RESEARCH REPORTS
Clinical

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J Dent Res 88(4):361-366, 2009

Healthy Eating Index Is a Predictor of Early Childhood Caries

ABSTRACT

Early childhood caries (ECC) is a preventable form of dental caries that affects very young children, particularly among low-income families and certain racial/ethnic minorities. The current study examined the relationship of dietary quality, as measured by the Healthy Eating Index (HEI), to the prevalence of ECC in 2- to 5-year-old children. Data from the Third National Health and Nutrition Examination Survey (NHANES III) were used for the study. We used logistic regression to compute adjusted odds ratios (OR) for ECC and 95% confidence intervals (CI). Children with the best dietary practices (uppermost tertile of the HEI) were 44% less likely to exhibit severe ECC compared with children with the worst dietary practices (lowest tertile of the HEI). A healthy eating pattern geared for promotion of optimal child development and prevention of chronic disease in later life may also reduce the risk of early childhood caries, particularly severe early childhood caries.

KEY WORDS: early childhood caries, Healthy Eating Index, oral health disparities.

DOI: 10.1177/0022034509334043

Received April 17, 2008; Last revision September 3, 2008; Accepted December 13, 2008

INTRODUCTION

In its simplest form, early childhood caries (ECC) refers to any dental caries in the primary dentition. Severe ECC is an aggressive form of dental caries in the primary dentition associated with specific patterns of dietary intake in young children (AAPD, 2008). ECC can rapidly destroy the primary dentition of toddlers and small children, and, left untreated, can lead to pain, acute infection, nutritional insufficiencies, and learning and speech problems. In its earliest stages, ECC is characterized by smooth-surface lesions of the primary maxillary teeth (Milnes, 1996). The negative impact of this public health problem and the need to decrease its incidence are well recognized. In fact, the national public health agenda, as stated in *Healthy People 2010* (USDHHS, 2000), includes the goal to reduce ECC prevalence to 11% or less (*Healthy People 2010*, goal 21-1a). Yet, based on nationwide data, ECC prevalence has actually increased among 2- to 5-year-old children (Beltran-Aguilar *et al*., 2005).

In the United States, overall ECC prevalence has been reported to be 27.9% among 2- to 5-year-old children (Beltran-Aguilar *et al*., 2005), but higher rates have been found in economically disadvantaged children (Milnes, 1996) and among certain racial/ethnic groups (Kelly and Bruerd, 1987; Albert *et al*., 1988; Broderick *et al*., 1989; Weinstein *et al*., 1992; Serwint *et al.*, 1993; Vargas *et al*., 1998; Shiboski *et al*., 2003).

It is well known that certain feeding practices, such as bedtime bottle feeding, "at will" breast feeding, and frequent intake of sugary snacks and drinks (Ismail, 1998; Sohn *et al*., 2006), contribute to the development of ECC. Failure to eat breakfast daily and eating fewer than 6 servings of fruits or vegetables a day were also associated with dental caries in very young children (Dye *et al*., 2004). Unfavorable eating habits vary among socioeconomic and race-ethnicity groups (Neumark-Sztainer *et al*., 2003; Champagne *et al*., 2004) and may partially explain differences in ECC risk.

Established dietary recommendations emphasize the selection of a variety of foods, low intakes of fat, saturated fat, and cholesterol, and moderate use of salt and sodium, primarily to reduce the risks of chronic diseases (NRC, 1989; USDHHS, 1991; USDA, 1995). But dental diseases, especially caries, are rarely addressed. Dietary advice given for general development and well-being needs to be integrated into oral health counseling. Several instruments have been developed to assess the overall quality of the diet. The Healthy Eating Index (HEI) is one index of overall diet quality based on the food pyramid. The HEI is used to assess adequacy, moderation, and diversity of food choices (Kennedy *et al*., 1995). Modifications to the HEI score as well as isolation of specific components of the HEI to assess intake and nutrition status of special groups have previously been reported (Feskanich *et al*., 2004; Knol *et al*., 2004). The association of dentition status to nutritional status using the HEI has been explored in older adults (Sahyoun *et al*., 2003), but it is not known if the HEI is an indicator of a low-caries-risk diet in young children.

