

Improving Women's Health and Perinatal Outcomes: The Impact of Oral Diseases

Among the most prevalent and preventable chronic health conditions in the United States¹, oral diseases have an immense impact on the oral, general, and reproductive health of women, their quality of life, and the oral health of their children. Approximately 84.7% of adults 18 and older in the United States show signs of past or present tooth decay.² Additionally, the majority of adults over the age of 24 exhibit clinical signs of moderate periodontal attachment loss.²

Given these facts, nearly all women can expect to experience some form of oral disease in their lifetime. In addition to the various genetic, behavioral, and social factors that place individuals at a higher risk of developing oral diseases, biological and physiological changes related to reproductive development, pregnancy, and menopause may also have an adverse impact on a woman's oral health status.³ Increasingly, oral diseases are being recognized as important markers for underlying health problems as well as potential risk factors for chronic health conditions and adverse perinatal outcomes.⁴ There is also evidence that poor maternal oral health status may increase the risk of early childhood tooth decay among infants.⁵ While the effects on physical health are substantial, the consequences of oral diseases are also psychological, social, and economic, often resulting in diminished self-image, social isolation, and days lost from work or school.²

Although there are numerous opportunities to prevent oral diseases throughout a woman's life course, barriers to accessing appropriate dental care services and the lack of integration between oral health and general disease prevention and health promotion activities often leave such opportunities unrecognized. Addressing these gaps in health care policy and practice has the potential to markedly improve the oral and general health status and well-being of women, as well as that of their children.

Oral Health Status of Women in the United States

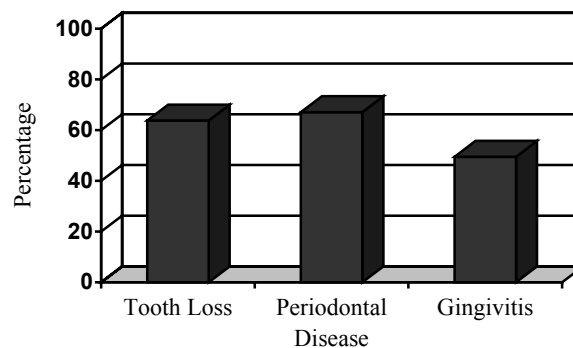
Assessing the oral health status of a population requires attention not only to common dental and periodontal infections, but also to various chronic and disabling conditions affecting the oral and facial areas. While the overall oral health status of women in the United States tends to be better than that of men, this does not diminish the fact that oral diseases are highly prevalent within the female population, or the fact that there are certain oral conditions that disproportionately affect women.

Commonly referred to as tooth decay, *dental caries* is one of the most prevalent infectious diseases within the U.S. population. Caused by bacteria commonly colonized within the mouth, dental caries results in the destruction of the

enamel and internal structures of the tooth. If left untreated, dental decay often leads to tooth loss and the deterioration of oral function. According to the 1988-94 National Health and Nutrition Examination Survey (NHANES III), approximately 46.9% of the tooth surfaces among females 18 years of age and older showed signs of decay.⁶ When looking specifically at women of reproductive age, estimates concerning the prevalence of untreated tooth decay range from 22% among females 15 years of age, to 25% among females aged 35-44.⁷

Also highly prevalent among women in the United States, *periodontal diseases* encompass several bacterial infections affecting the gums, soft tissue, and bone that form the support structure of the teeth. *Gingivitis*, a mild form of periodontal disease, is an inflammation of the gums characterized by bleeding, swelling, redness, and sensitivity. The 1985-86 National Survey of Oral Health in U.S. Adults and Seniors found that between 37 and 46 percent of females in the various age groups between 18 and 44 years of age exhibited signs of gingivitis.¹ Similarly, findings from NHANES III (Figure 1) showed that approximately 49.5% of women 18 years of age and older in the U.S. exhibited signs of gingivitis.⁶

Figure 1. Percentage of Women 18 Years of Age and Older in the United States Exhibiting Signs of Selected Oral Health Conditions. 1988-94



Source: Taken from Agenda for Research on Women's Health for the 21st Century, 1999⁶

Periodontitis, which is thought to develop as an extension of gingivitis, is a severe form of periodontal disease that affects the periodontal ligament and bony support structure of the teeth. This condition is characterized by the gradual loss of periodontal attachment, often resulting in the loosening and eventual loss of teeth. Analysis of NHANES III (Figure 1) data found that approximately 67.1% of women 18 years of age and older had experienced moderate periodontitis as measured by the loss of periodontal attachment of 2mm or more.⁶ According to the 1985-86 National Survey of Oral Health in U.S. Adults and Seniors, approximately 50 to 80

percent of females in the various age groups between 18 and 44 years of age exhibited some loss of periodontal attachment.¹

In addition to dental and periodontal infections, chronic and disabling conditions affecting the oral and facial areas are also important factors impacting an individual's oral health status. Although data are limited, studies show that women are disproportionately affected by both oral-facial pain and disorders associated with salivary gland dysfunction. **Oral-facial pain** includes pain resulting from tooth-related infections, oral sores, burning sensations within the mouth, pain in the jaw joint area, and pain across the face or cheek. A national study (Figure 2) found rates for every type of oral-facial pain to be higher among women when compared to men.⁸

While national data on the incidence of **salivary gland dysfunction** within the U.S. population do not exist, reports of autoimmune disorders such as Sjogren's syndrome, rheumatoid arthritis, and systemic lupus erythematosus are more common among women than men.² Such conditions can change the composition of saliva, as well as reduce salivary flow, resulting in increased susceptibility to dental caries. The estimated total number of cases of Sjogren's syndrome in the U.S. range from 1 to 4 million, with 90% of those diagnosed being women.⁸

