

# Visualizing Diet Quality at Multiple Levels of the Food Stream

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## Summary

The Healthy Eating Index-2010 (HEI-2010) is emerging as a key indicator of the construct of diet quality in dietary research, policy analysis, and health promotion. This project is designed to provide a visual representation of different HEI-2010 scores at each level of the food stream; photographs of different sets of foods are posted on the National Collaborative on Childhood Obesity Research (NCCOR) website.<sup>1</sup> These photographs can provide a basic understanding of diet quality for a lay audience and encourage a more in-depth analysis by researchers, practitioners, and policy makers working in the fields of nutrition and health promotion.<sup>2</sup>

## Visualizing Diet Quality at Multiple Levels of the Food Stream

Every five years, the U.S. Department of Agriculture (USDA) and U.S. Department of Health and Human Services jointly issue an updated *Dietary Guidelines for Americans* (DGA), which serves as a statement of federal nutrition policy in the United States.<sup>3</sup> To assess diet quality in relation to these guidelines, the USDA and the National Cancer Institute developed a scoring metric called the Healthy Eating Index-2010 (HEI-2010).<sup>4</sup>

Researchers can use the numerical scores (both component and total) generated by the HEI-2010 to evaluate diet quality at any level of the food stream. HEI-2010 scores are derived via an algorithm that involves ratios, truncation, and weighting and, consequently, can seem somewhat abstract.

To help researchers and the general public visualize what different scores represent, we photographed different sets of foods at three levels of the food stream. These pictures and additional details are available on the National Collaborative on Childhood Obesity Research (NCCOR) website.<sup>5</sup>

## BACKGROUND

### HEI-2010

The HEI-2010 is comprised of 12 components that sum to a maximum total score of 100. Because USDA food pattern recommendations for amounts of food groups, oils, and empty calories are couched in terms of absolute amounts that vary according to energy level, the HEI-2010 scores use standards that are expressed as either a percent of calories or per 1,000 calories. This “density” approach uncouples diet quality from quantity. The one exception is fatty acids, which are expressed as a ratio of unsaturated fatty acids to saturated fatty acids.

All of the key DGA food choice recommendations that relate to diet quality are reflected in HEI-2010’s 12 components. Nine of the components focus on adequacy (dietary components to increase) and three focus on moderation (dietary components to decrease).

The performance of the HEI-2010 has been evaluated through an assessment of its content validity, construct validity, and reliability.

## Food Stream

Individuals do not make food choices in isolation. Rather, their eating behaviors are influenced by a myriad of contextual factors, including what types of food are available to them where they live, work, and shop. The food stream refers to the flow of foods from agricultural production, through processing and distribution channels, to the food that ends up on our plates.

Increasingly, nutrition researchers are realizing that if we can characterize all the points (sometimes referred to as “levels”) along the food stream, we can build a better understanding of influences on consumer behavior. For example, examining the healthfulness of the U.S. food supply, the output from major producers, the menu of offerings in a school system, sales in a local grocery store, or individual-level diets could provide insights into the extent to which individuals have the capacity to make food choices that are consistent with the dietary guidelines.

For this project, we chose to focus on three levels of the food stream: national food supply, community food environment, and individual intake.

## PROJECT DESCRIPTION

### National Food Supply

For the national food supply level, we used the 2010 Loss-Adjusted Food Availability Data from the USDA Economic Research Service (ERS) to compare current food amounts per person per day with improved amounts.<sup>6</sup> The “current” food supply data produced an HEI score of 55, and we created an “improved” food supply list with an HEI score of 100. To do so, we modified food amounts in each food category to align with HEI standards for maximum scores.

For example, the HEI standards for the Total Fruit component require at least 1.8 cup-equivalents per capita for a maximum score, with 0.9 cup-equivalents coming from the

Whole Fruit sub-component; our ideal food list contains 1.8 cup-equivalents of Total Fruit, including 0.9 cup-equivalents of Whole Fruit. We then chose representative amounts of the most commonly produced food types for the actual list and the ideal list in each food category; for Total Fruit, we used apples, bananas, and melons.