Table 1. Distribution of Demographic/Behavioral Characteristics and ECC Prevalence: United States, 1988-1994 (n = 3912)

Characteristic	%	SE, %
Age (yrs)		
2 to <3	25.0	0.7
3 to <4	24.7	1.0
4 to <5	24.0	1.0
5 to <6	26.3	1.0
Race/Ethnicity		
Non-Hispanic White	63.1	1.7
Non-Hispanic Black	15.9	1.3
Mexican-American	9.9	0.9
Other	11.1	1.7
Education of Reference Person		
<12 yrs	24.7	1.3
12 yrs	33.4	1.6
>12 yrs	41.9	2.0
Poverty Income Ratio		
Less than 1.3	36.0	1.7
1.3 to <1.85	13.6	1.1
1.85 or greater	50.4	1.5
Recent Dental Visit?		
No recent visit	56.1	1.4
Visit within preceding year	43.9	1.4
Eats Breakfast Every Day?		
No	46.9	1.5
Yes	53.1	1.5
Stopped Bottle Feeding by 12 Mos?		
Yes	46.9	1.5
No	53.1	1.5
Infant Feeding		
Breast only	4.7	0.7
Bottle only	46.4	1.9
Breast and bottle	49.0	1.8
Simple ECC[1]		
No	76.2	1.4
Yes	23.7	1.4
Severe ECC[2]		
No	84.6	1.0
Yes	15.4	1.0
Maxillary ECC[3]		
No	89.1	0.9
Yes	10.9	0.9

[1] Simple ECC is defined as the presence of 1 or more decayed, missing, or filled tooth surfaces in any primary tooth in a child under 6 yrs of age.

[2] Severe ECC is defined as any sign of smooth-surface caries in children under 3 yrs of age; 1 or more cavitated, missing, or filled smooth surfaces in primary maxillary anterior teeth in children between the ages of 3 and 5; or decayed, missing, or filled scores of ≥ 4 (ages 3 to < 4), ≥ 5 (ages 4 to < 5), or ≥ 6 (ages 5 to < 6).

[3] Maxillary ECC is defined as 1 or more cavitated, missing, or filled smooth surfaces in primary maxillary anterior teeth in children under 6 yrs of age.

With low income related to nutrition and ECC and poor eating habits related to ECC, we postulated that low income, poor eating habits, nutrition, and ECC are closely interrelated. In an effort to validate a suspected link among these variables scientifically, in this study we examined the relationship of the HEI to ECC while taking into account racial and socio-economic differences.

MATERIALS & METHODS

Institutional Review Board

The Third National Health and Nutrition Examination Survey (NHANES III) has undergone Institutional Review Board (IRB) approval by the National Center for Health Statistics IRB and included written informed consent.

Healthy Eating Index (HEI)

The U.S. Department of Agriculture developed the HEI to provide a measure of the overall quality of an individual's diet based on recommendations in the Dietary Guidelines for Americans. The HEI is comprised of 10 component scores, each ranging from 0 (poor) to 10 (good). The first 5 components measure the degree to which a person's diet conforms to the Food Guide Pyramid serving recommendations for Grain, Vegetable, Fruit, Milk, and Meat groups. Components 6 and 7 measure compliance with recommended intake of total fat and saturated fat, respectively, as a percent of total food energy intake. Components 8 and 9 reflect compliance with recommended total cholesterol and total sodium intakes. The final component, Variety, represents the number of different food items in a person's diet *per* day. Criteria are set for each component for a score of 10, indicating good compliance, as well as for a minimum score of 0. Overall, the HEI is a sum of the components with a possible score of 0 to 100. The food group scores are based on recommended energy intake for age and gender. Since children require fewer calories than adults, the minimum number of servings was kept to reflect the Food Guide Pyramid recommendations, although the serving sizes were adjusted. HEI scores were derived from 24-hour recall data obtained in interviews with the child's parent or caregiver.

NHANES III

The Third National Health and Nutrition Examination Survey (NHANES III) is a survey conducted by the National Center for Health Statistics between 1988 and 1994 based on a complex, multi-stage sample plan. It was designed to provide national estimates of the health and nutritional status of the United States' civilian, non-institutionalized population over the age of 2 months. Examinations were performed by calibrated physicians and dentists, and extensive health, social, and nutritional histories were obtained by interviews with the children or their parents. Our study population consisted of 3912 children who were at least 2 to 5 years of age with complete dental and HEI records that were included in the data released by the National Center for Health Statistics (NCHS, 2000).

Poverty Income Ratio

Poverty Income Ratio (PIR) is the ratio of household income to the threshold income for poverty. The selection of categories for PIR reflects the cut-off points at which a person qualifies for food stamps (PIR < 1.3) (Food and Nutrition Service-1) and special supplemental food program for Women, Infants, and Children (WIC) (PIR < 1.85) (Food and Nutrition Service-2) (USDA, 2007a,b).

