth decay and to improve access to dental care in this age group.

Recommendations for Access to Dental Care

- Increase the number of dental providers (dentists, dental hygienists, and dental assistants) that can supply preventive and restorative services.
- Enhance access to specialty care such as partial and full dentures.
- Provide comprehensive restorative and rehabilitative treatment services for adults.
- Assure that high-risk periodontal patients receive special access to dental clinics.
- Provide individuals with diabetes special access to dental clinics and appropriate treatment and routine follow-up. Develop programs to identify and evaluate the periodontal status of all AI/ANs with diabetes.

Recommendations for Collaboration with and Education of Health Care Providers

- Collaborate with diabetes programs to assure that all patients with diabetes have annual oral health examinations.

Recommendations for Education of Patients and the Community

- Encourage all adults to visit the dental clinic each year to have their oral health status evaluated.

Recommendations for Advocacy

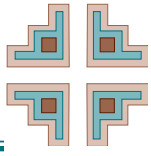
- Share information with the U.S. Congress, foundations, and advocacy groups about the tremendous oral health disparities that exist between Indian people and the general U.S. population. Develop partnerships to address these health disparities.
- Educate tribal leaders about the oral health needs of Indian people and encourage their advocacy efforts with the Congress and other organizations and agencies.

Recommendations for Tobacco Use

- Dental departments should join other health educators in educating and encouraging smokers to stop and non-smokers not to start. Smoking is a universal health hazard and has a dramatic, detrimental effect on periodontal health.
- Develop and refer smokers to smoking cessation programs.

Recommendations for Research

- Identify characteristics of American Indian adults that contribute to the maintenance of good oral health.
- Test and evaluate interventions to facilitate good oral health of adults.
- Identify characteristics of American Indian adults that contribute to the absence of root caries in susceptible individuals.
- Investigate the use of trained expanded function auxiliaries in the fabrication of complete removable prosthodontics (dentures).



ELDERLY

A high proportion of the elderly population has conditions that compromise their ability to chew food. Sixteen percent of the edentulous elderly have no dentures and an additional four percent are missing an upper or lower denture. In addition, a quarter of the elderly have less than 12 teeth. The elderly are susceptible to health problems associated with diet and nutrition, and having a poor dentition puts them at even greater risk. As with younger age groups, AI/AN elders are a high-risk group for dental caries. Because of tooth loss, plus a considerable burden of untreated decay and periodontal disease, AI/AN elders have complex dental treatment needs that require many different types of dental services to restore the dentition to a healthy, functional state. As with the younger adults, there appear to be environmental and behavioral factors that are protecting this population against root caries. In addition to decay, elders suffer from a higher prevalence and severity of advanced periodontal disease that results in tooth loss. Elders with diabetes are at a higher risk for both advanced periodontal disease and tooth loss when compared to those without diabetes. Tobacco use (mainly smoking) significantly increases the risk of advanced periodontal disease and tooth loss.

Recommendations for Prevention Programs

- ❖ Encourage communities and tribal utilities to fluoridate their water supplies in order to reduce the rates of dental disease among AI/AN populations.
- ❖ Provide comprehensive preventive dental services to high-risk elder dental patients, including topical fluorides, oral hygiene education, dietary counseling, and periodontal maintenance.
- ❖ Establish recall and maintenance programs for elders at high risk of dental caries and periodontal disease.

Recommendations for Access to Dental Care

- ❖ Increase the number of dental providers (dentists, dental hygienists, and dental assistants) that can supply preventive and restorative services.
- ❖ Provide training for dental clinicians in geriatric oral health.
- ❖ High-risk periodontal patients should receive special access to dental clinics.

- Provide special access to dental clinics to individuals with diabetes. Develop programs to identify and evaluate the periodontal status of diabetic patients. Provide diabetics with periodontal disease appropriate treatment and routine follow-up.
- Assure denture services for elders, especially those with diabetes. Tooth loss is such an important health issue, particularly for elders and those with diabetes, that denture services should be insured for these special target groups.
- Pursue referrals for contracted services if clinical programs are unable to provide services to elders due to lack of resources.

Recommendations for Collaboration with and Education of Health Care Providers

- Improve access to dental treatment through health center-based referral programs and community education.
- Collaborate with diabetes programs to assure that all diabetics have annual oral health examinations.

Recommendations for Education of Patients and the Community

- Improve access to dental treatment through community outreach, screening and referral targeting the elderly.
- Encourage all elders with and without teeth to visit the dental clinic each year to have their oral health status evaluated.

Recommendations for Advocacy

- Share information with the U.S. Congress, foundations, and advocacy groups about the tremendous oral health disparities that exist between Indian people and the general U.S. population. Develop partnerships to address these health disparities.
- Educate tribal leaders about the oral health needs of Indian people and encourage their advocacy efforts with the Congress and other organizations and agencies.

Recommendations for Tobacco Use

- Dental departments should join other health educators in educating and encouraging smokers to stop and non-smokers not to start. Smoking is a universal health hazard, and has such a dramatic, detrimental effect on periodontal health.

Recommendations for Research

- Identify characteristics of American Indian elders that contribute to the maintenance of good oral health.
- Test and evaluate interventions to facilitate good oral health of elders.
- Identify characteristics of AI/AN elders that contribute to the absence of root caries in susceptible individuals.
- Investigate the use of trained expanded function auxiliaries in the fabrication of complete removable prosthodontics (dentures).

