

The Childhood Obesity Epidemic: A Role for Pediatric Dentists?

William F. Vann, Jr, DMD, PhD¹ Thomas J. Bouwens, DDS² Antonio S. Braithwaite, DDS²
 Jessica Y. Lee, DDS, MPH, PhD³

Abstract

Since the 1970s, the incidence of obesity has more than doubled for children 2 to 5 years of age and adolescents 12 to 19 years of age, and has more than tripled for children 6 to 11 years of age. The increasing numbers of overweight and obese children and youth has led federal policymakers to rank it as a critical health threat. The purpose of this review article is to raise awareness within the pediatric dental community about the childhood obesity epidemic. This article reviews the underlying causes of childhood obesity and discusses the links between both nutrition and obesity to caries. Because pediatric health professionals have daily contact with children and their caregivers, the role of pediatric dentists in preventing and managing obesity is proposed and discussed. In addition, methods are presented that pediatric dentists can use to elevate awareness and address childhood overweight and obesity issues from practice-based, community-based, and advocacy/policy-based perspectives. The authors share an array of ideas that can be incorporated by the pediatric dental team in their practice and beyond. (*Pediatric Dent* 2005;27:271-276)

KEYWORDS: ADOLESCENCE, ANTICIPATORY GUIDANCE, BODY MASS INDEX (BMI),
 CARIES, CHILDHOOD OBESITY, CHILDHOOD OVERWEIGHT, DENTISTRY,
 NUTRITION, NUTRITION COUNSELING, ORAL HEALTH, PEDIATRICS

Received March 7, 2005 Revision Accepted July 15, 2005

A recent editorial in *Pediatric Dentistry*,¹ entitled “Dietary counseling—time for a nutritionist in the office?” called attention to the alarming problem of childhood obesity in the United States. It also issued a clarion call for pediatric dentists to educate parents about children’s overall nutritional needs. This crisis was explored in recent work² using data from the 1988-94 National Health and Nutritional Examination Survey (NHANES) III.³ The authors documented that the number of overweight children has increased among all age, race, and sex groups since the 1970s.⁴ Moreover, preliminary data from the most recent NHANES survey⁵ mirrors this trend, suggesting that childhood overweight continues to increase.

Several important federal policy initiatives have been introduced in response to the emerging nationwide obesity crisis. To heed the call for a national plan for addressing the problem, in 2001 the Surgeon General issued the re-

port *Call to Action to Prevent and Decrease Overweight and Obesity*. Subsequently, Congress charged the Institute of Medicine (IOM) in 2002 to develop a prevention-focused action plan to decrease the number of obese children and youth.⁶ The IOM’s action plan is detailed in *Preventing Childhood Obesity: Health in the Balance*,⁷ a document that has become the national template for addressing the childhood obesity crisis.

Health in the Balance offers a synopsis of the most up-to-date picture of childhood obesity. The snapshot is frightening: since the 1970s, the prevalence of obesity has more than doubled for preschool children 2 to 5 years of age and adolescents 12 to 19 years and has more than tripled for children 6 to 11 years old.⁷ This increasing number of obese children and youth has led policy makers to rank it as a critical health threat.

Health in the Balance underscores that childhood obesity involves significant risks to physical and emotional health. Dramatic escalation in obesity-related type 2 diabetes is well documented.⁸ Obese children are at risk for hypertension, fatty liver disease, obstructive sleep apnea, and orthopedic problems.⁹ One particularly alarming statistic is that obesity-associated hospital costs for children more than tripled over 2 decades, rising from \$35 million between 1979 to 1981 to

¹Dr. Vann is Demeritt Distinguished Professor, ²Drs. Bouwens and Braithwaite are residents, all in the Department of Pediatric Dentistry; ³Dr. Lee is assistant professor of pediatric dentistry and health policy analysis and administration, School of Public Health, University of North Carolina, Chapel Hill, NC.
 Correspond with Dr. Vann at bill_vann@dentistry.unc.edu

\$127 million between 1997 to 1999.⁷ While the full economic and social impacts of childhood obesity have not been elucidated fully, the psychosocial burdens due to societal stigmatization are real. The self-reported quality of life of obese children in one study was similar to that reported for children with cancer.⁹

It is critical that pediatric dentists maintain awareness of this epidemic and participate in the assessment and prevention of childhood obesity. The purpose of this article is to review the causes of childhood obesity, discuss the relevance of obesity to dental health and disease, and highlight some of the actions pediatric dentists should take.