Table 2. ECC Prevalence by Demographic and Behavioral Characteristics by 3 Definitions of ECC: United States, 1988-1994 (n = 3912)

	Simple ECC, %	*p*	Severe ECC, %	*p*	Maxillary ECC, %	*p*
Age (yrs)						
2 to < 3	8.6		6.7		6.7	
3 to < 4	17.6		12.6		9.9	
4 to < 5	29.4		19.2		12.2	
5 to < 6	38.7	< 0.001	22.7	< 0.001	14.7	< 0.001
Race/Ethnicity						
Non-Hispanic White	18.0		10.7		6.9	
Non-Hispanic Black	28.7		17.4		11.9	
Mexican-American	39.7		27.4		22.7	
Other	34.9	< 0.001	28.4	< 0.001	21.6	< 0.001
Education of Reference Person						
<12 yrs	35.1		25.3		18.6	
12 yrs	23.7		15.6		11.8	
>12 yrs	16.8	< 0.001	9.0	< 0.001	5.5	< 0.001
Poverty Income Ratio						
Less than 1.3	34.9		23.5		18.4	
1.3 to <1.85	24.3		16.5		10.6	
1.85 or greater	14.9	< 0.001	8.7	< 0.001	4.9	< 0.001
Recent Dental Visit?						
No recent visit	19.2		12.8		10.7	
Visit within preceding year	29.5	< 0.001	18.7	0.002	11.2	0.684
Eats Breakfast Every Day?						
No	34.6		21.3		14.9	
Yes	22.5	0.001	14.7	0.039	10.5	0.065
Stopped Bottle by 12 Mos?						
No	26.5		17.6		12.4	
Yes	20.5	0.019	13.0	0.033	9.1	0.053
Infant Feeding[1]						
Breast only	24.1		11.3		9.5	
Bottle only	26.8		17.8		12.4	
Breast and bottle	20.7	0.095	13.4	0.019	9.5	0.143

[1] When "Bottle Only" infant feeding was compared with the "Breast Only" and "Breast and Bottle" categories collapsed into one category, children with a history of "Bottle Only" infant feeding had a significantly higher prevalence of ECC for all 3 definitions, with $P = 0.008$, $P = 0.001$, and $P = 0.024$ for ECC (any deciduous), severe ECC (AAPD), and ECC (maxillary incisors only), respectively.

Definition of Early Childhood Caries (ECC)

Various systems of classification have been used to define Early Childhood Caries (ECC) (Drury *et al*., 1999; Psoter *et al*., 2003; Pendrys *et al*., 2004). Two commonly accepted classifications for ECC include simple ECC and severe ECC, as defined by the American Academy of Pediatric Dentistry (AAPD, 2008). These two definitions, along with a modified definition for ECC limited to maxillary primary incisors, were used for this study as follows:

(1) Simple ECC (any deciduous)—presence of 1 or more decayed, missing, or filled tooth surfaces in any primary tooth in a child under 6 yrs of age.

(2) Severe ECC (AAPD)—any sign of smooth-surface caries in children under 3 yrs of age; 1 or more cavitated, missing, or filled smooth surfaces in primary maxillary anterior teeth in children between the ages of 3 and 5; or decayed, missing, or filled scores of ≥ 4 (ages 3 to < 4), ≥ 5 (ages 4 to < 5), or ≥ 6 (ages 5 to < 6).

(3) Maxillary ECC (maxillary incisors)—1 or more cavitated, missing, or filled smooth surfaces in primary maxillary anterior teeth in children under 6 yrs of age.

Statistical Analysis

All statistical analyses were conducted according to survey procedures in SAS 9.13 to accommodate complex survey design. Distributions of demographic and behavioral characteristics were calculated. ECC prevalence for all 3 definitions was calculated by demographic and behavioral characteristics. The Rao-Scott chi-squared test of independence was used to test for associations between demographic/behavioral characteristics and ECC prevalence for each definition of ECC. Means and 95% confidence intervals were calculated for total HEI and each component of the HEI by ECC status for each definition of ECC. Comparisons of total HEI and each component of the HEI by ECC status were conducted with adjustment for weighting, stratification, and clustering to adjust for complex survey design.

