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# Diet Quality of Children Age 2-17 Years as Measured by the Healthy Eating Index-2010

## Nutrition Insight 52

### INTRODUCTION

A good quality diet is a major contributing factor to the health and well-being of children and adolescents. Children's dietary health, in particular poor eating patterns which could lead to childhood obesity, is one of the most pressing public health problems. Obese youths are more likely to have risk factors for cardiovascular disease, such as high cholesterol or high blood pressure. Children and adolescents who are obese are likely to become obese as adults and are therefore more likely to continue risk factors such as heart disease, type 2 diabetes, stroke, several types of cancer, and osteoarthritis into adulthood (Centers for Disease Control and Prevention, 2013).

The Healthy Eating Index-2010 (HEI-2010) (Guenther et al., 2013) is a dietary assessment tool comprising 12 components designed to measure quality in terms of how well diets meet the recommendations of the *2010 Dietary Guidelines for Americans* (U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010) and the USDA Food Patterns (Britten et al., 2012). The HEI-2010 total and component scores are averages across all children. Nine components of the HEI-2010 address nutrient adequacy. The remaining three components assess refined grains, sodium, and empty calories, all of which should be consumed in moderation, that is, in limited quantities. For adequacy components, a score of zero is assigned for no intake, and the scores increase proportionately as intakes increase up to the standard. For moderation components, a reverse scoring is applied; that is, levels of intakes at the standard get the maximum score, with scores decreasing as intakes increase. Component scores can range from 0-5, 0-10, or 0-20, with a maximum total score of 100.

A score corresponding to 100 percent indicates that the recommendation on average was met or exceeded. For the adequacy components, higher scores reflect higher intakes. For the moderation components, higher scores reflect lower intakes because lower intakes are more desirable. For all components, a higher percentage indicates a higher quality diet. "Empty calories" refers to calories from solid fats (i.e., sources of saturated fats and trans fats) and added sugars (i.e., sugars not naturally occurring) plus calories from alcohol beyond a moderate level.

The purpose of this Nutrition Insight is to compare the quality of the diet of children ages 2-17 years during 2003-04, 2005-06

and 2007-08 to Federal recommendations by utilizing the HEI-2010. The component and total scores are presented both as an absolute number and as a percentage of the maximum possible score.

### METHODS

#### *Study Sample*

The HEI-2010 scores were estimated using 1 day of dietary intake data provided by participants in the National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, National Center for Health Statistics, 2012). The dietary data were collected by trained interviewers using the United States Department of Agriculture Automated Multiple Pass Method, which is standardized, computer-assisted, and validated. The study sample included children who had complete and reliable dietary intake records. Participants were comprised of 2,996, 3,237, and 2,703 children who participated in the 2003-2004, 2005-2006, and 2007-2008 NHANES, respectively. Children under the age of 2 years were excluded because the Dietary Guidelines for Americans do not apply to them, and breast-fed and formula-fed children were excluded because food-group intake data for them are incomplete.

#### *Calculating HEI-2010 Scores*

Intakes of energy, fatty acids, sodium, and alcohol (for the few participants who reported it) were calculated using the Food and Nutrient Database for Dietary Studies, versions 1.0 and 4.1 (USDA Agricultural Research Service, 2012a). Food group intakes for 2003-08 were calculated using the MyPyramid Equivalents Database, version 2.0 (USDA Agricultural Research Service, 2012b); CNPP's addendum to that database (Koegel and Kuczynski, 2011); and the CNPP 2003-04 fruit database.

#### *Statistical Analyses*

Data were analyzed by the Survey Data Analysis System (SUDAAN) software (SAS-Callable SUDAAN, version 10.0.1 for WINDOWS), using the Proc Ratio procedure. Sampling weights were applied that account for the survey sample design, non-response, and day of the week. The mean of 1-day intakes is a good estimate of the mean "usual," or long-term daily average, intake of a population when it is properly estimated; that is, when the days of the week and seasons of the year are represented correctly (Freedman et al., 2008). This is the case in NHANES when the appropriate weighting factors are used. Therefore, estimates of HEI-2010

**Table. The quality of American children's diets, as measured by the Healthy Eating Index-2010**

Dietary component (maximum score)	2003-04 <sup>1</sup>	2005-06 <sup>1</sup>	2007-08 <sup>1</sup>
	Score (%)	Score (%)	Score (%)
<b>Adequacy (higher score indicates higher consumption)</b>			
Total Fruit (5)	3.3 (66)	3.4 (68)	4.0 (80)*
Whole Fruit (5)	2.9 (58)	3.4 (68)	4.6 (92)*
Total Vegetables (5)	2.3 (46)	2.3 (46)	2.3 (46)
Greens and Beans (5)	0.7 (14)	0.8 (16)	0.9 (18)
Whole Grains (10)	1.6 (16)	1.7 (17)	1.8 (18)
Dairy (10)	8.6 (86)	8.4 (84)	8.3 (83)
Total Protein Foods (5)	4.0 (80)	4.1 (82)	4.2 (84)
Seafood and Plant Proteins (5)	2.4 (48)	2.4 (48)	2.1 (42)
Fatty Acids (10)	3.1 (31)	2.9 (29)	3.0 (30)
<b>Moderation (higher score indicates lower consumption)</b>			
Refined Grains (10)	4.5 (45)	4.3 (43)	4.6 (46)
Sodium (10)	5.5 (55)	5.1 (51)	5.0 (50)
Empty Calories (20)	8.0 (40)	8.3 (42)	9.0 (45)**
<b>Total Score (100)</b>	<b>46.9 (47)</b>	<b>47.1 (47)</b>	<b>49.8 (50)</b>

<sup>1</sup> Excludes children under 2 years of age and breast- and formula-fed children.

\* Significantly different from 2003-04 and 2005-06 (P<0.05).

\*\* Significantly different from 2003-04 (p<0.05).

scores were based on the subpopulations' mean usual intake. The HEI-2010 scores were calculated in Microsoft Excel (2007). Differences among the three time periods were tested for statistical significance (p < 0.05).

## RESULTS

The total Healthy Eating Index-2010 score is a measure of overall diet quality. For children ages 2-17 years in 2003-04, 2005-06 and 2007-08, total scores ranged from 47 to 50 percent of the maximum score, and the differences were not statistically significant. The average scores for all the components of the HEI-2010 were below the standards. Dairy (milk and milk products) and Total Protein Foods (meat, fish, poultry, eggs, etc.) scores were closest to the standards (83-86 percent and 80-84 percent, respectively). Scores for Greens and Beans and Whole Grains were farthest from the standards (14-18 percent and 16-18 percent, respectively). This meant that 2-17-year-olds consumed far less than the recommended levels of dark-green vegetables and beans and of whole grains. On average, the component scores were similar across the three time periods for most components. For the adequacy components, Total Fruit (which includes 100 percent fruit juice) and Whole Fruit, intakes were significantly higher in 2007-2008, than in 2003-2004 or in 2005-2006. For the moderation component, empty calories intakes were significantly lower in 2007-2008, than in 2003-2004. All of these changes resulted in an increase in scores.

## CONCLUSIONS

The diet quality of children and adolescents fell short of recommendations. The diet quality scores of children and adolescents would be improved by increasing the intake of vegetables, especially dark greens and beans; replacing refined grains with whole grains, substituting seafood for some meat and poultry;

and decreasing the intake of sodium (salt) and empty calories from solid fats and added sugars.

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