Determinants of Women's Oral Health Status

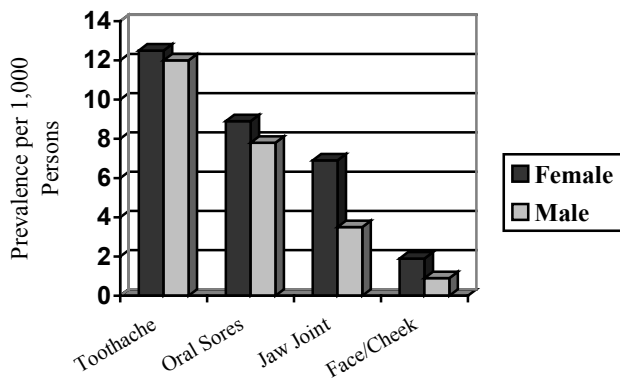
A woman's susceptibility to oral diseases and conditions, as well the impact of such conditions on her general health status and well-being is influenced by multiple biological, behavioral, and social factors present at various stages in her life course. While most oral health issues are not unique to the female population, there are several gender-specific factors that place women at an increased risk for the development of oral diseases and conditions.⁸

Beginning in adolescence, gender-specific factors influencing oral health status start to become apparent as women reach reproductive maturity and begin to establish health behaviors that have an impact on the risk of developing adverse oral health conditions. Among the most prominent of these factors, evidence exists showing that there are several pathways by which the physiological changes associated with reproductive development can exacerbate symptoms of gingivitis and promote the development and progression of periodontal diseases.⁹ Despite the fact that there do not appear to be any significant changes in the accumulation of dental plaque during adolescence, the prevalence and severity of gingivitis among adolescent women tends to increase at puberty.¹⁰ Underlying this increase in the prevalence of gingivitis among pubescent females is the fact that the increases in levels of progesterone and estrogen associated with the onset of reproductive maturity often also produce changes in the periodontium, resulting in increased reactivity to gingival irritants such as dental plaque.¹¹ Consequently, while the level of accumulated dental plaque may change little during adolescence, the increases in hormonal levels experienced during puberty increase the likelihood that such gingival irritants will result in gingivitis.¹⁰ In addition to the increased prevalence of gingivitis, the fluctuations in hormonal levels experienced during puberty may also be a contributing factor to the incidence of rapidly progressing periodontitis among adolescent females.¹¹

Although adolescent females tend to exhibit better oral hygiene practices than adolescent males¹¹, the oral health status of adolescent women can often be compromised by the initiation of adverse health behaviors. According to the National Youth Tobacco Survey (2000), approximately 27.3% of female high school students in the United States report the current use of cigarettes.¹² There is evidence that smoking not only contributes to the early onset and severity of periodontitis, but also limits the effectiveness of available treatment.¹⁰ Given that the health behaviors established during adolescence often continue into adulthood, it is important to note that tobacco use is also the single most prevalent preventable cause of oral cancer, accounting for over 90% of cancers of the oral cavity and pharynx.²

Other adverse health behaviors impacting the oral health status of adolescent females include anorexia nervosa, bulimia nervosa, and binge-eating disorder. While the prevalence of these eating disorders is relatively low within the U.S. population, such conditions are primarily concentrated among

Figure 2. Prevalence of Selected Types of Oral-Facial Pain Among Women and Men in the United States, 1989



Source: Taken from Oral Health in America: A Report of the Surgeon General, 2000²

In general oral diseases and conditions are progressive and cumulative across an individual's life course, resulting in severe and debilitating conditions in the absence of timely and appropriate treatment. As discussed in subsequent sections of this document, the multiple oral diseases and conditions experienced by women throughout their lives has important implications not only for their individual general health and well-being, but also that of their offspring.

adolescent and young adult women.¹³ The potential consequences of chronic eating disorders include the erosion of tooth enamel; enlargement of the salivary glands; xerostomia (dry mouth); trauma to the oral mucosal membranes and pharynx; and dental caries.¹³

Beginning in adolescence and continuing into early and middle adulthood, the risk of oral diseases and conditions among women is also often influenced by pregnancy and the utilization of hormonal birth control methods. During pregnancy, significant changes in hormonal levels occur as a result of the increased estrogen and progesterone production of the placenta.¹⁴ Similar to the effects observed during puberty, this increase in hormonal levels contributes to the risk of adverse oral conditions among pregnant women. It is estimated that between 60 and 75 percent of pregnant women have noticeable signs of gingivitis.³ Sequential increases in the severity of gingivitis as a result of pregnancy usually begin around the second month of pregnancy, reaching a maximum in the eighth month.⁹ Although the increased severity of gingivitis usually subsides after childbirth, women with untreated gingivitis during pregnancy will likely have gingivitis after pregnancy.³

Fluctuations in levels of estrogen and progesterone similar to that observed during pregnancy are also produced by the utilization of hormonal birth control methods. Consequently, the utilization of hormonal birth control methods may contribute to the risk of gingivitis. While there are currently no published studies that have specifically assessed the impact of either Norplant or Depo-Provera on the oral health status of women, studies have documented an increased response to gingival irritants during the first few months following the initiation of oral contraceptive use.⁹

As women progress through early and middle adulthood, increasingly complex role patterns may emerge as a result of demands concerning issues related to career choices, parenthood, and caring for aging parents. Given that increased levels of periodontal disease have been associated with experiences of both stress and depression¹⁰, these multiple roles not only influence a woman's ability to address dental care needs⁸, but can also have a direct impact on the risk and severity of oral diseases. For some women oral health status may be further compromised as a result of traditional gender-role expectations which lead them to place their own dental care needs secondary to the needs of others.⁸ It should be noted however that traditional gender-role expectations might also have a beneficial effect on the oral health status of women as a result of greater attention being given to health issues. This potential benefit of traditional gender-role expectations is supported by the fact that at each stage in life, women tend to report engaging in protective oral health behaviors such as brushing, flossing, and the appropriate utilization of dental services more often than men.⁸