For further analysis of the association of the HEI to ECC while adjusting for significant confounders, we fit a base multiple logistic regression model for each definition of ECC, with all demographic and behavioral characteristics that were significant at $\alpha = 0.10$ retained as significant confounders. Final multiple logistic regression models were then fit with tertiles of the HEI added to the base model, for estimation of the effect of the HEI on ECC prevalence for each definition of ECC while adjusting for all significant confounders. All modeling was conducted with adjustment for weighting, stratification, and clustering to accommodate complex survey design.

RESULTS

Distributions of demographic/behavioral characteristics and ECC prevalence for the 2- to 5-year-old children included in our study are given in Table 1.

Table 3. Descriptive Statistics for Components of the Healthy Eating Index (HEI) and Added Sugar by ECC Status for Three Definitions of ECC: United States, 1988-1994 (n = 3912)

	Simple ECC		Severe ECC		Maxillary ECC	
	Mean (95% CI)	*P*	Mean (95% CI)	*P*	Mean (95% CI)	*p*
Overall HEI						
No ECC	70.6 (69.7,71.6)		70.5 (69.5,71.5)		70.3 (69.3,71.3)	
ECC	67.6 (66.4,68.8)	< 0.001	66.7 (65.2,68.2)	< 0.001	66.9 (64.9,68.9)	< 0.001
Grain HEI						
No ECC	7.89 (7.76,8.02)		7.87 (7.74,8.00)		7.81 (7.67,7.94)	
ECC	7.42 (7.16,7.67)	0.002	7.30 (6.95,7.65)	0.006	7.56 (7.12,8.00)	0.087
Vegetable HEI						
No ECC	4.87 (4.64,5.09)		4.87 (4.65,5.09)		4.85 (4.62,5.07)	
ECC	4.84 (4.47,5.21)	0.897	4.81 (4.36,5.26)	0.781	4.95 (4.39,5.51)	0.609
Fruit HEI						
No ECC	6.29 (5.96,6.62)		6.20 (5.84,6.56)		6.13 (5.76,6.51)	
ECC	5.19 (4.61,5.78)	< 0.001	5.08 (4.52,5.64)	< 0.001	5.19 (4.58,5.81)	< 0.001
Dairy HEI						
No ECC	8.14 (8.00,8.27)		8.15 (8.03,8.27)		8.11 (7.99,8.23)	
ECC	7.75 (7.47,8.04)	0.023	7.45 (7.16,7.74)	< 0.001	7.51 (7.13,7.90)	< 0.001
Meat HEI						
No ECC	6.03 (5.79,6.27)				6.07 (5.85,6.29)	
ECC	6.42 (6.15,6.69)	0.025	6.49 (6.12,6.87)	0.057	6.58 (6.14,7.02)	0.004
Total Fat HEI						
No ECC	7.19 (6.97,7.41)		7.17 (6.95,7.38)		7.15 (6.94,7.37)	
ECC	6.89 (6.58,7.21)	0.104	6.84 (6.40,7.27)	0.184	6.80 (6.25,7.35)	0.082
Saturated Fat HEI						
No ECC	5.29 (5.06,5.53)		5.28 (5.06,5.51)		5.29 (5.07,5.52)	
ECC	5.31 (4.90,5.73)	0.931	5.36 (4.86,5.87)	0.747	5.33 (4.71,5.95)	0.867
Cholesterol HEI						
No ECC	9.00 (8.79, 9.21)		8.97 (8.77,9.18)		8.98 (8.78,9.18)	
ECC	8.61 (8.36,8.86)	0.005	8.54 (8.26,8.81)	0.002	8.34 (7.96,8.71)	< 0.001
Sodium HEI						
No ECC	8.39 (8.21,8.57)		8.32 (8.13,8.51)		8.32 (8.14,8.51)	
ECC	7.77 (7.41,8.13)	0.001	7.81 (7.22,8.41)	0.113	7.60 (6.83,8.37)	0.002
Variety HEI						
No ECC	7.73 (7.51,7.95)		7.78 (7.57,7.99)		7.76 (7.55,7.97)	
ECC	7.54 (7.20,7.88)	0.335	7.15 (6.70,7.61)	0.014	7.12 (6.55,7.68)	0.002
Added Sugar (tsps)						
No ECC	37.5 (35.8,39.3)		37.5 (35.8,39.1)		37.3 (35.7,38.9)	
ECC	35.7 (33.7,37.6)	0.165	34.9 (32.6,37.3)	0.097	35.5 (33.0,38.1)	0.282

The criteria used to define ECC influenced the frequency distribution in all categories, although trends were similar for all definitions. ECC prevalence was greatest among the oldest children (ages 5-6 yrs), Mexican-American children, and children classified as "Other" for race/ethnicity. High ECC prevalence was also noted among children with the following characteristics: a parent or guardian with < 12 yrs of education, a family with a Poverty Income Ratio (PIR) < 1.3, a dental visit within the preceding year, does not eat breakfast daily, did not stop bottle feeding by 12 mos, and were only bottle-fed (Table 2).

