Oral Health of Young Children in Mississippi Delta Child Care Centers: A Second Look at Early Childhood Caries Risk Assessment

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Abstract

Objectives: *To identify the predictors of early childhood caries and urgent dental treatment need among primarily African-American children in child care centers in the Delta region of Mississippi. The purpose of this study was to replicate predictors of caries and urgent dental treatment needs that were identified in an earlier study conducted in Delta child care centers and to assess additional caries risk factors not collected in the original study.* ***Methods:*** *Children in 19 child care centers were examined by the dentists, and the parents provided data on oral health practices, oral health history, and on children's oral health-related quality of life (QOL). The dentists also assessed visible plaque and tested levels of mutans streptococci. Predictors of caries and treatment need among children 24 to 71 months of age were examined using logistic regression.* ***Results:*** *Two parent predictors of caries identified in the earlier study (parent flossing and soft/sugary drink consumption) were not predictive in the current study. Parent history of abscess continued to predict their child's urgent need for treatment. Young children's level of salivary mutans streptococci, maxillary incisor visible plaque, and parents' reports of child oral health-related QOL measures predicted the presence of both caries and urgent treatment need. Some expected predictors, such as frequency of child's toothbrushing, were not predictive of caries.* ***Conclusions:*** *Parental abscess and parent's report of the child's oral health-related QOL are risk indicators for poor oral health outcomes that could be used by nondental personnel to identify young children in need of early preventive intervention and dental referral.*

Key Words: early childhood caries, preschool children, oral health, caries risk factors, child care center, quality of life

Introduction

The persistently high prevalence of early childhood caries (ECC) among low-income and minority children has been highlighted in recent years by a variety of federal efforts. ECC is defined as dental caries occurring in the primary dentition of children 71 months of age or younger (1). The 2003 National Survey of Children's Health (2) reconfirms previously recognized disparities by age, income, and race/ethnicity (3). Newly released 1999-2002 data from the Centers for Disease Control and Prevention indicate that caries rates among 2- to 5-year-olds are inching upward to 28 percent prevalence, and that poor children for all ages suffer twice that rate of disease (4). A Health Resources and Services Administration 2002 conference report on the oral health of young children revealed that caries experience is closely tied to social disadvantage, with poor and minority children more likely to develop caries, have greater numbers of teeth affected, and have fewer affected teeth repaired (5). Early detection of caries usually reduces the need for invasive and costly treatment; thus, the concept of risk assessment has been proposed as a strategy for controlling caries through effective dental care referral (6).

The best predictor of caries in primary teeth is previous caries experience (7). However, the use of caries history alone to identify children at high risk comes too late if the goal is prevention. Another clinical predictor with strong empirical evidence is the level of mutans streptococci, which has been found to be positively associated with inception or incidence of carious lesions (8). Microbiologic testing is required to assess risk based on mutans and is not readily available. In addition to caries history and level of mutans, visible plaque is included as a

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DOI: 10.1111/j.1752-7325.2007.00061.x

clinical risk indicator on the American Academy of Pediatric Dentistry Caries-risk Assessment Tool (CAT). However, visible plaque is determined by examining the child's mouth, which is not a practical approach because parents of high-risk children often wait until caries in primary teeth are advanced and causing pain before bringing their children to the dentist (9). Although available evidence suggests the usefulness of these three factors for caries prediction in clinical settings, risk factors that can be assessed early in the child's life and outside the dentist's office are needed to identify potentially high-risk children who may not receive regular dental attention.

Crafting and implementing practical risk assessment tools for use by those who come in close contact with young children outside of clinical settings may be an important step toward encouraging early detection and improved oral health status for all children (10). Child care centers are ideal agencies for this purpose because approximately 75 percent of the 23 million children in the United States under age 5 spend part of their day in nonparental care (11,12). Our prior report on ECC prediction substantiates that child care centers are also suitable locations for conducting research on ECC risk assessment (13).

In our first study of children in Mississippi Delta child care centers, children aged 3 to 5 years who were African-American and children who had public health insurance (compared to private) were more likely to experience caries. In addition, three parent behaviors (i.e., using floss, having a history of a dental abscess, and daily consumption of soft drinks or sugary drinks) significantly predicted caries in young children. The purpose of the current study was to validate and extend the findings regarding oral health risk indicators among children who may experience health disparities known to be associated with low socioeconomic status. This "second look" reexamines oral health risk predictors that were evaluated in our earlier study and provides further data on caries risk prediction in young children by also considering salivary mutans streptococci counts in children, the presence of visible plaque on the maxillary incisors, and parental responses to child oral health-related quality-of-life (QOL) questions. We revisited the utility of a number of risk factors included on the CAT that could potentially be assessed in child care settings among children likely to be at risk because of race and socioeconomic status.