Late adulthood marks a period during which many women begin to experience multiple adverse medical and cognitive conditions such as cardiovascular disease, diabetes,

osteoporosis, autoimmune disorders, and dementia. Such conditions have a significant affect on a woman's functional status, potentially limiting her ability to adequately care for her oral health needs.⁸ As discussed in the following section, many of the chronic health conditions existing during late adulthood also have a direct effect on the incidence and progression of oral diseases. The decrease in estrogen levels resulting from menopause is one of the primary contributors to the development of many of the adverse health conditions disproportionately affecting women during late adulthood and is associated with multiple adverse oral conditions including periodontal disease, dental caries, xerostomia, and burning mouth syndrome.¹¹ A woman's risk of developing adverse oral health conditions is also influenced by therapeutic regimens used to treat chronic health conditions. Women reportedly use medications 2.5 times more often than men.¹¹ A common side effect of many therapeutic regimens used to treat chronic conditions is a reduction in salivary flow, referred to as xerostomia. Xerostomia can increase the risk of both dental caries and periodontal diseases.⁸ The likelihood that a woman will experience a chronic health condition affecting her oral health status is increased by the fact that women have a greater life expectancy compared to men.¹⁵

Periodontal Diseases and General Health Status

Oral health status is an integral component of a woman's general health and well-being. Emerging research is beginning to establish distinct associations between periodontal diseases and adverse chronic health conditions such as cardiovascular disease, diabetes, and osteoporosis. Although additional studies are needed to determine the mechanisms by which such associations exist, available research clearly demonstrates that oral diseases and conditions are not only markers for underlying health problems, but also important determinants influencing the development and management of adverse chronic health conditions.

Cardiovascular Disease

Cardiovascular disease is the leading cause of death among women ages 35 and older in the United States, accounting for over 500,000 deaths among women annually.¹⁶ Researchers have hypothesized that periodontal diseases may contribute to the incidence of cardiovascular disease through infection of the blood system. Normal oral activities such as brushing and chewing can cause damage to tissues within the mouth allowing bacteria associated with periodontal diseases to enter the bloodstream. Such bacteria may stimulate factors associated with blood clots, atherosclerotic plaque, and vascular inflammation, resulting in obstructed blood flow to the heart.² Based on the analysis of the first National Health and Nutrition Examination Survey and its follow-up study, Wu et al. (2000) found periodontal disease to be a potential risk factor for coronary heart disease and stroke. Their results showed that individuals with periodontal disease were twice as likely as individuals without periodontal disease to have experienced nonhemorrhagic stroke and were also at an

increased risk of cerebrovascular disease.¹⁷ Similar findings have been documented in other studies using a variety of measures for both periodontal disease and cardiovascular disease.⁴

Other research also provides evidence that the risk of cardiovascular disease may be directly related to severity of periodontal disease. In a study conducted at the University of North Carolina, researchers found that an increasing cumulative incidence of cardiovascular disease within their study population corresponded with increasing severity of periodontal loss.¹⁸ Although additional research is needed to provide definitive evidence that periodontal diseases are an independent risk factor for cardiovascular disease, the consistent findings of available studies point towards a significant association between periodontal diseases and an increased risk of cardiovascular disease.

Diabetes

Surveillance reports show that over 8 million women 20 years of age and older in the U.S. have been diagnosed with diabetes.¹⁶ Imbalances in important immune factors resulting from diabetes can increase an individual's susceptibility to infection, including periodontal disease.⁹ Research concerning the association between diabetes and risk of periodontal disease consistently documents greater prevalence and severity of periodontal disease among individuals with both Type 1 and Type 2 diabetes when compared to individuals without diabetes.² According to some studies, these women are nearly 3 times more likely to experience loss of periodontal attachment as individuals without diabetes.¹⁹ In their evaluation of the prevalence of periodontal attachment loss, Emrich et al. found that among individuals between the ages of 15 and 24, those with diabetes had 4.8 times more periodontal disease than individuals without diabetes. Among individuals between the ages of 25 and 34, those with diabetes had 2.3 times more periodontal disease. Although the nature of the relationship between the two diseases has not yet been determined, the consistency of findings showing a higher prevalence and severity of periodontal disease among individuals with diabetes across studies provides strong support for an association between diabetes and the increased risk of periodontal infection.

Another important aspect of the association between periodontal diseases and diabetes focuses on glycemic control. The maintenance of appropriate blood glucose levels is an integral component in the prevention of complications related to diabetes such as heart disease, stroke, high blood pressure, blindness, kidney disease, and adverse pregnancy outcomes.¹⁶ There is emerging evidence that periodontal diseases may contribute to problems with glycemic control. It has been proposed by several researchers that periodontal infections interfere with the action of insulin and can complicate metabolic control in diabetes.² In addition, several clinical studies found that the systemic treatment of periodontal infections results in improved glycemic control.^{20,21} Such studies support the theory that the treatment of periodontal

infections can have a beneficial impact on the management of glycemic levels, but further research is needed to substantiate such an association.