Defining obesity

Obesity is a concept that is continually being redefined, but in simple terms it is an excess amount of body fat in proportion to lean body mass.¹⁰ The most reliable noninvasive and indirect measure of body fat is body mass index (BMI), which is defined as a person's weight in kilograms divided by the square of his or her height in meters.¹⁰ For adults, most authorities consider a BMI of 18.5 to 24.9 to be an ideal target in healthy individuals, while a BMI of 25.0 to 29.9 is considered overweight and 30 or higher is judged as obese.

BMI is subject to criticism, because it does not distinguish body fat vs muscle, and persons with increased muscle mass may have an elevated BMI without being overweight.¹⁰ For this reason, waist circumference or hip-waist ratio is gaining more attention, because truncal obesity better reflects the comorbidities associated with excessive body fatness.¹⁰

Both the definition of obesity and its measurement are concepts on which there is no universal consensus. This has added in part to interpretations of prevalence data in the populations. Obesity mortality data interpretation is also a controversial topic, and it has been argued that the government, medical authorities, and the media have misled the public about the health consequences of rising body weights.¹¹ Indeed, the Centers for Disease Control and Prevention recently revised downward its projected numbers of obesity-related deaths.¹² Even after this adjustment, however, obesity still ranks seventh among the nation's preventable causes of death at 25,814 per year.¹²

Childhood obesity is defined as a BMI for age and sex greater than the 95th percentile.⁷ Most authorities consider a BMI for age and sex of the 85th to 95th percentiles as overweight and at risk for obesity in children.¹⁰ Although comorbidity and mortality data for childhood obesity have not been fully disentangled, there has been no challenge to the dramatic increase in childhood and adolescent obesity prevalence data reported since the 1970s or the assertion that this increase carries serious health risks to children's physical and emotional health.

The causes of childhood obesity

There is no simple solution to this question, but recent reviews of the issues are available.^{13,14} After all the data have

been analyzed, it is clear that taking multilevel action on childhood obesity must address factors influencing both eating (energy intake) and physical activity (energy expenditure). While the scientific literature is intriguing, 8 common sense reasons for childhood obesity were discussed recently in *Sports Illustrated*.¹⁵ The authors have paraphrased those reasons as follows:

1. **Geography:** Americans' movement to neighborhoods without sidewalks and parks has discouraged children from walking and riding bicycles. Routine forms of exercise have been lost over the past 50 years.
2. **Fear:** Fear of child abduction (the ubiquitous milk carton campaign) has forced children indoors and restricted their outdoor activities.
3. **Hard-working parents:** Rather than playing outdoors, many children are in after-school and extended child care programs because both parents in 2-parent households and 1 parent in single-parent households need to work, sometimes at more than 1 job.
4. **The soccer myth:** Although organized youth sport teams have exploded, the total number of children and adolescents seriously involved in sports is small.
5. **Emphasis on test scores:** Many schools have eliminated physical education altogether or offer it sparingly. Numerous schools are strapped for cash and worried about "No Child Left Behind" mandates. Reductions in physical education contact hours is an easy way to gain more academic time and cut costs.
6. **Fast food:** The evidence for a connection between fast food and overweight children and adolescents remains speculative. A recent 15-year follow-up of young adults, however, concluded that fast food increases the risk of obesity and type 2 diabetes.¹⁶
7. **Technology:** Today, children prefer "screen time" vs outdoor playtime.
8. **Family traits:** The children of overweight parents are often themselves overweight. More than 64% of US adults are overweight. These issues are not merely genetic, but also reflect behavioral patterns.

Nutrition and caries

It is well established that dental caries and frequent ingestion of refined carbohydrates are highly correlated.^{17,18} This thesis was underscored dramatically in a recent prospective Finnish study that examined children from infancy to age 10.¹⁹ The study concluded that persistently high sucrose intake increases the risk of dental caries in children. Sucrose as the "arch criminal" of dental caries is an argument that spans the past 50 years in the dental literature. It is an argument that has been put forth by some of the most respected investigators in the dental profession.^{20, 21}

A recent seminal investigation examined not sucrose and caries, but rather the relationship between healthful eating practices and dental caries for young children ages 2 to 5 in the United States. Using data from NHANES III, Dye et al²² found significantly greater odds of experiencing caries

in primary teeth in nonpoor children who did not eat breakfast daily or who ate fewer than 5 servings of fruits and vegetables per day. They concluded that dental health education should encourage parents, primary caregivers, and policy makers to promote healthful eating practices such as eating breakfast daily for young children.²² Acknowledging that sugar is strongly associated with caries and recognizing that poor eating habits clearly are a caries risk, it cannot be ignored that a clean tooth does not get a cavity.