Methods

The current study is part of an ongoing project designed to examine the oral health of young children attending licensed child care centers in the Delta region of Mississippi. The venues for this second study, which occurred during April 2004, approximately 12 months after the first study of the project, were the 15 centers used in the first study (13) plus four additional child care centers. The additional centers were selected using the same procedures that have been described in our previous study (13), with the additional criterion of increasing the number of younger children who could be examined. The additional four centers increased the potential number of research participants from 626 children to 857 children. Both the Mississippi State University and the University of Mississippi Institutional Review Boards approved and monitored the study. Using the methods from the first study (13), parents/primary caregivers of the 857 children who were officially enrolled in the 19 participating centers for the second study were surveyed and requested to provide written consent for their children to be screened. Of the 857 children who were enrolled, 422 (49 percent) received parental consent for participation and were present to receive the dental examination. All but eight of the parents/caregivers of the 422 children returned a completed or partially completed survey. Of the 422 children, 72 had participated in the first study.

As in the first study, parent surveys included questions on demographic and family characteristics; their own oral health history and current oral hygiene practices; and their children's oral health histories, current hygiene practices, and dietary intake. Included in the survey were questions that corresponded to CAT risk factors: a) time of and reason for the child's last dental visit; b) child's history of decay; c) parent's history of decay; d) parent education as indicator of the socioeconomic status; e) child's exposure to fluoride; and f) daily frequency of brushing the child's teeth. An additional measure for the current study that was not included in the first study was the Michigan Oral Health-related QOL Scale – parent/guardian version (14,15) that assessed the child's pain/discomfort and functioning. QOL items included asking the parent if the child had difficulty chewing or biting hard; if the child's teeth were sensitive to temperature or to sweet food; and whether the child was currently experiencing any tooth pain or complaining about his/her teeth. Parent response choices for each QOL item was yes, no, or don't know. QOL measures have more recently been considered in relation to ECC, but not as risk factors. Children as young as 3 years of age and parents of children under age 6 reportedly provide valid and reliable reports of QOL both pre- and post-reparative treatment (14).

The dentist, who had examined the children during the first study, administered the examinations in the second study. A high intensity light, mirror, and tongue blade for retraction of soft tissues was used to examine the children. As needed to further visualize or assess the teeth, a dental explorer was used to facilitate or supplement a visual examination. A second dentist was present during the examination and noted the status of each tooth as sound, decayed, filled, or defective. The examining dentist also reported the presence of visible, unstained plaque on any surface for each tooth and collected a saliva sample to test for mutans streptococci levels. Mutans testing was accomplished using Dentocult strips (Edge Life Sciences, LLC, Traverse City, MI, USA) that were wetted on the child's tongue and then incubated for at least 2 days at 37 °C in low-oxygen-tension culture vials. The reading and evaluation were documented according to the manufacturer's packing insert instructions. Findings were classified in four categories by comparing growth to a standard chart: 1 – counts of less than 10,000 colony-forming units per cubic centimeter of saliva; 2 – counts of 10,000 to 100,000; 3 – counts of 100,000 to one million; and 4 – counts in excess of one million.

As in the first study, two measures of the child's oral health status, "evidence of caries" and "treatment urgency," were computed from the dental examination findings (13). "Evidence of caries" was defined as any decayed, missing (because of caries), or filled tooth surfaces and coded as present = 1 or not present = 0. "Treatment urgency" was categorized as "urgent," "routine," or "no obvious problems" according to the following criteria: urgent – if the child had obvious infection, current pain, or conditions expected by the examiner to elicit imminent pain, gross carious lesion or trauma potentially involving pulp tissue; routine – if the child had presence of any dental problem not currently causing pain and/or infection nor judged by the examiner to be urgent; and no obvious problem – if no dental problems other than poor oral hygiene were noted on examination. Because we are interested in identifying young children who urgently require treatment, we collapsed this variable into two categories: "urgent treatment needed" versus "no problems or routine treatment needed."