Osteoporosis

Osteoporosis, a degenerative disease characterized by loss of bone mass, affects over 20 million individuals in the United States, the majority of which are women.² In addition to being a major cause of disability and death among the elderly, there is evidence that the systemic loss of bone mass associated with osteoporosis may be a contributing factor to oral bone loss, periodontitis, and subsequent tooth loss. Although the nature of the relationship between osteoporosis and oral health status has not been clearly established, current research provides evidence that measures of oral bone density may be indicative of systemic bone density and that hormonal replacement therapy is a potentially effective intervention in the prevention of adverse oral health outcomes among postmenopausal women.⁹

Studies have consistently documented a higher prevalence of oral bone loss among women than in men.² A potential factor underlying this disparity is the disproportionate impact of osteoporosis on the female population and the apparent association between oral bone density and systemic bone density. In their study of postmenopausal women, Tezal et al. (2000) found a significant correlation between low skeletal bone mineral density and periodontal alveolar bone loss.²² Results from the oral ancillary study of the National Institutes of Health (NIH) Women's Health Initiative also demonstrate this correlation.²³ Researchers have suggested that systemic factors associated with osteoporosis may contribute to the effects of periodontal diseases resulting in increased rates of alveolar bone loss.²⁴ Given that the alveolar process is the portion of the jaw bone structure that provides support for the teeth, the resorption, or loss of alveolar bone can result in increased tooth mobility and tooth loss. Both higher rates of tooth loss and edentulism have been documented among women with osteoporosis compared to non-osteoporotic women.²⁵

Based on the fact that estrogen deficiency plays a significant role in the onset and progression of osteoporosis, researchers also have focused attention toward the impact of estrogen deficiency on alveolar bone loss, as well as the potential benefits of estrogen replacement therapy on oral health outcomes among postmenopausal women. A recent study involving postmenopausal women with a history of periodontitis documented a statistically significant association between estrogen deficiency and the increased risk of alveolar bone loss.²⁶ It has been proposed that estrogen plays a role in the regulation of enzymes released by the presence of periodontal bacteria. Consequently, the ability to control the inflammation and breakdown of bone supporting the gums promoted by these enzymes is compromised when estrogen levels are low.

Several studies demonstrate that estrogen replacement therapy may be an effective method for minimizing the occurrence of adverse oral health outcomes among postmenopausal women. Two large cohort studies evaluating the oral health status of women receiving estrogen supplements found significantly lower rates of tooth loss, as well as an inverse correlation between duration of estrogen replacement therapy and the proportion of edentulous women.^{27,28} Although these findings are promising, further research is needed to clearly define the relationship between estrogen deficiency and adverse oral health outcomes among postmenopausal women, as well as the potential benefits of hormonal replacement therapy.

Maternal Oral Health Status and Perinatal Outcomes

The potential influences of women's oral health status on perinatal and early childhood outcomes are currently being examined by a number of researchers. Such studies document associations between poor maternal oral health status and the risk of preterm birth and low birth weight, and illustrate the mechanisms by which maternal periodontal infections can increase the risk of early childhood caries among offspring.

Preterm Birth and Low Birth Weight

The most significant predictors of an infant's subsequent health and survival are birth weight and period of gestation. Compared to infants born with birth weights of 2,500 grams or more, very low birth weight infants (less than 1,500 grams) are over 90 times more likely to die within the first year of life. Similarly, the infant mortality rate among very preterm infants (less than 32 weeks of gestation) is approximately 66 times that of infants born at term (37 through 41 weeks of gestation). To a lesser magnitude, this increased risk of mortality is also observed among moderately low birth weight infants (1,500 to 2,499 grams) and moderately preterm infants (32 through 36 weeks of gestation).²⁹

In addition to their impact on mortality, preterm birth and low birth weight are also significant causes of both short-term and long-term morbidity³⁰, resulting in significant health care costs. Despite growing knowledge concerning specific risk factors, approximately 25% of the preterm and low birth weight cases in the U.S. remain unexplained.³¹ Increasingly, studies are providing evidence that periodontal diseases among pregnant women may increase the risk for preterm birth and low birth weight.

The potential impact of periodontal diseases on preterm birth and low birth weight was initially demonstrated by the research of Offenbacher et al. (1996) which documented that women who have low birth weight infants as a consequence of either preterm labor or preterm, premature rupture of membranes tend to have more severe periodontal disease than mothers of full-term, normal birth weight infants. Specifically, this case-control study of 124 pregnant or post-partum women found that after controlling for known risk

factors, severe periodontitis was associated with a 7.5 to 7.9 times increase in the risk of low birth weight.³¹

Supporting the findings of Offenbacher et al., a recent study at the University of Alabama Perinatal Emphasis Research Center documented a statistically significant correlation between generalized periodontitis (90 or more sites with attachment loss of 3mm or more) and preterm delivery. After adjusting for potential confounding factors, this prospective study of 1,313 pregnant women found that those exhibiting clinical signs of generalized periodontitis at 21 to 24 weeks gestation were 4.5 times more likely to have a preterm birth compared to women who were periodontally healthy. With regards to very preterm birth, the risk among women exhibiting clinical signs of generalized periodontitis was 7 times greater than that of periodontally healthy women. In a separate analysis, researchers associated with this study also documented that the risk of preterm birth increases with increasing severity of periodontal disease.³²

In attempting to understand the biological mechanisms underlying observed associations between preterm birth, low birth weight, and periodontal diseases, researchers have focused primarily on the possibility that periodontal infections interfere with the normal physiological regulation of labor and delivery. Throughout pregnancy, levels of prostaglandins and certain regulatory proteins known as cytokines steadily increase until a critical threshold level is reached inducing labor, cervical dilation, and delivery. The gram-negative, anaerobic bacteria associated with periodontal diseases are capable of stimulating the excessive production of these physiological mediators, potentially resulting in preterm birth.³¹ The role of prostaglandins and cytokines in the link between preterm birth, low birth weight, and periodontal diseases is supported by findings from a University of North Carolina study that documented a statistically significant inverse association between gestational age, birth weight, and gingival cytokine levels.³³

Emerging research has provided some support for the idea that the risk of preterm birth and low birth weight can be reduced through addressing women's oral health needs during the prenatal period. Although not statistically significant, preliminary results from a study conducted by Mitchell-Lewis et al. (2001) documented a lower combined incidence of preterm and low birth weight infants among pregnant women receiving periodontal therapy prior to delivery compared to pregnant women not receiving treatment.³⁴

Early Childhood Caries

Dental caries is the most common disease affecting children in the United States.³⁵ In addition to the impact of infant feeding practices that lead to baby bottle tooth decay, researchers have identified maternal oral health status as a significant determinant of early childhood caries.