GLOSSARY

Advanced Periodontal Disease: For the purpose of this report, a person has advanced periodontal disease when at least one of the six sextant scores of the CPITN index is four. This means that at least one sextant has a periodontal pocket > 5.5 mm.

Anterior Teeth (Incisors): The four front or biting teeth.

Caries Experience or Caries History: The sum of all tooth decay a person has experienced during a lifetime. This includes teeth with fillings, unfilled cavities, and teeth missing because of tooth decay.

Dental Caries (Tooth Decay, Dental Decay or Cavities): An infectious disease that results in demineralization of the tooth surface and ultimately cavitation (a hole) of the tooth if not controlled or remineralized. Dental decay may be either treated (filled) or untreated (unfilled). For the purpose of this survey, remineralized dental decay is scored as no decay.

Dental Sealant: A dental sealant is a plastic coating that is bonded to the chewing surfaces of the back teeth. The sealant acts as a barrier, protecting the tooth from the bacteria and acids that cause decay.

Dental Fluorosis: A condition caused from ingesting high levels of fluoride during the development of the teeth.

Dentate: People are considered to be dentate if they have at least one natural tooth.

Early Childhood Caries: Dental decay of the primary teeth of infants and young children (aged 1 to 5 years) often characterized by rapid destruction of tooth structure. Also known as Baby Bottle Tooth Decay or Nursing Caries.

Early Periodontal Disease: For the purpose of this report, a person has early periodontal disease when at least one of six sextants has a CPITN score of three. This means that at least one sextant has a periodontal pocket 3.5-5.5 mm and there are no periodontal pockets greater than 5.5 mm.

Edentulism (Edentulous): A person is considered to be edentulous if they do not have any natural teeth.

Fluoride: A compound of the element fluorine. Fluorine, the 13th most abundant element in nature, is used in a variety of ways to reduce dental decay.

Gingivitis: An infectious disease that causes inflammation of the gum tissue often characterized by gums that bleed easily.

Incisors (Anterior Teeth): The four front or biting teeth.

Loss of Attachment: The teeth are supported in the jaw by ligaments and bone. Loss of attachment means that some of the supporting structure has been lost because of periodontal disease. Loss of attachment is measured in millimeters.

NHANES III: The Third National Health and Nutrition Examination Survey. NHANES III was conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics between 1988-1994. It used a national multistage probability sample of the U.S. civilian non-institutionalized population to collect information on the national prevalence of, trends in, and risk factors for selected diseases. Data were collected from participants through face-to-face interviews, physical and dental examinations, and laboratory tests.

Periodontal Disease: A group of diseases caused by bacterial infections and resulting in inflammatory responses and destruction of the soft tissues and bone that support the teeth. Periodontal disease is a broad term encompassing several diseases of the gums and tissues supporting the teeth.

Posterior Teeth: The back or chewing teeth.

Root Caries: Dental decay that occurs on the root portion of a tooth. In this survey, root caries was only evaluated in individuals whose gums had receded and exposed the root surface.

Appendix A

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Appendix B

ORAL HEALTH SURVEY EXAMINATION PROTOCOL

Patient Selection: The basic objective of sampling for this survey was to examine a cross-section of selected dental patients during a sufficient period of time to obtain data from enough patients to make comparisons of oral health status and needs between the Areas. The total sample size for each Area was generally not large enough for precise comparisons among local programs. However, some local programs over sampled in order to have enough data for their own use.

The age groups selected to participate in the survey were: 2-5 years; 6-14 years; 15-19 years; 35-44 years; and 55+ years. The age groups were limited to those addressed in the Year 2000 and 2010 Oral Health Objectives and the Government Performance and Results Act (GPRA).

The survey protocol required that all patients who presented at the examining facility at the time data collection began be examined until the minimum sample for each age group was met. This included both emergency (walk-in) patients and appointed patients currently in therapy. For patients who were in therapy, all oral status data were coded as they existed at the time the survey exam was conducted.

Survey examinations were conducted and recorded prior to any other oral examination that may have been needed for dental treatment. For emergency patients, the exam was conducted after addressing the patient's emergent needs. Examiners were instructed to try to examine every other patient or every third patient on very busy days, rather than exclude these patients from the sample population. It was permissible to examine a group of patients if these patients were participants in an ongoing screening and referral program conducted by the local dental program. However, the examination protocol was followed in such instances.

Examination Procedures: Hard and soft tissues examinations were completed in the same sequence whenever possible. A mounted dental light (not a headlamp or sunlight) was used. Transillumination by external light source was permissible. For

this survey, dental radiographs were not used. Front-surface mirrors were used but an explorer was not used. An air syringe could be used to dry the teeth prior to making the diagnosis. WHO disposable plastic probes and special NIDR metal periodontal probes were used for assessing periodontal status.

The sequence of the clinical examination and scoring for each patient was as follows: (1) oral pathology status, (2) oral prosthetic appliance status, (3) edentulism in either or both arches, (4) fluorosis status, (5) root caries, (6) dental caries status of permanent and/or primary teeth, and (7) periodontal status.

Health Factors: Information on health factors was collected on all patients.

Tobacco Use – A user was defined as a person who has used tobacco products at least once in the past 30 days. If the patient responded "yes" to the question on tobacco use a series of questions about the type of tobacco used, frequency of use, amount used and duration were asked.

