Assessing foods offered in the Food Distribution Program on Indian Reservations (FDPIR) using the Healthy Eating Index 2010

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This is a postprint of an article that originally appeared in Public Health Nutrition in August 2015.

Shanks, Carmen Byker, Teresa Smith, Selena Ahmed, and Holley Hunts. "Assessing foods offered in the Food Distribution Program on Indian Reservations (FDPIR) using the Healthy Eating Index 2010." Public Health Nutrition (August 2015): 1-12.
DOI: https://dx.doi.org/10.1017/S1368980015002359

Abstract

Objective To assess the nutritional quality of food packages offered in the Food Distribution Program on Indian Reservations (FDPIR) program using Healthy Eating Index-2010 (HEI-2010).

Design Data were collected from the list of the food products provided by the United States Department of Agriculture's Food and Nutrition Handbook 501 for FDPIR. Nutritional quality was measured through a cross-sectional analysis of five randomly selected food packages offered through FDPIR. HEI-2010 component and total scores were calculated for each food package. Analysis of variance and t-tests assessed significant differences between food packages and HEI-2010 maximum scores, respectively.

Setting This study took place in the United States.

Subjects Study units included food products offered through FDPIR.

Results The mean total HEI-2010 score for the combined FDPIR food packages was significantly lower than the total HEI-2010 maximum score of 100 (66.38, SD=11.60; $p<0.01$). Mean scores for total fruit (3.52, SD=0.73; $p<0.05$), total vegetables (2.58, SD=0.15; $p<0.001$), greens and beans (0.92, SD=1.00; $p<0.001$), dairy (5.12, SD=0.63; $p<0.001$), total protein foods (4.14, SD=0.56; $p<0.05$), and refined grains (3.04, SD=2.90; $p<0.001$) were all significantly lower than the maximum values.

Conclusions The FDPIR food package HEI-2010 score was notably higher than other federal food assistance and nutrition programs. Study findings highlight opportunities for the FDPIR to modify its offerings to best support lifestyles towards prevention of diet-related chronic disease.

Keywords American Indian; Diet; Nutrition; Food assistance; FDPIR; Food access

Introduction

Overweight, obesity, and nutrition-related chronic diseases are complex health conditions influenced by a number of biological, behavioral, environmental, genetic, and personal factors[1]. Improving access to nutrient-dense foods is one key strategy to prevent nutrition-related chronic disease and obesity[2,3]. In the United States (US), access to nutrient-dense foods is particularly a concern in communities with marked health disparities, including those that are rural, urban, limited income, or have high a percentage of minorities[4–9].

For example, American Indians are more likely than the general US population to live in rural locations with limited food access [10]. At the same time, American Indian adults are 60% more likely to be obese than non-Hispanic whites[11]. The consequences of obesity are well documented, including the risk of developing diabetes mellitus[12], which is particularly concerning as American Indian and Alaska Natives have a higher age-adjusted prevalence of diabetes mellitus than any other race or ethnic group in the US[13].

Previous research[14,15] indicates that the modern American Indian diet is poor in nutrient quality and household food security is relatively low[15–17]. Emerging research indicates potential connections between diets poor in nutrient quality, high food insecurity rates, and high obesity and chronic disease rates among American Indians[18,19]. Contemporary food issues observed within Native American populations have been connected to a long and storied history of colonialism and historical trauma[20–22]. With socio-economic, political, and environmental changes including reduction in tribal land, end of nomadic lifestyles, shifts in farming policies, the near extinction of buffalo, and limited rights to hunt, fish, and collect wild foods, the current diet among American Indians has notably transitioned from traditional ways in post-colonial times[23,24].