Researchers have hypothesized that brushing twice a day with a fluoride toothpaste appears to have a greater impact on cavities in young children than restricting sugary foods.²³ Given this fact and the daunting challenge of modifying parental and child behaviors, many dental teams prefer to focus their counseling efforts on oral hygiene rather than dietary modification.

In summary, the dichotomy of thought about diet and caries has left many pediatric dentists feeling uncertain and cynical about how to approach the issue of diet with parents. Considering this confusion, the authors believe that pediatric dentists will be more successful in a message that calls attention to the notion: "it's not what children eat that causes dental caries, but rather how and when they eat it." Adherence to this philosophy would lead pediatric dentists to concentrate their nutritional messages to:

1. issues related to Early Childhood Caries in infancy;
2. attention on regular mealtimes and healthy snacking throughout childhood;
3. soft drink/soda consumption throughout childhood and adolescence.

Although this observation lacks support in scientific data, the authors suggest that a substantial majority of pediatric dentists would agree that these 3 dysfunctional eating habits are responsible for the vast majority of dental caries seen in children today.

Obesity and caries in children

Considering that the relationship between nutrition and caries is complex, perhaps the correlation of obesity and caries would offer the practitioner more specific clinical data on which to act. For example, might we be able to "profile" children at risk for obesity as a way to approach parents about their child's diet in relation to their dental health? In other words, do obese children get more cavities?

There are no published studies that have investigated the relationship between obesity and dental caries in US children. One Finnish study²⁴ followed 516 children from birth to age 12 and used weight to predict caries experience (DMFT/dmft). The investigators reported that obesity alone was not a good predictor of dental decay. Controlling for past caries experience, however, raised the sensitivity of prediction.²⁴ A Swedish study examined the relationship between dental caries and risk factors for atherosclerosis in nearly 200 15-year-olds in one small urban community. The study reported that children with a

DMFT score greater than 9 had significantly higher BMI values than caries-free children.²⁵

The role of pediatricians

If one envisions pediatric dentistry as a part of a broader health care system, it is instructive to examine pediatric medicine's perspective on childhood obesity. To this end, the 2003 American Academy of Pediatrics policy statement²⁶ on childhood obesity offers insights, making recommendations in 2 categories: (1) child health supervision; and (2) child health advocacy. There are 8 recommendations under child health supervision:

1. Identify and track patients at risk by virtue of family history, birth weight, or socioeconomic, ethnic, cultural, or environmental factors.
2. Calculate and plot BMI yearly for all children and adolescents.
3. Use change in BMI to identify rate of excessive weight gain relative to linear growth.
4. Encourage, support, and protect breast-feeding.
5. Encourage:
 - a. parents and caregivers to promote healthy eating patterns by offering nutritious snacks, such as vegetables and fruits, low-fat dairy foods, and whole grains;
 - b. children's autonomy in self-regulation of food intake and setting appropriate limits on choices;
 - c. healthy food choices.
6. Routinely promote physical activity, including unstructured play at home, in school, in child care settings, and throughout the community.
7. Recommend limiting television and video time to a maximum of 2 hours per day.
8. Recognize and monitor changes in obesity-associated risk factors for adult chronic disease, such as hypertension, dyslipidemia, hyperinsulinemia, impaired glucose tolerance, and symptoms of obstructive sleep apnea syndrome.

Dentistry's challenge

Based on the findings recently published in *Pediatrics*,²⁷ it was recommended that dental clinics serve as an important source of health promotion, disease prevention, and screening for nonoral health-related problems, with better integration of children's dental services and other child health care services.²⁷ With childhood obesity being at the forefront of current health issues in children, this is a perfect moment in time to strive for integration of child health promotion in the dental health arena.

This theme was echoed in a recent editorial in the *Journal of the American Dental Association* (JADA).²⁸ In his piece, "A concern that cannot wait", JADA Editor Michael Glick provided an eloquent overview of the obesity epidemic. He noted that, "while the consequences of obesity will have an indirect effect on oral conditions, this alone is not justification to get involved. Rather, there needs

to be a stronger desire to have an impact on the patients' general health."²⁸

What pediatric dentists can do

As a point of departure, pediatric dentists may want to heighten staff awareness relying upon the recently adopted American Academy of Pediatric Dentistry (AAPD) Policy on Dietary Recommendations for Infants, Children, and Adolescents.²⁹ This policy offers a superb platform for nutritionally related anticipatory guidance using dental-friendly terminology and practical routines familiar to the pediatric dental staff. This well-referenced policy statement also encourages the integration of dietary and nutritional recommendations into the age 1 dental visit and the dental home concept, which are fundamental cornerstones supported by the AAPD.