Diabetes – The patient was asked if they have diabetes. If the answer was "yes," the medical history was searched to determine the date of diagnosis. If the medical record was not available, the patient was asked the year of diagnosis. Diabetic control was assessed by one or more of three measures: Hemoglobin A1c, mean blood sugar, and the most recent fasting blood sugar (FBS) from the last 12 months.

Oral Pathology Status: An examination of the oral mucosa was performed for all patients included in the survey. The only pathology recorded in this survey was the presence of suspicious lesions that required biopsy and/or follow-up.

Oral Prosthetic Appliance Status: This section was for patients 15 years or older. The examiner determined if the patient possesses and wears a complete and/or partial denture. If a removable appliance was not being worn at the time of the examination, the examiner may review the patient's chart and query the patient to make this assessment.

Edentulism By Arch: A check mark was placed beside the appropriate arch if the person being examined was fully edentulous (no remaining teeth) in either or both arches.

Fluorosis In Permanent Teeth: The permanent dentition of patients between 6-14 years were examined to determine the presence or absence of fluorosis. Permanent teeth that were not fully erupted, teeth in which more than one half of the visible surface was obscured by a restoration, caries, or an orthodontic appliance, were excluded from the fluorosis assessment. In this survey, Dean's Index was used. Each tooth was examined and assigned to one of six categories according to its degree of fluorosis. Classification of a person was based on the two teeth most affected by fluorosis. If the two teeth were not equally affected, the classification given was that of the less involved tooth. Both the lingual and labial surfaces of the teeth were evaluated. The teeth were not air-dried before scoring.

Root Caries: The prevalence of root surface caries was measured in this survey. Each person was assessed for the presence of root caries. The number and location of root caries lesions was not recorded. Root caries was defined as any lesion that originated below the cemento-enamel junction (CEJ).

Dental Caries Examination: The dental caries examination was conducted on all patients having one or more teeth in the mouth. A tooth was considered erupted when any part of its crown projected through the gum. All visible surfaces of banded or bracketed teeth were examined and coded in the usual manner.

Coding Data For The Tooth Surface Caries Status:

The permanent and primary teeth were examined and coded in numeric order, starting with #1 (the right maxillary third molar) and continuing through the upper arch, then proceeding through the lower arch beginning with tooth #17 and finishing with tooth #32. Radiographs were not used during the caries diagnosis. Transillumination of interproximal surfaces was acceptable. The tooth surfaces were examined in this order: mesial, occlusal, distal, buccal/facial, and lingual. In anterior teeth the incisal surface was not coded for caries. The following criteria were used for scoring each tooth surface:

SOUND: Tooth surfaces showing no evidence of treated or untreated caries were considered to be sound. In this survey, arrested carious lesions were coded as sound if no active lesions were present.

DECAYED: If a tooth surface meets the criteria for carious lesions

in fissures, smooth areas, or interproximal surfaces, it was coded as decayed. Surfaces with lost restorations were coded as decayed, even in the absence of recurrent active decay.

FILLED: A surface was coded as filled when a permanent restoration was present as a result of dental caries and no active lesions were found on that surface. When a filling or a lesion on a posterior tooth or any anterior tooth extended beyond the line angle onto another surface, then the other surface was also coded as filled. A proximal filling on an anterior tooth was not considered to involve the adjacent lingual or labial surface unless it extended at least 1/3 of the distance to the opposite proximal surface.

Incisal edges of anterior teeth were not considered as separate surfaces. If a lesion or restoration was confined solely to the incisal edge, it was coded as involving the nearest adjacent surface.

Steel or plastic crowns on permanent teeth as a result of caries were considered temporary restorations and were coded as temporary. If the surface was restored for reasons other then caries, such as trauma, hypoplasia or malformation, it is coded as excluded and was not included in the caries data.

SEALED: When an adhesive fissure sealant was present in a pit and fissure, and if there was no evidence of caries, and there was no restoration present, that surfaces is coded as sealed. Sealants were coded for both primary and permanent tooth surfaces.

A sealant was coded as present when any part of the surface remained covered. If it appeared that the sealant material was used as part of a permanent restoration, the surface was scored as filled.

DECAYED AND FILLED: When a tooth surface had a restoration and there was decay present, it was coded as decayed and filled.

DECAYED AND SEALED: When a tooth surface had decay and a sealant, it was coded as decayed and sealed.

TEMPORARY FILLING: When a tooth surface had a temporary restoration due to caries, it was coded as having a temporary filling.

CROWN: A tooth with a full cast metal or porcelain fused to metal full coverage restoration due to dental caries was coded as crowned. If any surface had decay, that surface was coded as

decayed. Stainless steel or plastic crowns on primary teeth are coded as crowns. Inlays or onlays were coded as a filled restoration. If a surface on a crowned tooth was also decayed or filled, it was coded as decayed or filled.

EXCLUDED: Tooth surfaces with a restoration covering the entire surface and placed for reasons other than caries, i.e., crowns due to trauma, labial veneers to correct hypoplasia or malformation were considered excluded. If a tooth surface could not be assessed, i.e., banded, unerupted, those surfaces were also excluded. Hypoplastic tooth surfaces with caries were coded as decayed.

UNERUPTED: If the tooth was not in the space that it would normally fill, the tooth was considered unerupted. If a primary tooth was not present in the mixed dentition, its permanent successor is coded unerupted. If the examiner was not certain the tooth was actually missing, it is coded as unerupted. If it could be determined that the tooth was congenitally missing rather than unerupted, the tooth was scored as unerupted. This also applied to impacted teeth if their status was unknown.