In effort to address nutrition related challenges faced by American Indian peoples, the US government has supplied food to American Indians living on reservations for over 150 years as well as had a series of food-related agreements[14]. For example, some treaties included "annuities" which granted hunting, fishing, and gathering rights for American Indians[25]. During the period circa 1860 – 1934, the government issued rations to supplement lost sources of wild foods and failed crops[26]. However, some historical documents describe the rations provided by

the government as being culturally inappropriate, inadequate, not delivered as promised, and of low quality[27,28].

The Food Distribution Program on Indian Reservations (FDPIR) was implemented by Congress in 1973 as part of the Consumer Protection Act[29]. The program states, "many households participate in FDPIR as an alternative to the Supplemental Nutrition Assistance Program (SNAP), because they do not have easy access to SNAP offices or authorized food stores"[30]. Through FDPIR, the United States Department of Agriculture (USDA) provides increased access to nutritious foods for low-income households living on Indian reservations and to American Indian families residing in designated areas near reservations[30]. The FDPIR is one of 16 distinct federal food assistance and nutrition programs (FANPs) administered by the Food and Nutrition Service (FNS) of the USDA[31]. The program provides individuals an alternative to the Supplemental Nutrition Assistance Program (SNAP) enrollment by directly distributing commodity packages in communities and striving to meet basic nutrient needs of program participants[30].

The USDA administers the FDPIR program through either Indian Tribal Organizations (ITOs) or an agency of a state government[32]. The USDA purchases and ships FDPIR foods to the ITOs and state agencies based on orders placed from a list of available foods[32]. State agencies and ITOs are responsible for determining applicant eligibility, storing and distributing the food, and provide nutrition education to recipients. According to the program, "Low-income American Indian and non-Indian households that reside on a reservation and households living in approved areas near a reservation or in Oklahoma that contain at least one person who is a member of a federally-recognized tribe, are eligible to participate in FDPIR"[30]. Households may not participate in the FDPIR and SNAP in the same month[32]. There currently are 276 tribes through 100 ITOs and 5 State agencies receiving FDPIR benefits[30]. Since the inception of the FDPIR, participant size has increased with a total 75,608 participants in 2013[33]. Each month, participants select a food package based on their food preferences, household size, and foods available at their particular ITO or State agency distribution site to help them maintain a nutritionally balanced diet[32].

In 2008, the Special Nutrition Programs Report No. FD-08-FDPIR was developed by the USDA to assess the nutritional quality of FDPIR foods utilizing the Healthy Eating Index 2005 (HEI-2005)[34]. Results from the report indicated that FDPIR had the potential to provide participants with a higher nutrient quality diet than the average American or SNAP participant.

To the best of the authors' knowledge, the Healthy Eating Index 2010 (HEI-2010)[35] has yet to be utilized in assessing the nutritional quality of foods offered as part of FDPIR. The HEI-2010[35] has been developed to measure adherence to the most recently published federal dietary guidelines, the 2010 Dietary Guidelines for Americans[36], whereas HEI-2005 was developed to measure the previous version of the federal dietary guidelines, the 2005 Dietary Guidelines for Americans[35,37]. Specifically, HEI-2010 updates include: (1) emphasis on dark green vegetables and beans and peas, (2) seafood and plant proteins component was introduced (3) fatty acids replaces the oils and saturate fats components, and (4) refined grains (a moderation component) replaced total grains (an adequacy component)[35].

It is important to assess the nutritional quality of FDPIR foods utilizing the HEI-2010 to understand how each iteration of current dietary guidance is reflected within the offerings of the food assistance program. For example, dark green vegetables and beans and peas are two vegetable subgroups for which intakes are furthest from recommended levels and the category of "vegetables and soup" allows for choices among many vegetables; the introduction of the seafood and plant proteins within HEI-2010 allows for capturing the dietary contribution of more specific protein choices within the broad "meat, poultry, fish, beans, eggs, and nuts" category of FDPIR; replacing saturated fats with fatty acids within HEI-2010 allows for the more specific assessment of the value of vegetable oil, light buttery spread, and butter within the "oil" category of FDPIR; refined and whole grains are both offered within the FDPIR "grains, cereal, rice, and pasta" category and assessing these separately with HEI-2010 is important to understand their distinct dietary contributions[38,39].