In order to assess the concurrent validity of expected risk factors for caries and urgent treatment needs, children age 24 to 71 months were evaluated. Risk factors that had been examined in our first study, as well as visible plaque, levels of mutans, and parent reports of child oral health-related QOL indicators, which had not been included in our previous study, were evaluated. In order to increase sample size, children who participated in both studies were included in the initial logistic regression analyses for risk factors. However, bivariate logistic regression analyses of risk predictors that were examined in the first study were recomputed, excluding children who participated in the earlier study, for any risk factor that had been identified in the prior study and that was also a significant risk predictor in the first set of analyses. This latter process provided independent cross-validation of the risk predictor. Unless otherwise noted, however, all data reported in this paper include the 72 children who participated in the first study. We also examined the pattern of missing data to determine whether or not the missing data were random. This was important because missing data have a practical impact on the sample size and because nonrandom patterns of missing data can bias statistical results (16,17).

Logistic regression (18) was used to test sociodemographic variables of child gender, age, race, parent education, and health insurance; parent behavior and oral health; child biologic measures (level of mutans and visible plaque); and child oral health-related QOL indicators as potential predictors of caries and urgent treatment. The analyses were limited to children 71 months or younger to meet the age criteria in the definition of ECC (1). Crude or unadjusted odds ratios are reported for bivariate analyses. Adjusted odds ratios are reported for multivariate logistic regression analyses to allow for associations to be tested while controlling for potentially confounding variables. Odds ratios for the effects of visible plaque, level of mutans, and child oral health-related QOL measures are adjusted for child's age, race (African-American versus other races), parent education, and health insurance coverage (no insurance, public, or private). All data were entered into a computer data file and analyzed using SPSS (19) statistical software.

Results

As in the earlier study, the majority of children were African-American (72.7 percent). Whites comprised 26.3 percent of the participants, and only 0.9 percent classified themselves as other. Few (26.3 percent) had private health insurance, while most families had public health insurance, such as Medicaid or the State Children's Health Insurance Program (SCHIP) (64 percent), which reflects low or modest income. Only 9.6 percent had no medical insurance. About one-third of parents (33.3 percent) reported having a college degree; 31.8 percent reported some college; and 35 percent reported high school completion or less. Taken together, the majority of the children could be classified as "high risk" based on CAT criteria of low socioeconomic status. With the exception of average age, the sociodemographic characteristics of participants in the current study did not differ significantly from that of participants in our previous study ($P > 0.05$) (13). As compared to a mean age of 41.8 months in the first study, children were, on the average, slightly younger (M = 38.5 months). Reported oral health status and practices for 422 children and their parents in the current study are shown in Table 1 and are similar to those reported in the prior study. When the two studies were compared on indicators shown in Table 1, no significant differences were found ($P > 0.05$).

About 8 percent of children did not brush their teeth on a daily basis (Table 1), and the majority (84 percent) of these children were under the age of 2 and had few or no teeth. Among children who brushed, all reportedly used fluoridated toothpaste, plus 18 percent of the parents reported using fluoride supplements. Although toothbrushing and fluoride exposure put these children at low risk according to the CAT, 64 percent of the children had never seen a dentist (Table 1). The lack of a regular source of dental care puts children at high risk according to the CAT.

Table 1
Parental Responses to Oral Health and Behavior Questions

Variable	%
Frequency of child brushing	
None	7.6
1-2 times per day	88.9
More	3.6
Child dental visits	
Within past year	29.6
More than a year	6.2
Never	64.2
Parent flosses own teeth	
Yes	60.4
(Missing)	(3.5)
Parent history of cavities	
Yes	69.4
(Missing)	(8.8)
Parent history of abscessed tooth	
Yes	28.6
(Missing)	(17.6)
Parent soft/sugary drink consumption	
0	5.6
1	21.2
2	38.2
3	18.3
4+	16.7
(Missing)	(10.7)

Number of children screened = 422.

According to the CAT, children are at high risk if their parent and/or sibling(s) have decay. The majority of parents reported cavities (Table 1). However, there was a high rate of missing answers to key questions regarding the caregiver's own dental health. Parents who answered the questions about cavities and abscessed teeth were compared with parents who did not answer these questions on each child oral health outcome. Parents who did not answer the questions about their own oral health were more likely to have children with caries and who urgently required dental care. The relationships were not statistically significant for child caries, but were for urgent treatment need for the child (parent cavity history $\chi^2 = 13.5$, $P < 0.001$; parent abscess history $\chi^2 = 10.3$, $P = 0.001$). As the treatment urgency rate was significantly higher among the "missing" group, an assumption of missing completely at random is not warranted, and methods for imputing missing values cannot be applied (16,17).