MISSING DUE TO CARIES: Only teeth that were lost due to caries were coded as missing.

MISSING OTHER THAN CARIES: Teeth that were missing for reasons other than caries were coded as such. If the examiner was uncertain about the reason for tooth loss, it was coded as missing for reasons other than caries. All bicuspid teeth missing due to orthodontics were called 1st bicuspids and coded as missing for reasons other than caries.

MISSING DUE TO TRAUMA: If a tooth was missing due to trauma it was coded as such.

BRIDGE PONTIC: If a missing tooth had been replaced by a pontic, it is coded as a pontic. Abutments that were crowned solely for supporting the pontic were coded as excluded.

SCORING THE PRIMARY TEETH: Decayed or filled surfaces on primary teeth were coded in the same manner as permanent teeth, using the same criteria. Prior to the eruption of the first permanent molars the missing code was used to score missing primary teeth due to caries. If the examiner was uncertain as to the reason a primary tooth was not present in the mixed dentition, its permanent successor was coded as unerupted and the primary tooth data left blank.

Periodontal Status: A periodontal examination was completed on all patients 15 years and older. Prior to conducting the periodontal portion of the examination, the patient's health history was reviewed to assess the need for antibiotic prophylaxis. Following the guidelines of the American Heart Association, those individuals at high and moderate risk for heart infection were prescribed the appropriate antibiotic one hour before the periodontal exam. If this was not possible, the patient was excluded from the study.

Periodontal disease was assessed in two ways. First, each sextant of the mouth was scored using the Community Periodontal Index of Treatment Needs (CPITN) procedure. Secondly, loss of attachment and periodontal pocket depth were scored on two randomly selected quadrants, one maxillary and one mandibular following NIDCR protocols.

CPITN Procedure: All teeth in the sextant were scored. WHO disposable plastic probes were used. The highest score of all the teeth in the sextant was entered in the appropriate box beginning with the upper right sextant and proceeding to the lower left sextant. Third molars and partially erupted teeth were excluded. All sextants that contained one or more teeth were scored.

Periodontal Pocket Depth and Loss of Attachment: NIDR metal periodontal probes were provided to all sites to use for the periodontal examination. The examination was performed on two randomly selected quadrants one maxillary and one mandibular. A maximum number of 14 permanent teeth were eligible for assessment. Third molars were not assessed. Measurement was made at the mesiobuccal and mid-buccal sites of all fully erupted permanent teeth present in the two randomly selected quadrants.

Crevice or periodontal pocket depth (PPD) was measured in millimeters from the free gingival margin (FGM) to the base of the sulcus. Also, the distance in millimeters from the cemento-enamel junction (CEJ) to the free gingival margin (FGM/CEJ) was measured. When the crest of the gingiva was on the root surface, it was recorded as a positive number, i.e., + 3 mm. When the crest was on enamel; the measure of the FGM/CEJ was recorded as a negative number, i.e., -3 mm.

Patient Background Status: Date of birth and sex were collected from all patients. In addition, each patient was classified according to their usual type of dental care use – episodic or routine. Dental examiners were allowed to review the patient's dental record or query the patient to make this determination.

Episodic User – The patient episodically seeks dental care, mainly for the relief of symptoms and does not often seek follow-up for routine care.

Routine User – The patient seeks non-emergent dental care, principally not for the relief of oral pain or acute symptoms. This criterion included those patients routinely using IHS, tribal, urban clinics, and/or private dental clinics.

Sample Size Methodology: Sample size estimates were calculated using means and standard deviations from the 1991 Oral Health Survey. Margins of error of one and one-half surface or one-half tooth score in child age groups were deemed to be of programmatic importance at the area level, while margins of error of four surfaces or one tooth were judged to be adequate for adult age groups. A minimum of 200 complete and usable records of dentate patients were required to achieve estimates with these margins of error for each age group in each Area. For example, for children ages 2-5, a sample of 200 for a given area will allow one to estimate the true mean dmfs for that area within +/- 1.6 tooth surfaces. If the sample sizes are 200 for each of two areas, the detectable difference between these two areas is +/- 3.3 tooth surfaces. It was recommended that each area inflate the sample size of 200 to allow for the inevitability of lost, incomplete, or unreadable records.

Sample sizes for periodontal disease were based on estimated prevalence of 20% for patients less than 35 years old and 40% for patients 35 years old or older. These estimates were based on the 1991 Oral Health Survey. For example, with a sample size of 200 for ages < 35 years, the prevalence can be estimated within 6%. That is, the estimated true prevalence for the area would be between 14% and 26%. In comparing two areas, there is at least an 80% chance of finding a statistically significant difference if the true prevalence for one area is 20% and the true prevalence for the comparison area is ≤9% or ≥33%.