This AAPD policy is most timely and relevant for young children, as underscored in a recently published study that offers new evidence that the first 3 years of life may lay the groundwork for obesity.³⁰ In short, the nutritional risk assessment that is integral to the age 1 dental visit may offer health benefits far beyond those related to caries prevention.

The authors suggested earlier that most pediatric dentists are likely to be energized around nutritional interventions related to: (1) Early Childhood Caries; (2) regular mealtimes and healthy snacking; and (3) judicious soft drink consumption. The authors would not suggest a diversion of office staff attention from those 3 areas of concern. Instead, the authors suggest a broader view. For those children with caries, the authors recommend that the pediatric dental staff may want to frame obesity-related discussions in the context of dietary modification. The promotion of healthy eating is an arena in which pediatric dentists have extensive training and can easily be brought into the conversation. For patients without caries, the issue of nutrition can be raised with patients and parents by explaining, "because many of our patients do not regularly see a physician, we are taking a greater role in addressing some health-related issues, including obesity."

The authors also recommend that pediatric dentists take a bold step forward and embrace a reliance on calculating and monitoring BMI in each child's dental record. The authors are aware that obtaining height and weight is not routine in all offices, but it is a simple and quick procedure that can be completed by any staff member. Weighing patients at recall, emergency, and new patient visits is commonly recommended by several respected dental authorities.³¹⁻³³ Calculating and monitoring BMI in dental records is simple once height and weight are obtained. BMI forms may be downloaded from the CDC Web site at www.cdc.gov/nchs/about/major/nhanes/growthcharts/charts.htm.

While calculating BMI is simple, the matter of addressing a child's weight with parents is a more difficult challenge that needs to be based on the comfort level of the dentist or staff member. One suggestion is to incorpo-

rate this information into an oral health report card. Many practitioners provide report cards or progress reports at each recall appointment to call attention to and document oral hygiene and other clinical findings. Adding BMI to the other child dental health information reviewed with the parent may be an easier way to objectively present the information. Pediatric dentists are quite comfortable referring children to orthodontists, oral surgeons, and other dental specialists as needed for consultations. Therefore, the authors suggest that it is appropriate to refer a high BMI patient to a pediatrician for consultation.

The authors further recommend that the pediatric dental office strive to serve as a community model of healthy eating and physical activity. Office visit discussions related to healthy eating and an active lifestyle communicate a level of importance to these behaviors. The office also can send messages to parents and the community by promoting and sponsoring community programs promoting health and well-being. Examples include sponsoring a local youth soccer team, supporting a road race for children, organizing a sporting event, or coaching a local team. Pediatric dentists may also want to consider health promotion advocacy that begins within the office by supporting staff weight-loss or exercise programs that create a positive example for patients and their families.

Pediatric dentists as advocates for fighting childhood obesity

Previously, the authors discussed the AAP's 8 recommendations for health supervision, and the same policy statement includes 5 advocacy recommendations:

1. Encourage parents, teachers, coaches, and others who influence youth to discuss health habits, not body habits, as part of their efforts to control overweight and obesity.
2. Enlist policymakers from local, state, and national organizations and schools to support a healthy lifestyle for all children that includes a proper diet and adequate opportunity for regular physical activity.
3. Encourage organizations responsible for health care and health care financing to provide coverage for effective obesity prevention and treatment strategies.
4. Encourage public and private sources to direct funding toward research into effective strategies to prevent overweight and obesity and to maximize limited family and community resources to achieve healthful outcomes for youth.
5. Support and advocate for social marketing intended to promote healthy food choices and increased physical activity.²⁹

As community leaders, pediatric dentists have a responsibility to serve as advocates for children's overall health, not just their oral health. These recommendations offer an excellent template through which pediatric dentists can serve as advocates for addressing the childhood obesity crisis.