Recognizing that dental caries is a transmissible, infectious bacterial disease, several researchers have proposed that

periodontal infections are often transmitted from the mother to child. Behaviors that can result in the exchange of saliva including the sharing of eating utensils and kissing also have the potential to facilitate the exchange of the bacteria associated with dental caries. Researchers at the University of Alabama have provided evidence that the principal bacteria associated with early childhood caries are acquired from the mother sometime after an infant's first set of teeth begin to emerge.³⁶ Further research has shown that the colonization of these bacteria within a child's mouth usually occurs during a relatively narrow "window of infectivity" from about 7 to 24 months of age.³⁷ After this period the ability of the principal bacteria associated with dental caries to colonize within a child's mouth is greatly reduced. Additional evidence for the maternal transmission of dental caries causing bacteria to offspring is provided by studies using DNA fingerprinting techniques which have found that infants' genotypes of these type of bacteria match that of their mothers' in over 70% of the cases.⁵

One study has shown that the utilization of therapeutic mouth rinses beginning in the sixth month of pregnancy and continuing until deliver results in significant reductions in levels of dental caries causing bacteria within the oral cavities of pregnant women, consequently leading to delays in the colonization of such bacteria among offspring.³⁸

Addressing Women's Oral Health Needs

The oral health status of women within the United States has substantially improved over the past century as a result of increasing knowledge concerning effective strategies for the prevention of oral diseases.² Research shows that even with the addition of excessive sugars and other carbohydrates in an individual's diet, dental caries and periodontal diseases fail to develop in the absence of bacterial plaque.³⁹ Given such findings, oral disease prevention strategies often focus on efforts to inhibit the development and accumulation of bacterial plaque in the dental and periodontal regions through both mechanical procedures and chemotherapeutic agents. Research also demonstrates that fluoride is an effective agent for reducing the incidence of oral diseases, as well as enhancing the remineralization of tooth enamel and inhibiting the activity of bacterial plaque.² Such evidence has led to the use of fluoride in a variety of oral hygiene products and efforts to implement community water fluoridation programs across the United States. Overall, preventing oral diseases and conditions among women requires a combination of multiple individual, provider, and community level interventions targeted towards promoting appropriate oral hygiene practices; reducing known risk factors; ensuring access to needed preventive and therapeutic dental services; and creating healthy environments.²

Oral Hygiene and the Utilization of Dental Care Services

Daily oral hygiene practices and the appropriate utilization of dental services are integral components to maintaining oral

health. While daily oral hygiene practices such as tooth brushing and flossing aid in preventing the accumulation of bacterial plaque, the appropriate utilization of dental services provides the opportunity for preventive counseling and health education; the early detection and treatment of oral problems; and the receipt of preventive therapies.

Analysis of data from NHANES III found that adults 18 and older reporting a dental visit within the previous year were approximately 9 times more likely to be dentate and over 4 times more likely to have a complete dentation compared to adults not reporting a recent dental visit. This analysis also showed that among dentate adults, those reporting a dental visit within the previous year were slightly over 3 times less likely to have untreated tooth decay and 1.5 times less likely to have gingivitis than those not reporting a dental visit.²

Although rates of daily oral hygiene practices and receipt of dental care services tend to be higher among women compared to men, this does not diminish the fact that a substantial percentage of women within the United States fail to receive appropriate oral health services. According to the National Health Interview Survey, only 68.5% of women in the United States aged 18 to 64 reported having a dental visit during the previous 12 months in 1999.⁴⁰ In an earlier survey it was determined that while the interval since last dental visit was less than one year for 59.9% of females in the United States, slightly over 10% had not had a dental visit in five or more years. Additionally, 4.4% of female respondents had never had a dental visit.⁴¹

Given the association between periodontal diseases and adverse perinatal outcomes, ensuring that women maintain optimal oral health during pregnancy may have a beneficial impact on their personal health, as well as that of their offspring. Despite this fact, a significant percentage of women do not receive needed dental services during pregnancy. According to findings from the Pregnancy Risk Assessment Monitoring System only 34.7% of mothers received dental services during their most recent pregnancy. Among those reporting having a dental problem, approximately 50% did not receive appropriate dental care.⁴² Although dental management for women during pregnancy requires attention to care issues such as the use of anesthetic agents or length of time spent supine in the dental chair, this does not preclude pregnant women from receiving needed dental services and counseling.