The sum of the scores for the 12 components is the total HEI-2010 scores, which ranges from 0 to 100, with a higher score indicative of a more healthful diet. HEI-2010 is composed of 12 components, nine that focus on nutritional adequacy and three that apply nutritional moderation[40]. For HEI-2010, refined grains, sodium, and empty calories are all moderation

components. A higher score within moderation components indicates lower availability of the food in the diet. All other categories are adequacy components, where a higher score indicates higher availability of food in the diet. HEI-2010 scores separate diet quality from quantity by using standards that are expressed as either a percent of calories, per 1,000 calories, or ratio of fatty acids[40].

The lack of assessment of the FDPIR with the HEI-2010 presents a knowledge gap regarding the dietary quality of FDPIR foods that support American Indian households in compliance with the 2010 Dietary Guidelines for Americans. Current nutrition research is needed in order to develop appropriate nutritional planning and policies related to food assistance, food security, and obesity in tribal communities with marked health disparities. The purpose of the current research is to assess the nutritional quality of foods offered in the FDPIR using HEI-2010.

Experimental Methods

Data were collected from a list of the food products, found in Exhibit O of the Food and Nutrition Handbook 501 for FDPIR, which was effective as of September 2013[32]. The study was exempt from Institutional Review Board review since no information was collected from human subjects.

Data Analysis

Each food option was entered into the USDA What's In The Foods You Eat online search tool (version 5.0)[41]. Matching food package components and search tool foods was based on the item description and nutrient profiles. Each food item was assigned a USDA food code and nutrient composition was ascertained (Table 1). Food group composition was determined using MyPyramid Equivalents Database for USDA Survey Food Codes, 2003-2004 Version 2. Each food listed in FDPIR, including foods requiring preparation (e.g., flour) and the few available ready-to-eat options, can be found in the cited database[41].

The researchers simulated five possible food package scenarios for analysis by: (1) using the FDPIR guide to establish the maximum allowed number of items for a one-person household[39] and then (2) randomly selecting the maximum allowed number of items per USDA food group (grains, cereal, rice and pasta; vegetables and soup; fruit and juice; meat, poultry, fish, beans,

eggs and nuts; milk and cheese; oil). The FDPIR guide outlines requirements for the number of items that can be chosen based on the number of people in a household per month for each food item [39]. The number of items that can be chosen are often increased linearly per person (e.g., 1 person = 1 item, 2 persons = 2 items, 3 persons = 3 items, etc.). Analysis was based on a one-person household with the expectation that the dietary quality would remain consistent with increasing number of persons in a household. For each food package, a random number generator was utilized to randomly select from all options per USDA food group. Randomly generated options were allowed to be chosen more than once when FDPIR guidelines allowed for greater than one option per USDA food group.

Using randomly generated food packages, HEI-2010 component and total scores were calculated using published SAS code (version 9.2 SAS Institute Inc., Cary, NC), modified to assess this specific dataset[42]. Prior to analysis, Analysis of Variance was used to detect if the criteria for randomly selecting food packages used in this study could lead to significant differences in key nutrient content across each of the five food packages. No significant differences were found among total calories, carbohydrates (g), saturated fat (g), and sodium (mg) for each of the five food packages.

Following the methodology outlined by Erinosho and colleagues[43], means and standard deviations were calculated to generate both HEI-2010 component scores and total scores across all menus. T-tests were calculated to assess whether mean HEI-2010 component scores and total scores differed significantly ($P<0.05$) from the maximum scores.