Conclusions

Our society is in the midst of a childhood obesity epidemic that threatens the nation's long-term health. Recognizing that obese parents often beget obese children, it is easy to speculate that we are seeing only the tip of the iceberg and that the future economic, health, and social consequences of this epidemic may be one of our nation's most serious challenges in this century. This is not positive news, but we need to be encouraged that the childhood obesity epidemic is controllable.

The authors challenge all pediatric dentists to join in the battle against childhood obesity. As members of the pediatric health team, we have an obligation to do so. As clinicians in frequent contact with children and parents, we also have the perfect opportunity.

Acknowledgements

This research was supported by the Maternal and Child Health Grant 5 T17 MC 00015-13-01.

References

1. Adair SM. Dietary counseling—time for a nutritionist in the office? *Pediatr Dent* 2004;26:389.
2. Strauss RS, Pollack HA. Epidemic increase in childhood overweight, 1986-1998. *JAMA* 2001;286:2845-2848.
3. National Center for Health Statistics. *National Health and Nutrition Examination Survey III: 1988-94*. Hyattsville, Md: US Department of Health and Human Services; 1996.
4. National Center for Health Statistics. *National Health and Nutrition Examination Survey II: 1976-80*. Hyattsville, Md: US Department of Health and Human Services; 1981.
5. National Center for Health Statistics. *National Health and Nutrition Examination Survey IV: 1999-04*. US Department of Health and Human Services. Available at: <http://www.cdc.gov/nchs/NHANES>. Accessed February 13, 2005.
6. US Department of Health and Human Services. The Surgeon General's call to action to prevent and decrease overweight and obesity. (Rockville, MD): US Department of Health and Human Services, Public Health Service, Office of the Surgeon General (2001). Available at: <http://www.surgeongeneral.gov/library>. Accessed July 13, 2005.
7. Koplan JP, Liverman LT, Kraak VA. *Preventing Childhood Obesity: Health in the Balance*. Available at: <http://www.nap.edu>. Accessed July 13, 2005.
8. Svetlana T, Maclaven N. Insulin resistance syndrome in children. *J Clin Endocrinol Metab* 2004;89:2526-2539.
9. Schwimmer JB, Barwinkle TM, Varni JW. Health-related quality of life of severely obese children and adolescents. *JAMA* 2003;289:1813-1819.
10. Centers for Disease Control and Prevention. BMI-Body Mass Index. Available at: <http://www.cdc.gov/nccdphp/dnpa/bmi/bmi-means.htm>. Accessed July 13, 2005.
11. Gibbs WW. Obesity: An overblown epidemic? *Scientific American*, June 2005. Available at: <http://www.sciam.com/article.cfm?chanID=sa006&colIDz=1&articleID=000E5065-2345-128A-9E1583414B7F0000>. Accessed July 13, 2005.
12. Flegal KM, Graubard BI, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. *JAMA* 2005;293:1861-1867.
13. Nestle M, Jackson MF. Halting the obesity epidemic: A public health policy approach. *Public Health Rep* 2000;115:12-24.
14. Slyper AH. The pediatric obesity epidemic: Causes and controversies. *J Clin Endocrinol Metab* 2004; 89: 2540-2547.
15. Layden T. Get out and play. *Sports Illustrated*. November 15, 2004:80-90.
16. Pereira MA, Kartashov AI, Ebbeling CB, et al. Fast food habits, weight gain, and insulin resistance in a 15-year prospective analysis of the CARDIA Study. *Lancet* 2005;365:25-32.
17. Gustafsson BE, Quensel CE, Lanke LS, et al. The Viphholm dental caries study. The effect of different levels of carbohydrate intake on caries activity in 436 individuals observed for five years. *Acta Odont Scand* 1954;11:232-364.
18. Sreebny L. Sugar availability, sugar consumption, and dental caries. *Community Dent Oral Epidemiol* 1982;10:1-7.
19. Ruottinen S, Karjalainen S. Sucrose intake since infancy and dental health in 10-year-old children. *Caries Res* 2004;38:142-148.
20. Newbrun E. Sucrose, the arch criminal of dental caries. *J Dent Child* 1969;36:269-247.
21. Zero D. Sugars—The arch criminal? *Caries Res* 2004;38:277-285.
22. Dye B, Shenkin J, Ogden C, Marshall T, Levy S, Kanellis M. The relationship between healthful eating practices and dental caries in children aged 2-5 years in the United States, 1988-1994. *J Am Dent Assoc* 2004; 135:55-66.
23. Gibson S, Williams S. Dental caries in preschool children: Associations with social class, tooth-brushing habit and consumption of sugars and sugar-containing foods. *Caries Res* 1999;33:101-113.
24. Tuomi T. Pilot study on obesity in caries prediction. *Community Dent Oral Epidemiol* 1989;17:289-291.
25. Johansson I, Hallmans G, Ericson T. Relationship between dental caries and risk factors for atherosclerosis in Swedish adolescents? *Community Dent Oral Epidemiol* 1995;23:205-210.