The most commonly cited reason for the non-utilization of dental care services among women is the lack of perceived need⁴¹; however, research shows that barriers to accessing care also play a significant role in the non-receipt of appropriate dental services. In their analysis of the 1994 National Access to Care Survey, Mueller et al. (1998) found that the percentage of women aged 19 to 64 with perceived dental care needs unable to acquire appropriate dental care (12.1%) exceeded the national average (8.5%) by more than 40%. Among individuals with unmet desired dental care needs, 71.5% cited costs of care, lack of dental insurance, or the lack of a provider

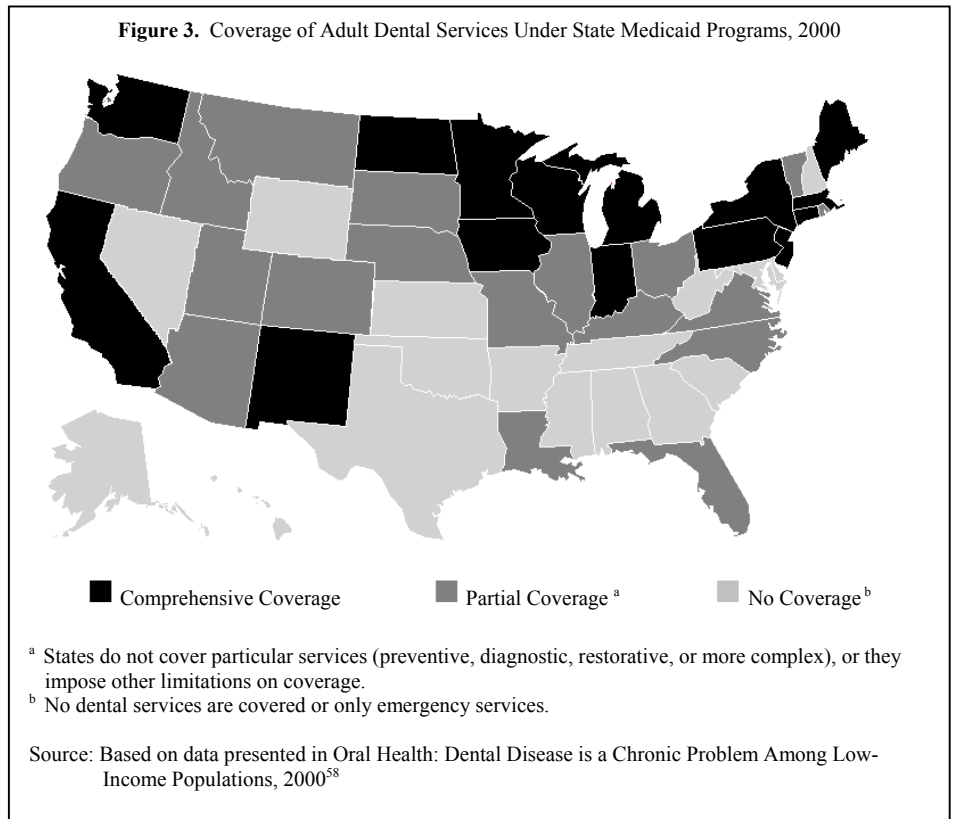
accepting insurance type as barriers to acquiring desired dental care.⁴³ According to the 1995 Behavior Risk Factor Surveillance System, approximately 45.2% of women reported having no dental insurance.⁴⁴

Public Financing of Oral Health Services

Given that the lack of dental insurance is one of the primary factors underlying the high percentage of unmet dental needs among U.S. women, government financing of oral health services is key to ensuring access for low-income populations. For every individual in the U.S. 18 years of age and older without medical insurance, there are three without dental insurance.² Studies show that less than 51% of individuals without dental insurance report seeing a dentist within the past year compared with over 70% of those with private dental insurance.⁴¹ Of the \$53.8 billion spent on dental services in this country during 1998, 93% was accounted for by employer-based dental insurance benefits and out-of-pocket payments, while only 4% was publicly financed. The primary public funding source of dental services is Medicaid, accounting for \$2 billion of the \$2.3 billion in government spending.² Despite being the primary public funding source of dental services, limited eligibility, low reimbursement rates, and inadequate provider participation hinder State Medicaid programs from ensuring that low-income women have access to needed oral health services.

In order to adequately address the oral health needs of low-income women, not only must coverage of comprehensive dental services be included under State Medicaid plans, but eligibility for such coverage must be broad enough to include the various populations of women without private sources of dental coverage. Although the inclusion of comprehensive dental services in Medicaid benefits are currently required for individuals under 21 years of age as part of Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) services, coverage of dental services for adults is an optional benefit often not included in State Medicaid plans.⁴⁵ Less than 20 states (Figure 3) provide comprehensive preventive and restorative dental care services as part of their optional benefits under Medicaid.⁴⁶ The lack of comprehensive dental care coverage for those over the age of 21 under most State Medicaid plans precludes many women from acquiring needed care.

Given that there are a lack of substitutes for private dental services, reimbursement rates under Medicaid must be at a sufficient level for ensuring provider participation. A recent survey of dentists in North Carolina found that while 89% of



respondents reported that they were currently accepting new non-Medicaid clients, only 21% were accepting new Medicaid clients. The most common reason cited for non-participation in the state Medicaid program was low reimbursement rates. In an analysis of North Carolina Medicaid claims data from 1985 through 1991, researchers determined that a 23% increase in Medicaid fees over the study period resulted in a slight increase in the number of Medicaid clients seen by participating dentists, but failed to have an impact on the number of participating dental providers. According to the study, the average increase in reimbursement rates needed to induce participation ranged from 50% for an initial exam to 131% for an extraction. Based on these results, reimbursement rates for dental services are substantially lower than provider expectations. Interestingly, analysis failed to find a significant relationship between the Medicaid-to-private price ratio and either likelihood or extent of participation. Such findings led researchers to conclude that dentists may be willing to accept lower fees for Medicaid clients provided that reimbursement rates are sufficiently high to prevent or minimize financial loss.⁴⁷

Availability of Dental Services

Utilization of oral health services is highly dependent on the availability of care. Extended waiting periods or the inability to locate a dental provider in close proximity to residence can result in substantial delays in receiving needed dental services. As a consequence of such delays, oral conditions that were relatively minor at the time care is initially sought may increase in severity, not only compromising the health and well-being of the individual, but

also leading to greater health care costs. Ensuring that the capacity of the oral health care system is sufficient for providing adequate and timely dental services for women is partially dependent on effectively addressing the declining dentist-to-population ratio, the inequitable distribution of oral health care providers, and the inadequate ethnic/racial diversity within the dental profession.