Along with adjustment for complex survey design, means and 95% confidence intervals were calculated for total HEI, components of the HEI, and added sugar by ECC status for each definition of ECC (Table 3). The overall HEI score was significantly associated with ECC for all definitions ($P < 0.001$). For HEI components, with the exception of Meat, children with no ECC tended to have higher scores, although not all differences were statistically significant. All ECC definitions demonstrated a significant association between high Fruit, Dairy, and Cholesterol HEI scores and a reduced likelihood of ECC. Grain, Sodium, and Variety HEI scores were also significantly higher among young children with no ECC, compared with those with ECC, for at least two of the definitions of ECC. Added sugar was not significantly associated with a higher prevalence of ECC for any definition (Table 3).

For further evaluation of the relationship of the HEI to ECC, a base model of putative confounders associated with ECC under each definition was fit (Table 4). Two sets of multiple logistic regression models were then fit by addition of the HEI to the base model for each ECC definition: (1) HEI included as a continuous measure and (2) HEI in tertiles. For simple ECC, increased HEI was not significantly associated with a decreased risk of ECC ($P = 0.196$ for continuous HEI, $P = 0.089$ for HEI in tertiles). For severe ECC, increased HEI was significantly associated with a decreased risk of severe ECC ($P = 0.044$ for continuous HEI, $P = 0.012$ for HEI in tertiles). Children with the best diets (third tertile of HEI) were 44% less likely to have severe ECC compared with children with the worst diets (first tertile of HEI) ($P = 0.009$). For ECC in maxillary incisors only, increased HEI was not significantly associated with a decreased risk of ECC ($P = 0.144$ for continuous HEI and $P = 0.208$ for HEI in tertiles).

DISCUSSION

Severe ECC is an insidious form of dental caries that affects very young children. Whereas certain feeding patterns, such as

Table 4. Odds Ratios for Association of Total Healthy Eating Index to ECC with Adjustment for All Significant Confounders

	Simple ECC			Severe ECC			Maxillary ECC		
	OR	95% CI	*p*	OR	95% CI	*p*	OR	95% CI	*p*
Age (yrs)									
2 to <3	Ref.	-		Ref.	-		Ref.	-	
3 to <4	2.14	(1.28, 3.56)		1.77	(1.00,3.14)		1.49	(0.89,2.49)	
4 to <5	3.80	(2.35, 6.14)		2.34	(1.32,4.16)		1.71	(1.05,2.79)	
5 to <6	6.07	(3.93, 9.36)	< 0.001	3.20	(1.76,5.80)	< 0.001	2.36	(1.33,4.17)	0.011
Race/Ethnicity									
Non-Hispanic White	Ref.	-		Ref.	-		Ref.	-	
Non-Hispanic Black	1.49	(0.98, 2.26)		1.28	(0.82,1.97)		1.20	(0.76,1.91)	
Mexican-American	2.63	(1.83, 3.79)		2.22	(1.56,3.16)		2.66	(1.82,3.88)	
Other	2.05	(1.06, 3.94)	< 0.001	2.57	(1.26,5.22)	< 0.001	2.52	(1.25,5.08)	< 0.001
Education of Reference Person									
<12 yrs				Ref.	-				
12 yrs				0.82	(0.48,1.40)				
>12 yrs	-	-	-	0.54	(0.35,0.84)	0.015	-	-	-
Poverty Income Ratio									
Less than 1.3	Ref.	-		Ref.	-		Ref.	-	
1.3 to <1.85	0.69	(0.45,1.05)		0.89	(0.58,1.38)		0.64	(0.41,1.00)	
1.85 or greater	0.35	(0.23,0.52)	< 0.001	0.44	(0.27,0.73)	0.001	0.29	(0.17,0.49)	< 0.001
Recent Dental Visit?									
No recent visit	Ref.	-		Ref.	-				
Visit within preceding 12 months	1.55	(1.13, 2.13)	0.006	1.66	(1.13,2.45)	0.011	-	-	-
Eats Breakfast Every Day?									
No	Ref.	-			-				
Yes	0.57	(0.37, 0.88)	0.012	-	-	-	-	-	-
Tertiles of HEI[1]									
1st Tertile	Ref.	-		Ref.	-		Ref.	-	
2nd Tertile	1.04	(0.78,1.39)		0.96	(0.66,1.38)		0.84	(0.57,1.23)	
3rd Tertile	0.74	(0.54,1.02)	0.082	0.56	(0.37,0.87)	0.012	0.65	(0.41,1.05)	0.208