### Community Food Environment

To depict community-level diet quality, we created two virtual shopping baskets to approximate \$100 worth of groceries purchased from a mid-priced, non-specialty national chain grocery store; one basket represents a “typical” grocery list (HEI score: 49) and one represents an “improved” grocery list (HEI score: 92). We targeted the expenditures for the two baskets to match the average (typical) and recommended (improved) breakdowns of expenditures by grocery item category provided in an earlier study.<sup>7</sup> For example, the study identified a typical expenditure of 1.33 percent in the category “Eggs and egg mixtures,” and our expenditure on eggs was \$1.29 (out of \$100) for the typical basket.

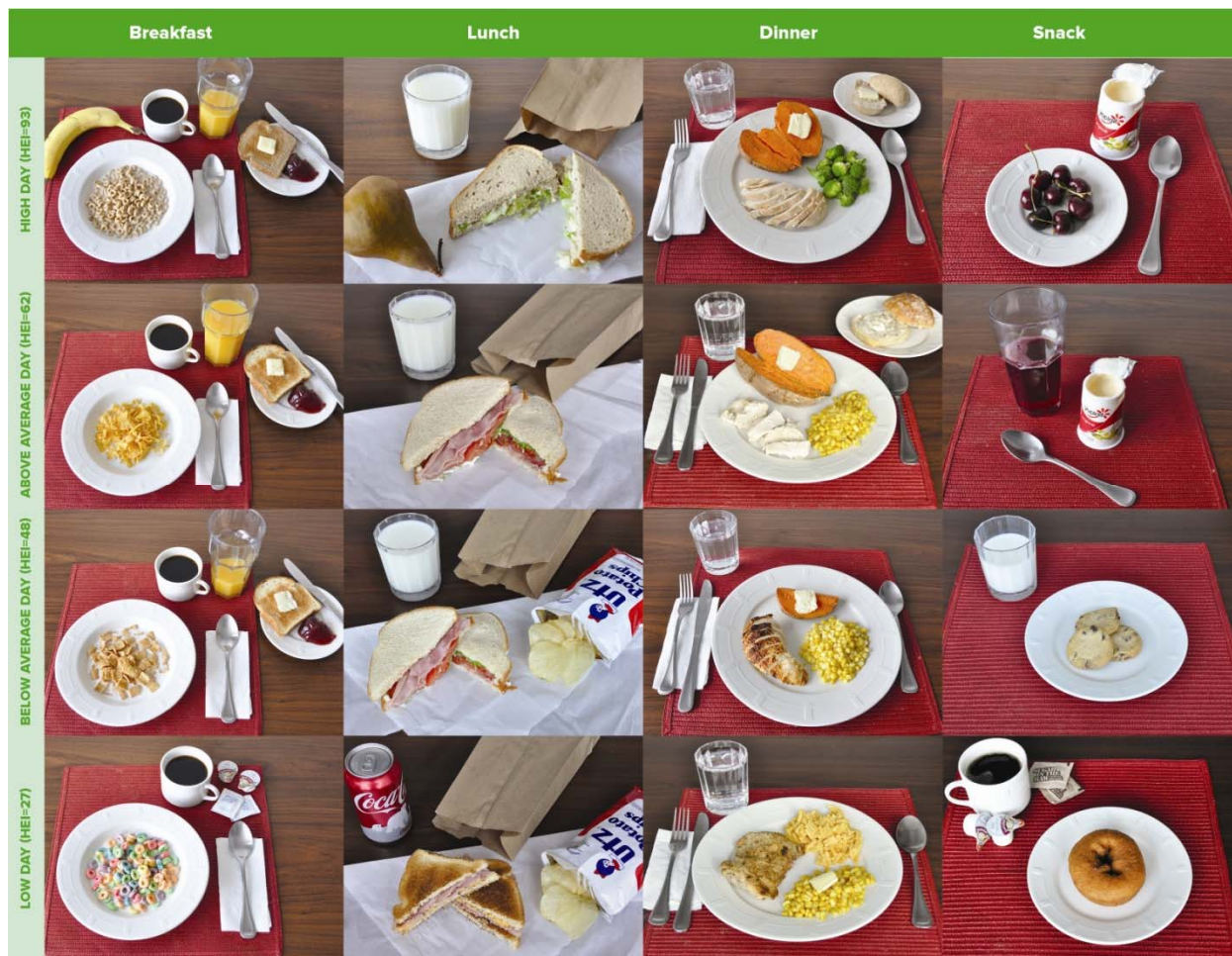
### Individual Intake

At the individual level, we created four one-day sample menus, all around 2000 calories but with varied HEI scores: “high,” “above average,” “below average,” and “low.” For the high HEI score, we used one of the exemplary menus on the USDA Center for Nutrition Policy and Promotion’s website and made several small changes to lower the HEI score of each additional menu so that the various menus would be fairly similar but with observable modifications that illustrate differences in HEI scores.

For example, all four breakfasts include some type of cereal and milk. In the high HEI menu, the breakfast is Cheerios® with skim milk; the above average menu contains Corn Flakes® with skim milk; the below average menu contains Cinnamon Toast Crunch® with 2% milk; and the low menu contains Froot Loops® with 2% milk. These and other

changes allowed us to keep the calories close to 2000 per day ( $\pm 150$ ), while showing how incremental differences in menus would affect HEI scores. *Figure 1* shows the photographic

comparison of these four menus; photographs depicting the national food supply and community food environment levels are available on the NCCOR website.



**Figure 1. Individual level menus for four HEI scores: High, Above Average, Below Average, and Low.**

### IMPLICATIONS FOR PROMOTION, POLICY, AND PRACTICE

Although this project targeted researchers interested in employing the HEI-2010, we believe that it can be an effective tool for members of the general public, health practitioners, and policy makers. The general public may use the photographs to discern what distinguishes a high quality diet from others that are closer to average and may therefore be able to make changes in their