Appendix C

Appendix C – Table 1
Oral Health of Children 2-5 Years Stratified by IHS Area

Area	Number	Caries Free	Untreated Decay	Incisor dmft≥1	Incisor dmft≥2	Severe ECC	dmft	dmfs	ds/dmfs
		Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error
Aberdeen	498	21.8 2.1	67.6 2.4	45.3 2.5	35.6 2.4	55.6 2.5	5.44 0.24	13.45 0.84	0.68 0.02
Alaska	232	22.6 3.6	62.2 4.3	52.2 4.4	47.4 4.4	59.7 4.4	5.17 0.39	13.27 1.27	0.60 0.04
Albuquerque	197	18.0 3.4	72.7 3.8	62.0 4.1	52.6 4.2	69.5 3.9	6.14 0.40	15.89 1.34	0.68 0.04
Bemidji	144	37.7 4.1	49.0 4.3	28.8 3.9	20.8 3.5	36.2 4.1	3.26 0.33	7.14 0.94	0.61 0.05
Billings	217	12.7 2.2	80.8 2.7	56.6 3.7	46.8 3.8	62.9 3.6	6.20 0.32	13.49 1.06	0.71 0.03
California	199	37.1 4.1	60.0 4.1	36.9 3.7	32.8 3.6	45.2 4.0	3.41 0.27	6.62 0.62	0.70 0.03
Nashville	136	20.3 4.0	64.1 5.5	51.4 6.8	42.6 6.1	68.3 5.1	5.89 0.38	14.80 1.30	0.63 0.04
Navajo	208	9.3 2.2	82.9 2.8	72.1 3.3	65.1 3.6	77.6 .1	7.45 0.34	19.02 1.15	0.67 0.03
Oklahoma	202	34.7 4.0	51.3 4.3	30.2 3.9	25.1 3.7	36.3 4.1	3.83 0.36	9.92 1.18	0.54 0.04
Phoenix	213	15.0 3.1	72.7 3.9	60.3 4.3	53.3 4.3	70.1 4.1	6.86 0.41	18.26 1.41	0.65 0.04
Portland	274	22.1 2.9	65.7 3.4	50.8 3.5	47.7 3.5	55.8 3.5	5.34 0.32	12.45 0.97	0.65 0.03
Tucson	143	18.5 3.0	76.2 3.3	58.0 3.9	47.9 4.0	65.6 3.7	5.12 0.32	9.82 0.84	0.76 0.03
Total IHS	2,663	20.7 1.2	68.2 1.4	52.9 1.4	46.2 1.4	60.2 1.4	5.72 0.14	14.43 0.45	0.64 0.01

Appendix C – Table 2

Oral Health of Children 6-14 Years Stratified by IHS Area

Area	Number	Caries Free Permanent Teeth	Untreated Decay Permanent Teeth	dmft	dmfs	ds/dmfs	DMFT	DMFS	DS/DMFS
		Percent Standard Error	Percent Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error
Aberdeen	578	35.5 2.2	54.0 2.3	3.76 0.17	10.05 0.57	0.42 0.02	2.58 0.14	4.12 0.28	0.61 0.02
Alaska	304	35.1 3.3	44.4 3.5	4.50 0.31	12.79 1.02	0.27 0.03	2.60 0.28	4.56 0.55	0.47 0.04
Albuquerque	220	38.4 5.2	52.7 5.9	4.51 0.42	12.44 1.35	0.38 0.04	2.02 0.26	3.18 0.42	0.55 0.07
Bemidji	356	42.8 2.8	34.3 2.7	3.03 0.20	8.18 0.70	0.30 0.03	1.63 0.11	2.63 0.20	0.44 0.03
Billings	363	39.1 2.9	44.0 2.9	4.63 0.26	13.61 0.99	0.40 0.03	2.27 0.18	3.65 0.31	0.55 0.03
California	682	44.8 2.9	30.8 2.5	3.66 0.18	8.30 0.49	0.34 0.03	1.77 0.12	2.76 0.21	0.41 0.04
Nashville	284	37.6 4.9	46.5 4.2	5.22 0.78	14.55 1.85	0.33 0.05	2.03 0.21	3.04 0.32	0.61 0.03
Navajo	217	35.3 3.4	51.3 3.6	6.03 0.38	17.61 1.28	0.35 0.03	2.14 0.20	3.26 0.33	0.64 0.04
Oklahoma	202	34.7 4.0	44.4 4.3	3.45 0.29	10.02 1.01	0.37 0.04	1.96 0.22	3.28 0.52	0.47 0.05
Phoenix	249	35.3 3.7	44.3 3.9	4.80 0.36	14.29 1.28	0.40 0.04	2.32 0.23	3.90 0.43	0.49 0.04
Portland	322	35.9 3.0	49.7 3.1	4.42 0.27	13.20 1.00	0.31 0.03	2.01 0.14	3.33 0.27	0.56 0.03
Tucson	293	27.9 2.6	21.6 2.3	3.74 0.21	10.67 0.78	0.16 0.02	2.34 0.13	3.75 0.21	0.15 0.02
Total IHS	4070	36.1 1.3	46.5 1.4	4.51 0.12	12.90 0.42	0.35 0.01	2.17 0.08	3.52 0.15	0.53 0.02