[1] Multiple logistic regression models with total HEI included as a continuous covariate yielded the following results: (for simple ECC) For every 10-point increase in total HEI, there was a 6.2% reduction in the prevalence of simple ECC ($P = 0.196$); (for severe ECC) for every 10-point increase in total HEI, there was a 12.3% reduction in the prevalence of severe ECC ($P = 0.044$); and (for maxillary ECC) for every 10-point increase in total HEI, there was a 10.5% reduction in the prevalence of simple ECC ($P = 0.144$).

"at will" breast feeding and bedtime bottle feeding, have long been known to be risk factors for ECC, current research has demonstrated that other factors may also play a role. In particular, low income, race/ethnicity, poor diet, and other poor eating habits have been identified in previous studies as risk factors for ECC. Our study investigated the relationship of dietary guidelines presented in the food pyramid as measured by the Healthy Eating Index to the prevalence of ECC while accounting for low income, race/ethnicity, and other poor eating habits. Based on our study, high scores for the fruit, dairy, and cholesterol components of the Healthy Eating Index were consistently associated with a reduced prevalence of ECC, regardless of the definition used, while grain, sodium, and variety were associated with a reduced risk of ECC for two of the three definitions. For the fruit, dairy, and grain components, high scores corresponded to increased intake of these products, while high scores for cholesterol and sodium corresponded to lesser intakes of these nutrients. Characteristics of individual nutrients abundant in these food groups may influence the risk of caries. The cariostatic properties of dairy products have been well documented in the literature (Jensen and Wefel, 1990; Ahola *et al*., 2002; Kashket and DePaola, 2002). Fruits contain fiber and polyphenols that may interfere with plaque formation and production of acids by oral bacteria (Touger-Decker and van Loveren, 2003). The total Healthy Eating Index may also be a reflection of an overall dietary pattern in which fruits, grains, and dairy are consumed frequently, displacing meat products and processed foods that tend to have added sugar and sodium.

The overall Healthy Eating Index and its components have limitations with regard to the study of caries. A perfect score of 10 is given when the minimum recommended number of servings in each food group is consumed, but it may also include children with excess consumption, such as excess fruit juice. There is no separate component for sweets as there is in the Food Guide Pyramid, which might result in better discrimination between healthy children and those with ECC. Even with these limitations, the results of this analysis indicate there is a significant relationship between adherence to general healthy eating guidelines and a reduced likelihood of severe ECC in young children. A strength of the Healthy Eating Index is that it is derived from a 24-hour food recall, so an accurate "snapshot" of the child's diet and how well it conforms to the food pyramid is obtained.

Just as low income is a risk factor for ECC, low income is also related to poor eating habits. In Minnesota's Project EAT, low socio economic status was found to be strongly associated with low intake of fruits and vegetables in adolescents (Neumark-Sztainer *et al.*, 2003). In addition to the impact of income on dietary patterns, racial and cultural differences also contribute to differences in eating habits. In a study comparing the eating habits of residents of the Mississippi delta region with those in the rest

of the U.S., people living in the Mississippi delta region had generally poorer eating habits in terms of adhering to the food pyramid recommendations. In this same study, it was found that black adults consumed a less-optimal diet than their white counterparts in the Mississippi delta region. Although the children of the Mississippi delta region reported diets that were more comparable with those of the rest of the U.S., inadequacies in certain vitamins and minerals were noted (Champagne *et al*., 2004).

In summary, the Healthy Eating Index is a predictor of the prevalence of severe ECC, independent of race/ethnicity and socio-economic status. These findings highlight the value of providing a consistent message about diet to the public, and may suggest other strategies to prevent ECC in vulnerable segments of the population.

ACKNOWLEDGMENTS

This research was supported by NIH/NIDCR Grants U54 DE 014264, U54 DE 019275, and K24 DE 00419.

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