It is expected that increasing numbers of retiring dentists and decreasing dental school graduates will result in a shortage of dental providers in coming years. In 1990 the dentist-to-population ratio was 59.1 per 100,000. If current trends continue, this ratio will decline to 53.7 per 100,000 by the year 2020. One of the primary factors underlying this declining dentists-to-population ratio is a decrease in the absolute number of practicing dentists. The number of applicants to dental programs declined 4% in 1998. With further declines of 8 to 10 percent expected during 1999 and 2000, it is estimated that there will only be about 4,000 new dental school graduates per year to replace the estimated 2,500 to 4,300 retiring dentists per year between 1996 and 2021.²

The areas most likely to be affected by expected dental provider shortages are low-income and rural communities. There are approximately 1,198 federally approved dental Health Professional Shortage Areas (HPSA) in the United States. With a population of 25.9 million, it is estimated that only 6% of the dental need in these areas is currently being met. An additional 4,873 dental providers would be required to adequately address the dental needs of underserved populations.²

One of the reasons many dental school graduates may be reluctant to serve low-income communities is because of substantial school-related indebtedness. The average debt incurred by dental school graduates ranges from \$71,000 to \$108,000, approximately 14% higher than that of medical students. In order to increase the capacity of the oral health care system in underserved communities, federal assistance programs such as the National Health Service Corps (NHSC) offer loan repayment awards to graduating dental students agreeing to practice in approved dental HPSAs.² Efforts to initiate similar incentive programs at the state level include a proposal presented to the Maryland State General Assembly to forgive dental school loans for dentists serving a specified proportion of Medicaid-eligible clients.⁴⁸

Ensuring the availability of dental services in low-income communities also may require efforts to increase ethnic/racial diversity within the dental profession. Research shows that underrepresented racial and ethnic minority dentists are more likely to serve disadvantaged minority populations compared to white dentists.⁴⁹ According to one study, underrepresented racial and ethnic minority dentists also are 2.7 times more likely than white dentists to serve Medicaid populations.⁴⁷ Despite the great importance of underrepresented racial and ethnic minority dentists in addressing the needs of underserved populations, African Americans, Hispanics, and American Indians comprise only 5.4, 4.0, and 0.5 percent of

students enrolled in professional dental programs, respectively.⁵⁰

Given the lack of dental care providers serving low-income populations, the Bureau of Primary Health Care's Migrant and Community Health Center program is an important source of care for many underserved populations. An evaluation of the impact of community health centers on the utilization of health services documented an increase in the utilization of dental services among low-income populations in which community health centers were implemented.⁵¹ Although it is unclear from this study the extent to which community health centers contributed to observed increases in the utilization of care, it is evident that community health centers added substantially to the dental resources accessible to low-income study populations. Despite the potential benefits of community health centers in the provision of dental services, only 56% of the 671 community health centers in the United States provide dental care.⁴⁶ Increasing the capacity of community health centers to provide dental health services is an important strategy for increasing access in underserved areas. As part of the Health Resources and Services Administration (HRSA) oral health program, the Bureau of Primary Health Care is striving to increase the percentage of community health centers providing dental services to 80% by the year 2005.⁴⁶

State Public Health Infrastructure and Capacity

State oral health programs play an integral role in the development of policies and programs that assure individuals access to effective oral disease prevention and treatment services, as well as a role in the evaluation and monitoring of community oral health needs. Inadequate resources and limited funding for building infrastructure and capacity often hinder implementing and sustaining such programs. Within the United States, only 31 states currently have full-time state dental directors and 21 states have two or fewer full-time equivalents staffing their oral health program. Approximately 25 states have less than 10% of their counties supported by local health departments with oral health programs.⁵² Given these findings, substantial improvements are needed in the funding and organization of state oral health programs. Based on an evaluation of deficiencies within current state oral health programs, the Association of State and Territorial Dental Directors (ASTDD) developed a set of guidelines identifying the resources and components needed to effectively address the primary public health functions of assessment, policy development, and assurance.

Among the 43 states responding to the ASTDD Survey, all reported gaps in their oral health infrastructure and capacity. Most notably, only 19% of responding states reported having an oral health surveillance system. The percentage of respondents reporting that their state had an oral health improvement plan was also substantially low (38%), as was the percentage having an oral health advisory committee (48%). Aside from the need for a state-based oral health surveillance system, the most commonly identified state needs included: leadership consisting of a state dental director and

adequate staffing (63%), resources to build community capacity (62%), and resources to implement health systems interventions directed toward oral disease prevention and treatment (60%).⁵²

According to ASTDD estimates, state budgets of \$445,000 to \$4,760,000 are needed to expand and address the gaps in current oral health infrastructure and capacity. Despite this fact, approximately half of the states within the U.S. report that their oral health programs are supported by budgets of \$500,000 or less.⁵²

Integrating Oral Health With General Health Promotion and Education Activities Targeting Women

Despite growing evidence concerning the associations between oral diseases and general health, efforts to develop linkages between the oral health care system and general health care providers and services have been limited. This polarization of oral health care and general health care practice fails to maximize the opportunities to promote women's oral health. An integrated approach to oral health promotion and education provides greater opportunity for reducing known risk factors and providing early treatment, potentially resulting in reduced health care costs and improved oral and general health outcomes.