Appendix C – Table 3

Oral Health of Adolescents 15-19 Years Stratified by IHS Area

Area	Number	Caries Free Permanent Teeth	Untreated Decay Permanent Teeth	DMFT	DMFS	DS/DMFS	Tobacco	CPITN≥3	CPITN≥4
		Percent Standard Error	Percent Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error
Aberdeen	238	4.7 2.2	80.9 3.1	7.96 0.38	14.21 0.87	0.47 0.02	49.4 3.9	13.3 2.8	1.1 0.6
Alaska	216	11.5 3.4	56.7 4.8	6.63 0.48	12.44 1.11	0.28 0.03	31.0 4.4	9.2 2.9	0.2 0.2
Albuquerque	160	10.9 3.0	66.7 4.5	5.5 0.36	10.19 0.89	0.40 0.03	22.0 3.8	25.1 3.8	3.2 1.6
Bemidji	144	12.2 2.8	54.2 4.2	5.51 0.41	10.15 1.07	0.25 0.03	41.9 4.1	2.8 1.4	0.0 0.0
Billings	194	4.2 1.4	78.4 2.9	7.84 0.37	15.18 1.05	0.43 0.02	29.7 3.4	24.5 3.1	0.6 0.6
California	210	13.6 3.2	54.1 4.4	6.78 0.60	12.38 1.48	0.31 0.03	21.0 4.0	19.9 3.2	1.4 0.7
Nashville	74	2.3 1.6	67.5 8.5	6.72 0.76	12.07 1.56	0.32 0.07	13.4 3.9	23.8 8.8	0.0 0.0
Navajo	202	6.8 1.9	76.7 3.1	6.37 0.32	11.53 0.76	0.49 0.03	9.5 2.1	27.5 3.2	5.6 1.7
Oklahoma	196	10.1 2.5	63.9 4.0	6.33 0.39	12.55 1.06	0.38 0.03	19.1 3.1	19.7 3.2	0.4 0.4
Phoenix	210	12.2 2.7	64.2 3.7	7.30 0.40	14.61 1.00	0.34 0.03	21.2 3.2	25.0 3.4	3.0 1.3
Portland	217	8.5 1.9	65.3 3.4	6.70 0.36	12.19 0.84	0.34 0.03	26.2 3.2	7.0 1.8	0.3 0.3
Total IHS	2,061	8.9 0.9	68.1 1.4	6.64 0.14	12.48 0.35	0.40 0.01	22.6 1.1	20.1 1.2	2.2 0.5

Appendix C – Table 4A

Oral Health of ALL Adults 35-44 Years Stratified by IHS Area

Area	Number	Use Tobacco	Have Diabetes	Have 28 Teeth	Have 20 Teeth	Have No Teeth
		Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error
Aberdeen	210	55.7 5.6	4.5 1.3	14.9 2.9	73.3 7.6	3.5 1.5
Alaska	205	51.3 4.7	4.8 2.5	24.5 4.2	81.1 3.4	1.1 0.6
Albuquerque	135	23.6 4.2	11.4 2.8	19.9 4.1	91.5 2.9	1.0 1.0
Bemidji	130	65.6 4.6	7.5 2.6	25.1 4.0	87.8 3.0	2.5 1.4
Billings	194	40.1 3.8	16.5 3.0	21.3 3.1	82.9 3.0	1.8 1.1
California	277	35.8 3.9	9.3 2.7	22.8 3.5	86.3 3.4	0.3 0.2
Nashville	68	52.2 11.5	21.4 9.2	17.9 9.5	76.3 10.6	0.9 0.9
Navajo	200	16.3 2.9	10.4 2.3	25.1 3.1	94.8 1.8	0.8 0.6
Oklahoma	178	49.9 4.4	13.2 3.2	16.4 3.2	81.1 3.2	6.8 1.8
Phoenix	213	29.7 3.7	16.2 3.1	21.5 3.3	92.0 1.9	0.6 0.5
Portland	211	47.5 4.4	8.5 3.0	30.6 4.3	87.4 2.9	2.6 2.3
Total IHS	2,021	37.8 1.5	10.8 1.0	21.6 1.3	86.4 1.2	2.4 0.4

Appendix C – Table 4B

Oral Health of DENTATE Adults 35-44 Years Stratified by IHS Area

Area	Number	Untreated Decay	DMFT	DMFS	DS/DMFS	CPITN≥3	CPITN≥4	PPD≥6 mm	LOA≥5 mm
		Percent Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error
Aberdeen	203	70.3 4.6	15.37 0.57	42.93 3.14	0.13 0.01	57.5 5.5	33.7 7.4	17.2 3.3	28.2 4.4
Alaska	201	50.8 4.7	16.59 0.48	49.68 2.20	0.06 0.01	45.1 5.2	11.1 3.2	9.2 3.3	37.4 5.9
Albuquerque	134	64.0 4.9	12.51 0.50	33.00 1.92	0.14 0.03	64.8 4.9	26.8 4.8	22.2 4.7	33.2 5.0
Bemidji	127	65.3 4.4	14.00 0.50	38.88 2.17	0.12 0.02	48.0 4.7	20.1 3.5	17.5 3.5	36.8 4.5
Billings	191	72.9 3.5	15.80 0.43	44.72 1.81	0.12 0.01	60.9 3.8	14.8 2.8	25.0 3.5	43.2 3.9
California	275	61.8 4.2	14.97 0.47	43.69 2.18	0.10 0.02	50.6 4.3	17.4 3.1	11.5 3.1	33.6 4.1
Nashville	67	68.7 10.8	16.90 0.70	47.60 3.84	0.08 0.02	65.2 11.3	43.1 11.7	8.8 3.3	18.9 8.7
Navajo	198	74.0 3.3	13.01 0.33	34.37 1.32	0.15 0.01	60.5 3.6	24.9 3.2	20.0 3.0	33.5 3.5
Oklahoma	162	69.3 4.4	13.74 0.58	39.74 2.17	0.17 0.02	69.2 4.2	25.4 4.2	12.8 2.9	34.1 4.4
Phoenix	211	74.9 3.6	14.65 0.44	39.82 1.83	0.13 0.01	67.3 3.7	25.8 3.6	15.4 2.9	19.7 3.2
Portland	209	56.1 4.4	16.63 0.51	48.24 2.25	0.07 0.01	34.2 4.1	7.0 2.6	11.6 2.8	26.5 3.8
Total IHS	1,978	67.6 1.5	14.40 0.17	40.30 0.71	0.13 0.01	59.3 1.5	23.0 1.5	16.2 1.2	31.7 1.5