personal dietary intake. For health practitioners, particularly in the field of health promotion, these photos may serve as an easily accessible educational tool for patients or other members of a lay audience. Lastly, at both the local and national levels, policy makers may be able to identify key areas for improvements in food availability, food production, and food importing/exporting.

Additionally, researchers can extend this visualization approach to other settings where

measures of diet quality are relevant. For example, pictures of offerings in restaurants, hospitals, or child-care facilities and their associated scores could help highlight both challenges and successes in providing access to healthy food. These pictures could also serve as the starting blocks for creating a repository of images that show diet quality in the United States.

Ultimately, these photographs illustrate the strong disconnect between the *Dietary Guidelines* and the nutritional realities facing consumers, whether at the national food supply level or the individual intake level. Improving American diet quality will require making real changes in the foods available at all levels of the food stream, thus ensuring consistency with federal recommendations.

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## CITATIONS

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<sup>1</sup> <http://nccor.org/projects/hei/photos.php>

<sup>2</sup> The authors would like to acknowledge the contributions of the NCCOR Coordinating Center at FHI 360 and the photographs taken by Leanne Gray and the FHI 360 Design Lab.

<sup>3</sup> USDA. Dietary Guidelines for Americans. <http://www.cnpp.usda.gov/healthyeatingindex.htm>. Accessed January 21, 2015.

<sup>4</sup> National Cancer Institute. HEI-2010. <http://riskfactor.cancer.gov/tools/hei/>. Accessed January 21, 2015.

<sup>5</sup> <http://nccor.org/projects/hei/photos.php>

<sup>6</sup> USDA. Food Availability (Per Capita) Data System. [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system.aspx). Accessed January 21, 2015.

<sup>7</sup> Volpe, Richard, and Abigail Okrent. *Assessing the Healthfulness of Consumers' Grocery Purchases*, EIB-102, U.S. Department of Agriculture, Economic Research Service, November 2012.