26. American Academy of Pediatrics Committee on Nutrition: Prevention of pediatric overweight and obesity. *Pediatrics* 2003;112:424-430.
27. Dovey S, Weitzman M, Fryer G, et al. The ecology of medical care for children in the United States. *Pediatrics* 2003;111:1024-1029.
28. Glick, M. A concern that cannot weight. *JADA* 2005;136:572-574.
29. American Academy of Pediatric Dentistry. Policy on Dietary Recommendations for Infants, Children, and Adolescents. *Pediatr Dent*. In Press.
30. Reilly JJ, Armstrong J, Dorosty AR, et al. Early life risk factors for obesity in childhood: Cohort study. *BMJ* 2005;330:1357.
31. Moore PA. Preventing local anesthesia toxicity. *J Am Dent Assoc* 1992;123:60-64.
32. Casamassimo PS, Christensen JR, Fields HW. Examination, diagnosis, and treatment planning. Pinkham JR, ed. *Pediatric Dentistry—Infancy Through Adolescence*. 3rd ed. Philadelphia, Pa: WB Saunders Co; 1999:265-286.
33. Proffit WR, Ackerman JL. Orthodontic diagnosis: The development of a problem list. Proffit WR, Fields HW, eds. *Contemporary Orthodontics*. 3rd ed. St. Louis, Mo: Mosby, Inc; 2000:147-195.

ABSTRACT OF THE SCIENTIFIC LITERATURE



A STUDY TO DETERMINE IF SINGLE-STEP BONDING AGENTS CAN BE SUBSTITUTED FOR SEALANTS

Single-step bonding agents, also known as all-in-one adhesives, are currently the most developed resin-bonding systems for restorative treatment. These systems have the advantage of eliminating acidification and water rinsing, so that tooth structure can simultaneously be etched, primed, and bonded, thus reducing the number of bonding procedure steps. Restorative resins used as sealants have long-term success. Therefore, the concept of using restorative adhesive resins has been considered due to their high bond strength. The purpose of this study was to evaluate in vitro single-step bonding agents as fissure sealants compared to resin sealants.

Two all-in-one adhesives and 2 resin sealants were used in this study. Twenty-four noncarious human premolars extracted for orthodontic reasons were prepared in 2 ways: (1) for ground enamel specimens, each tooth was sectioned to expose a flat buccal enamel surface and ground with carbide paper to make an artificial smear layer that would be analogous to the prepared tooth structure of a cavity preparation; (2) for polished specimens, buccal enamel surfaces were cleaned with toothpaste and a dental brush in a low-speed hand-piece. The single-step bonding agents were applied to the prepared enamel surface, light-cured, and subsequently had 5, 1-mm thick increments of a resin composite applied. The resin sealants were applied by: (1) acid conditioning the enamel; (2) rinsing with water; (3) air drying; and (4) light curing. A subsequent build-up of the resin sealant was conducted in a manner as described previously. After 24 hours of storage in water, the resin/enamel-bonded teeth were sectioned perpendicular to the adhesive interface to produce specimen beams, with 4 beams obtained per sample. The results showed that the bond strengths of the 2 all-in-one adhesives tested to the polished enamel surfaces were significantly lower than that of the ground enamel. No significant differences were found between the polished and ground enamel surfaces for resin surfaces using the acid-etch technique.

Comments: This study's results again reinforce the importance of using the tried and proven acid-etch technique for polished enamel, which would be the substrate for pit and fissure sealants. The single-step bonding agents have good adhesion to ground enamel surfaces. Without pretreatment of the polished enamel, however, a fissure sealant would fail under normal clinical conditions. **GM**

Address correspondence to Dr. Minoru Hori, Division of Pediatric Dentistry, Hokkaido University, Graduate School of Dental Medicine, North 13, West 7, Kita-ku, Sapporo 060-8586, Hokkaido, Japan.

Hori M, Yoshida E, Hashimoto M, Kaga M, Sano H, Oguchi H. In vitro testing of all-in-one adhesives as fissure sealants. *Am J Dent* 2004;17:177-181.

32 references