Appendix C – Table 5A

Oral Health of ALL Elders 55 Years or Older Stratified by IHS Area

Area	Number	Use Tobacco	Have Diabetes	Have 28 Teeth	Have 20 Teeth	Have NoTeeth
		Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error
Aberdeen	234	31.0 3.9	31.7 3.9	0.3 0.3	17.5 3.0	39.7 4.8
Alaska	203	28.7 5.2	9.3 2.2	1.4 0.8	28.4 5.2	26.3 4.0
Albuquerque	145	3.3 1.6	40.7 5.4	1.8 1.3	35.1 6.3	17.4 3.3
Bemidji	152	20.2 3.5	28.5 3.8	0.0 0.0	30.0 4.0	27.5 3.7
Billings	183	22.8 3.5	42.5 4.0	1.7 1.1	22.6 3.5	35.4 4.0
California	274	17.3 3.2	29.5 4.3	4.3 1.2	49.3 4.5	10.4 3.3
Nashville	46	26.4 8.7	63.0 11.2	4.2 4.2	39.6 11.4	32.5 11.4
Navajo	209	8.4 2.3	35.0 3.7	3.2 1.4	39.2 3.8	11.7 2.2
Oklahoma	194	17.3 3.1	45.6 4.7	2.6 1.4	30.4 4.8	21.7 3.3
Phoenix	205	10.9 2.4	44.2 3.8	2.4 1.2	36.1 3.6	19.3 3.1
Portland	221	20.9 3.4	22.2 3.1	4.5 1.9	37.6 3.9	22.9 3.0
Total IHS	2,066	16.4 1.2	35.6 1.7	2.5 0.5	33.2 1.7	21.0 1.2

Appendix C – Table 5B

Oral Health of DENTATE Elders 55 Years or Older Stratified by IHS Area

Area	Number	Untreated Decay	DFT	DFS	DS/DFS	CPITN≥3	CPITN≥4	PPD≥6 mm	LOA≥5 mm
		Percent Standard Error	Mean Standard Error	Mean Standard Error	Mean Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error	Percent Standard Error
Aberdeen	154	63.4 4.8	7.19 0.50	18.00 1.42	0.32 0.04	58.4 5.0	29.0 4.5	19.0 3.9	56.9 4.9
Alaska	141	50.8 6.6	8.17 0.77	24.08 3.06	0.17 0.03	56.6 7.1	29.8 6.5	13.3 4.1	68.9 6.0
Albuquerque	107	46.8 6.6	7.78 0.61	20.24 1.62	0.14 0.03	67.4 6.0	15.6 4.3	10.9 3.7	54.7 6.8
Bemidji	107	28.9 4.5	9.35 0.57	27.46 2.07	0.11 0.02	56.4 5.3	22.8 4.5	17.3 4.4	61.3 5.1
Billings	124	61.3 5.0	8.97 0.57	26.46 2.02	0.24 0.03	58.4 5.1	20.6 4.4	23.7 4.7	53.1 5.2
California	251	38.3 4.4	10.26 0.49	31.04 1.88	0.08 0.01	66.6 4.2	32.1 4.7	19.8 4.5	60.4 4.2
Nashville	32	44.7 12.6	9.13 0.97	27.48 3.48	0.22 0.09	76.4 9.3	27.8 11.2	25.4 10.8	46.4 13.0
Navajo	180	76.6 3.5	8.83 0.41	22.80 1.35	0.32 0.03	64.0 4.1	33.1 4.1	20.8 3.4	56.5 4.2
Oklahoma	146	61.7 5.6	7.67 0.51	0.26 0.03	19.98 1.90	57.8 5.7	19.8 4.0	16.5 3.6	54.2 5.7
Phoenix	169	63.5 4.2	8.30 0.42	21.73 1.28	0.28 0.03	69.0 4.0	37.9 4.2	21.5 3.3	51.8 4.3
Portland	168	48.5 4.6	10.64 0.51	32.77 1.84	0.14 0.03	42.4 4.6	12.5 3.3	11.9 3.0	42.8 4.7
Total IHS	1,579	61.3 2.0	8.45 0.20	22.89 0.70	0.25 0.01	61.2 2.1	26.9 1.8	18.2 1.5	55.6 2.1

Appendix D — Table 1
Service and Service Minute Need for Each Age Group Stratified by IHS Area