As in our prior study, approximately one-third of children (33 percent) had evidence of oral disease based on the dental examination. Approximately 1 in 12 young children (8.6 percent) had an urgent need for dental treatment. Among younger children (71 months or younger), 17.3 percent had ECC.

The associations between child oral health outcomes and age, gender, race, insurance status, parental education, risk factors based on the CAT, and parents' oral health status and behaviors are reported in Table 2. Not surprisingly, increasing age consistently predicted outcomes. Gender was not associated with outcomes. Compared to children of other races, African-American children were more likely to have ECC. Also, a significant relationship between race and treatment urgency was observed but the confidence interval (CI) associated with this finding is moderately large, which could be associated with the fact that only about one-fourth of the sample was not African-American. Odds ratios for public versus private insurance were significant for ECC with children having public insurance being at a higher risk of ECC than those with private insurance. Only 9.6 percent of children had no health insurance, and the odds ratio for comparing the uninsured to those with private insurance was not significant (Table 2). Lower parent education was significantly associated with ECC.

When previously identified parental predictors of oral health outcomes from our prior study (parental flossing, abscess, and soft drink consumption) and from the CAT (cavities) were examined in bivariate analyses (Table 2), neither flossing nor sugary drink consumption was a significant predictor for either outcome. Parental cavities and abscessed teeth were significant predictors of urgent treatment needs, although the odds ratio for cavities and urgent treatment needs was quite large (Table 2). Neither parental cavities nor abscessed teeth significantly predicted ECC (Table 2).

When parental abscess and urgent treatment needs were reexamined eliminating children who participated in the first study, although the number of cases were reduced, parental abscess remained a significant predictor of urgent treatment needs (odds ratio = 3.3, $P = 0.02$, $n = 218$, 95 percent CI = 1.24 to 8.78). The odds ratio for cavities again had an extremely large CI, but was significantly associated with treatment urgency after eliminating first study participants (odds ratio = 9.18, $P = 0.03$, $n = 237$, 95 percent CI = 1.20 to 69.98).

We also examined the predictive utility of parental reports of two child oral health practices. Approximately 93 percent reported daily brushing of children's teeth, and daily brushing was not associated with either outcome (Table 2). The children's last dental visit was significantly associated with both outcomes (Table 2), but the results are, at first glance, counter to expectations. Compared to children who have never been to a dentist, children who

Table 2
Possible Predictors of Child Oral Health Status

Variable		Early childhood caries OR (95% CI)	Treatment urgency OR (95% CI)
Demographic	$n = 323$		
Child age		1.07*** (1.05-1.10)	1.03* (1.00-1.07)
Child gender		0.73 (0.46-1.14)	0.93 (0.44-1.95)
Race/ethnicity (other†)			
African-American		3.00*** (1.70-5.31)	3.71* (1.10-12.52)
SES	$n = 297$		
Health insurance (private†)			
None		2.37 (0.94-5.93)	3.30 (0.62-17.50)
Public		2.06* (1.16-3.66)	3.11 (0.90-10.75)
Parent education (college or more†)			
High school or less		1.70* (1.06-2.73)	1.65 (0.76-3.57)
Parent oral health behaviors			
Floss	$n = 310$	0.66 (0.42-1.05)	0.63 (0.29-1.34)
Cavity history	$n = 297$	0.92 (0.55-1.53)	10.23* (1.36-77.16)
Abscess history	$n = 270$	1.06 (0.61-1.84)	3.32* (1.29-8.53)
Soft/sugary drink consumption	$n = 288$	0.98 (0.80-1.22)	0.75 (0.52-1.08)
Child oral health behaviors	$n = 323$		
Brushing (no†)			
1-2 times per day		0.44 (0.12-1.58)	1.00 (0.12-8.14)
2+		0.22 (0.04-1.37)	0.00
Dental visits (never†)			
Within past year		1.18 (0.50-2.82)	0.40 (0.09-1.85)
Year or longer		0.54* (0.33-0.89)	0.24** (0.10-0.54)

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.
† Reference category.
OR, odds ratio; CI, confidence interval; SES, socioeconomic status.

have seen a dentist over a year ago or longer were less likely to have ECC or urgently need dental care. There was no significant difference between children with a more recent (within the past year) dental visit and children who had never seen a dentist.