A particular area in which the potential benefits of integrating oral health care and general health care practice have not been realized is prenatal care.⁵³ As discussed in previous sections, emerging research suggests that interventions designed to improve a woman's oral health status during pregnancy may have a beneficial impact on pregnancy outcomes, as well as the oral health status of offspring. Based on this research, prenatal care programs attempting to address the multiple factors influencing perinatal outcomes should integrate appropriate dental screening, education, and treatment services into care plans. Ensuring the provision of appropriate oral health promotion and treatment services within prenatal care programs is dependent on greater coordination between dental and prenatal care providers. Effective coordination requires not only that health care providers are adequately educated concerning the associations between oral health status and general health, but also that mechanisms are established that facilitate communication between dental and prenatal health care providers.⁵⁴ Health care systems should encourage cross-referral between dental and medical care providers.⁵⁴

Within the state of California, information concerning oral health issues has been integrated into the curricula and guidelines of programs such as the Comprehensive Perinatal Services Program (CPSP) and the Black Infant Health Program (BIH), both of which are designed to improve the health of low-income pregnant women and infants. Additionally, a Dental Workgroup has been developed within the Department of Health Services with the purpose of improving the coordination of oral health services within maternal and child health programs.⁵⁵

A potential barrier to the incorporation of oral health issues within prenatal care programs is the exclusion of dental services under many State Medicaid programs. Although most State Medicaid programs do not cover comprehensive oral health services for adults over the age of 21, Section 1902 (a)(10) of the Social Security Act allows states to cover such services for pregnant women regardless of whether similar coverage is offered to other segments of the Medicaid population. State Medicaid agencies can choose to provide coverage to pregnant women for services not currently included in their State plan if such services address conditions that can complicate pregnancy.⁴⁵ Given the associations between maternal periodontal infections and adverse perinatal outcomes, appropriate oral health promotion, education, and treatment services can be viewed as medically necessary pregnancy-related services.

An opportunity to provide dental coverage to women also exists under SCHIP. States meeting certain criteria can apply for SCHIP 1115 demonstration waivers allowing them to extend coverage to low-income parents of children currently enrolled in Medicaid and SCHIP.⁵⁶ Funding for such expansions however is currently limited.

Although the State Medicaid program in Maryland does not provide comprehensive dental coverage for adults over the age of 21, in 1998 pregnant women were added as a mandated group to receive Medicaid dental services. Additionally, pregnant women up to 200% of the federal poverty level are eligible to receive comprehensive dental coverage up to six weeks postpartum through the Maryland Children's Health Program.⁵⁷

Beyond the incorporation of dental services within prenatal care programs, oral health issues should become an integral component of all health disciplines. Every contact a woman has with a health care provider provides the opportunity to reinforce the importance of oral health.

Implications of Current Research for Improving Women's Oral and General Health Status

- Oral diseases are among the most prevalent and preventable health conditions affecting women in the United States. In addition to the high prevalence of dental caries and periodontal diseases, women are disproportionately affected by several chronic and disabling oral conditions including oral-facial pain and salivary gland dysfunction.
- There are several gender-specific biological, behavioral, and social factors present at different stages in a woman's life course that increase individual susceptibility to adverse oral diseases and conditions.

- Oral diseases and conditions are not only markers for underlying health problems, but also important determinants influencing the development and management of adverse chronic health conditions such as cardiovascular disease and diabetes.
- Poor maternal oral health status during the perinatal period not only contributes to the incidence of preterm birth and low birth weight, but also increases the risk of early childhood caries among offspring.
- Preventing oral diseases among women requires a combination of multiple individual, provider, and community level interventions targeted towards promoting appropriate oral hygiene practices; reducing known risk factors; ensuring access to needed preventive and therapeutic dental services; and creating healthy environments.²
- The inclusion of comprehensive dental care coverage under State Medicaid plans is an integral component to ensuring that low-income women have access to needed dental services.
- Expanding eligibility for comprehensive dental care coverage under State Medicaid plans beyond traditional EPSDT requirements is an important step towards ensuring continuity in access to needed dental services for low-income women throughout their life course.
- Reimbursement rates for dental services under Medicaid should be sufficiently high to prevent or minimize the potential financial loss dental care providers may incur in choosing to serve low-income populations.
- Increasing the capacity of Migrant and Community Health Centers to provide dental services is an important strategy for increasing access to dental care within underserved populations.
- Incentives such as loan repayment and forgiveness programs may aid in increasing the number of dental care providers serving low-income populations.
- Efforts to increase racial and ethnic diversity within the dental profession may have a beneficial impact on access to dental care within underserved populations.
- The development and implementation of effective policies and programs directed towards ensuring that women have access to needed oral disease prevention and treatment services requires that adequate resources and funding be appropriated for building oral health infrastructure and capacity at the state level.
- Integrating oral health issues and dental care within the current system of health care accessed by women throughout their life course provides greater opportunity

for reducing known risk factors and providing early treatment, potentially resulting in reduced health care costs and improved oral and general health outcomes.

Additional Information

For additional information concerning women's oral health please refer to the *Women's Oral Health Resource Guide* published by the National Center for Education in Maternal and Child Health. An electronic copy of this publication is available on the National Maternal and Child Oral Health Resource Center web site (www.mchoralhealth.org).

Single copies of the resource guide are also available at no cost from:

HRSA Information Center
 P.O. Box 2910
 Merrifield, VA 22116
 Phone: (888) Ask-HRSA
 Fax: (703) 821-2098
 E-mail: ask@hrsa.gov
 Web site: www.ask.hrsa.gov

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Improving Women's Health and Perinatal Outcomes: The Impact of Oral Diseases

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