Area		Age 2-5 Mean (S.E.)	Age 6-14 Mean (S.E.)	Age 15-19 Mean (S.E.)	Age 35-44 Mean (S.E.)	Age 55+ Mean (S.E.)
Aberdeen	Services	10.14 (0.29)	12.23 (0.26)	17.65 (0.53)	17.46 (0.63)	11.37 (0.59)
	Service Minutes	138.44 (5.21)	163.98 (3.26)	331.26 (15.33)	618.67 (25.60)	415.95 (28.02)
Alaska	Services	9.97 (0.48)	10.48 (0.42)	13.71 (0.70)	14.00 (0.52)	11.75 (0.63)
	Service Minutes	139.59 (8.72)	148.86 (5.79)	282.4 (19.56)	489.95 (24.57)	443.31 (28.24)
Albuquerque	Services	11.48 (0.50)	11.89 (0.50)	17.17 (0.62)	16.16 (0.70)	12.38 (0.57)
	Service Minutes	164.50 (9.06)	165.04 (7.34)	328.17 (18.76)	582.03 (42.83)	455.91 (30.04)
Bemidji	Services	7.95 (0.43)	10.24 (0.30)	14.50 (0.57)	15.54 (0.57)	10.60 (0.53)
	Service Minutes	101.04 (6.76)	136.12 (3.52)	247.65 (19.70)	540.92 (28.09)	395.68 (24.26)
Billings	Services	11.75 (0.41)	11.67 (0.29)	17.98 (0.51)	16.66 (0.51)	11.55 (0.58)
	Service Minutes	161.70 (7.16)	160.76 (4.18)	370.23 (20.61)	569.32 (24.82)	439.70 (26.76)
California	Services	8.74 (0.39)	11.69 (0.28)	17.10 (0.58)	14.83 (0.64)	13.68 (0.72)
	Service Minutes	115.15 (6.54)	153.06 (3.26)	299.98 (15.46)	510.80 (34.16)	517.28 (35.32)
Nashville	Services	10.62 (0.59)	11.56 (0.40)	14.53 (0.99)	18.17 (1.35)	11.74 (1.56)
	Service Minutes	146.22 (8.84)	154.44 (4.81)	285.95 (20.71)	649.83 (70.43)	500.75 (99.45)
Navajo	Services	13.26 (0.43)	11.67 (0.43)	16.50 (0.56)	17.11 (0.48)	15.54 (0.46)
	Service Minutes	198.61 (8.45)	163.82 (5.90)	339.73 (17.05)	584.97 (21.59)	612.57 (23.32)
Oklahoma	Services	7.74 (0.38)	10.95 (0.48)	16.64 (0.66)	17.98 (0.68)	12.58 (0.55)
	Service Minutes	102.94 (7.05)	148.84 (6.03)	323.93 (19.36)	657.13 (34.03)	448.42 (27.05)
Phoenix	Services	12.21 (0.54)	13.10 (0.43)	19.15 (0.54)	17.44 (0.49)	14.02 (0.55)
	Service Minutes	181.26 (9.87)	178.35 (5.53)	397.08 (20.26)	614.94 (24.39)	547.27 (25.19)
Portland	Services	9.93 (0.42)	12.00 (0.34)	15.35 (0.54)	13.31 (0.54)	11.48 (0.58)
	Service Minutes	138.58 (7.70)	160.18 (4.31)	286.18 (15.11)	426.90 (23.49)	420.44 (25.87)
Tucson	Services	11.44 (0.45)	12.26 (0.28)			
	Service Minutes	159.22 (8.20)	149.14 (3.04)			
Total IHS	Services	10.73 (0.17)	11.62 (0.16)	16.59 (0.23)	16.58 (0.22)	13.14 (0.22)
	Service Minutes	152.82 (3.15)	159.14 (2.09)	328.11 (6.89)	582.01 (10.54)	497.37 (10.71)

Appendix D — Table 2

Service and Service Minute Need Stratified by Level of Care

Level of Care		Age 2-5 Mean (S.E.)	Age 6-14 Mean (S.E.)	Age 15-19 Mean (S.E.)	Age 35-44 Mean (S.E.)	Age 55+ Mean (S.E.)
Level 1	Services	0.17 (--)	0.06 (--)	0.04 (--)	0.44 (--)	1.12 (--)
	Service Minutes	2.57 (--)	0.90 (--)	0.60 (--)	6.60 (--)	16.86(--)
Level 2	Services	2.71 (0.04)	6.58 (0.11)	8.67 (0.15)	5.18 (0.05)	4.22 (0.07)
	Service Minutes	42.86(0.58)	77.74(1.07)	136.41 (2.06)	129.66 (1.32)	107.95 (1.82)
Level 3	Services	8.21 (0.12)	5.38 (0.09)	6.97 (0.12)	7.74 (0.12)	5.66 (0.09)
	Service Minutes	108.70 (2.21)	90.26(1.45)	113.38 (2.12)	148.29 (2.40)	105.62 (2.03)
Level 4	Services	0.19 (0.03)	0.08 (0.02)	0.44 (0.03)	1.46 (0.06)	1.09 (0.06)
	Service Minutes	7.55 (1.11)	2.26 (0.47)	45.49(2.66)	126.73 (4.96)	88.65(4.79)
Level 5	Services	NA	0.08 (0.01)	0.90 (0.06)	2.92 (0.09)	2.22 (0.08)
	Service Minutes	NA	5.00 (0.00)	76.30(4.36)	253.94 (7.04)	224.79 (6.24)
Level 9	Services	0 (0.00)	0.07 (0.01)	NA	NA	NA
	Service Minutes	0.03 (0.03)	1.96 (0.18)	NA	NA	NA
All Levels	Services	11.29(0.17)	12.25(0.16)	17.01(0.23)	17.75(0.22)	14.31(0.22)
	Service Minutes	161.71 (3.15)	178.11 (2.09)	372.17 (6.89)	665.21 (10.54)	543.87 (10.71)