Finally, we examined the predictive utility of clinical and oral health-related QOL factors among children (Table 3). Higher levels of mutans were associated with greater likelihood of ECC and urgent treatment need. The odds ratio for mutans level is interpreted as the number by which we multiply the odds of caries or treatment urgency for each one-unit increase in the level of mutans. For example, a child with mutans in the range of 10,000 to 100,000 is twice as likely to have caries as a child with mutans less than 10,000. These odds hold even when adjusted for child age, race, parent education, and health insurance. We also find that the presence of visible plaque on the maxillary primary incisors was associated with caries. However, the positive association between plaque and treatment urgency does not hold when controlling for sociodemographic variables.

Lastly, we examined the relationship between QOL measures and early childhood caries and treatment need. QOL measures indicating poor oral health were rare in that few children had difficulty chewing or biting hard or had teeth sensitive to sweet food or temperature. Yet these QOL indicators were, for the most part, associated with poor outcomes, particularly the need for urgent dental treatment. For example, controlling for sociodemographic variables associated with oral health status, children who had difficulty chewing were 16 times more likely to require dental treatment as children who had no problems chewing. Large odds ratios were observed for each QOL indicator and urgent treatment need because QOL measures were rare among children in our sample. Few children had difficulty chewing (1.6 percent) or biting hard (2.9 percent) or had sensitive teeth to sweet food (3.9 percent) or to temperature (6.3 percent). Large odds ratios are to be expected when, for example, there are only nine children who have difficulty biting hard, and seven of them were assessed by the dentist as urgently needing care.

Discussion

This study contributes to the ongoing quest for reliable risk predictors of ECC and treatment urgency for both dental and nondental professionals. We evaluated primarily African-American children residing in one of the poorest parts of the nation, the Mississippi Delta, on a number of risk indicators, some of which were new and some of which were derived from the American Academy of Pediatric Dentistry CAT and a previous study of oral health risk predictors. One of the goals of this study was to identify risk predictors beyond minority and socioeconomic status in order to more easily identify children within this population who are most in need of dental referral.

As in our earlier study of oral health of children enrolled in child care centers in the Delta region of Mississippi, results confirmed that being African-American and having public, as opposed to private, health insurance puts children at higher risk of caries. Lower parental education was associated with a higher risk of ECC in the current study, but not in the prior study. Parental education as a risk factor for poor oral health outcomes should be evaluated in future studies. As expected, indicators of lower socioeconomic status tend to be associated with higher risk of poor oral health outcomes.

The current study found that the level of mutans streptococci and the presence of plaque are predictive of ECC. Our results confirm previous

Table 3
Clinical and Oral Health Quality-of-Life Predictors of Early Childhood Caries and Urgent Treatment Need among Children 24 to 71 Months

			Early childhood caries		Treatment urgency	
Variable	*n* (% missing)	% yes	OR	AOR	OR	AOR
Mutans	318 (1.5%)		2.06***	2.03***	2.02***	1.92**
<10,000		49.7				
10,000-100,000		28.6				
100,000-1 million		16.0				
>1 million		5.7				
Plaque†	257 (20.4%)	62.3	2.67***	4.18***	2.78*	2.33
Difficulty chewing	312 (3.4%)	1.6	6.59	6.92	16.21**	16.15**
Difficulty biting hard	308 (4.6%)	2.9	13.55*	12.83*	44.07***	42.01***
Sensitive to temperature	269 (16.7%)	6.3	5.65**	4.98*	12.29***	15.69***
Sensitive to sweets	284 (12.1%)	3.9	17.58**	8.43*	23.39***	15.69***

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$.
† Plaque present on any surface of maxillary primary incisors.
OR, odds ratio; AOR, adjusted for child age and race, parent education, and family health insurance.

research showing the value of microbiologic testing for level of mutans streptococci as an indicator of caries (8,20). Additionally our study also demonstrated that oral health-related QOL measures are strong predictors of risk in this population. QOL results suggest that parents can accurately report obvious indicators of children's oral health. Their perceptions of their child's oral health-related QOL may decide whether dental care is obtained for children (14).

As in our earlier study, parental history of dental abscess was found to be a significant predictor of urgent treatment needs in children. Although the current study could not identify underlying reasons that parental/caregiver abscess was consistently found to predict urgent treatment need for the child, the utilization of dental care among children from low-income families has been shown to be hampered by a lack of transportation and provider access (21), as well as from a defeating cycle of expectation and experience. In such a defeating cycle, fears of pain and substandard care can lead to avoidance of dental care, which in turn increases pain when a worsened condition is treated, which in turn reinforces the fear and avoidance (9). Other negative expectancies such as lack of control or efficacy to access dental care among impoverished families could also be factors in the observed relationships. This may explain why oral health problems in some children were severe, and significantly more children with urgent needs had parents with a history of severe oral health problems themselves. The underlying factors that contribute to this relationship need to be identified in future studies.

We found that two CAT risk assessment indicators, parent reports of the frequency of children's toothbrushing and utilization of dental care, are not useful risk indicators in this population. The majority of parents reported that children's teeth were brushed daily. It is not clear how accurate these reports might be as there may be a social stigma attached to not brushing. The findings regarding dental visits and oral health risk indicators were contrary to expectations. It appears that parents in the study took their children to the dentist when they perceived the need for care. If previous dental care is to be useful as a risk predictor, it may be necessary to develop instruments that differentiate between preventive dental visits and visits to establish a dental home versus visits triggered by existing problems.

Some findings were inconsistent across studies. Several risk predictors identified in our previous study were not replicated. Specifically, parent flossing and soft drink consumption were not significant predictors of oral health outcomes in the current study. Parental abscess was a significant predictor of treatment urgency, but not caries. Several factors that were not significantly related to oral health outcomes in the first study were related in the second study. Several of these, such as parental cavities and lack of insurance, had less than 10 percent of the sample reporting certain states, such as having no cavities or having no insurance, and odds ratios for these factors had very large CIs. Such factors may have limited utility for risk prediction, at least within some populations.

Additionally, patterns of missing data may account for some inconsistent findings. There was a higher percent of missing information from parents in the current study than in our previous study. Furthermore, children of nonresponding parents were more likely to urgently need treatment, suggesting an underlying systematic (nonrandom) process. For example, the rate of urgent treatment need among children of parents who did not respond to questions about their own dental health was significantly higher than for those that responded to the questions. The issues of missing data and of whether nonresponse to certain questions in this venue may represent a real risk factor for poor oral health outcomes need to be further evaluated and will be addressed in a later paper. A more likely explanation for several of the inconsistent findings between studies is that some factors such as parental sugary drink consumption and flossing were weak in their ability to predict ECC because recall may be poor; certain answers may be socially undesirable, resulting in inaccurate reporting; and the factors are only indirectly related to caries.

To summarize, we were able to replicate and add to previous findings by identifying several potentially useful oral health risk indicators for children already known to be of high-risk status in the Delta region of Mississippi. These findings include levels of mutans streptococci, presence of plaque, oral health-related QOL measures, and history of parental abscess. Our study has implications for real-world practice. By better understanding specific risk factors within high-risk populations, we can equip those who interact most with children at high risk (i.e., parents and child care providers) with better information and tools to recognize oral health problems.

Our research efforts have focused on child care centers as possible venues for reaching and improving the health of high-risk children (9,12). Given the acceptance that any effective prevention and/or intervention program for optimal oral health should begin early, it may be useful for a range of caregivers to have knowledge of risk assessment tools that can identify children most in need of preventive dental care. This information may be especially helpful for child care health consultants, who coordinate safety and health care for children in the child care setting. Child care centers with health consultants have been shown to increase oral health screening in the centers they serve (22).

There are a number of ways that parents and child care providers can be trained to enhance their oral health risk assessment of high-risk children. Although we demonstrated that it is possible to collect saliva specimens to test for mutans in a nonclinical setting, e.g., child care centers, it is not a practical method of assessing risk. Assessing for the presence of plaque is a more realistic approach for identifying at-risk children with little access to dental care because nondental health professionals and child care providers can be trained to examine children for plaque (23). As parent factors can play an important role in risk assessment, intake information on parents concerning history of abscess and other oral health behaviors should be acquired. Given the finding that parent reports of children's oral health-related QOL predict poor dental health, educational efforts should be directed toward increasing parent awareness that sensitive teeth and difficulty chewing are signs of serious oral health problems.

Traditional screening tools may be modified and augmented to best evaluate this population. As demonstrated by our analyses, not all global risk indicators proved useful in assessing this group of children. Clearly, more research is needed to confirm these results and to further identify risk indicators most useful for distinct populations of high-risk children. By mandating and allocating funding for the research, development, and implementation of risk assessment tools that are specific to high-risk populations, as well as the implementation of programs to educate child care providers and parents, we can expand the tools that may be used to identify risk among vulnerable populations of children. This expansion to include nonclinical criteria will broaden the scope of persons who are able to utilize such tools, possibly facilitating early detection and improved oral health status for all children.

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