Results

Table 2 describes HEI-2010 component scores and total scores for foods and beverages provided as part of the five randomly generated FDPIR food packages. The mean total HEI-2010 score for the combined FDPIR food packages was significantly lower than total HEI-2010 total maximum score of 100 (66.38, SD=11.60; $p<0.01$), with total HEI-2010 scores ranging from 49.50 to 79.50 across all five FDPIR food packages. Mean scores for Total Fruit (3.52, SD=0.73; $p<0.05$), Total Vegetables (2.58, SD=0.15; $p<0.001$), Greens and Beans (0.92, SD=1.00; $p<0.001$), Dairy (5.12, SD=0.63; $p<0.001$), Total Protein Foods (4.14, SD=0.56; $p<0.05$), and Refined Grains (3.04, SD=2.90; $p<0.001$) were all significantly lower than the maximum values (5, 5, 5, 10, 5, and 10

respectively). All other components did not demonstrate significant differences from their maximum values.

Contributing to the combined FDPIR HEI-2010 score, all five food packages (100%) met the standard for a maximum value for Empty Calories, followed by three (60%) that met the standard for Whole Grains, three (60%) that met the standard for Seafood and Plant Proteins, two (40%) that met the standard for Whole Fruit, and one (20%) that met the standard for Fatty Acids. No sample food packages met the standard for a maximum value for Total Fruit, Total Vegetables, Greens and Beans, Dairy, Total Protein Foods, Refined Grains, or Sodium.

Discussion

This study addresses an important knowledge gap by characterizing the mean nutritional quality of five randomly generated food packages of the FDPIR on the basis of the most recently published federal dietary guidelines, the 2010 Dietary Guidelines for Americans (DGA). The FDPIR packages are not meeting the diet quality recommendations outlined by the 2010 DGA, as our analysis found significantly lower HEI-2010 overall score compared to the maximum score.

Similar to our findings, Americans do not consume adequate amounts of fruits, vegetables, whole grains, or dairy and significantly lower HEI-2010 component scores compared to the maximum values from 2010 DGA were found for Total Fruit, Total Vegetables, Greens and Beans, Dairy, Refined Grains, Total Protein Foods, and Protein[36]. The current study shows that, although there was no significant difference, the HEI-2010 scores for Whole Fruit, Whole Grains, Seafood and Plant Proteins, and Fatty Acids also fell short of the maximum HEI-2010 score indicating a potential need to improve options within these categories. Although the HEI-2010 mean total score for FDPIR (score of 66) was slightly better than the American food supply (HEI-2005 score of 55)[44], the FDPIR program should target providing more inadequately consumed foods (of fruits, vegetables, whole grains, or dairy) to promote better nutrition among participants in line with the needs of the American population.

Interestingly, HEI-2010 scores of each of the five assessed food packages show significant variation in nutritional quality and thereby emphasize the role of FDPIR centers in providing

198 more foods that are consistent with adequacy components and less foods categorized as
199 moderation components by HEI-2010[38]. Secondly, consumer behavior in making dietary
200 choices from available food access should also be considered. Findings from this study highlight
201 opportunities to provide guidance to FDPIR participants about nutritionally balanced food
202 choices at FDPIR centers as well as foods that participants acquire outside of FDPIR. The
203 FDPIR should ideally provide participants with the opportunity to increase diet quality beyond
204 the average American diet as well as meet the current DGA[36]. The FDPIR is positioned to
205 modify its food and education offerings to best support lifestyles towards prevention of diet-
206 related chronic disease.

207 The HEI-2010 FDPIR score from this research (score of 66) resulted in lower score than a
208 previous assessment of FDPIR that utilized HEI-2005 (score of 87)[34]. Though methodologies
209 between FDPIR assessments differed, it is important to explore the differences found using the
210 two versions of the Healthy Eating Index, which reflects the most up-to-date dietary guidance.
211 The current assessment offered similar scores to total fruit, whole fruit, total vegetables, greens
212 and beans (previously dark green and orange vegetables and legumes), dairy (previously milk),
213 and empty calories than the previous assessment[34]. Differences in scores between the two
214 assessments can be attributed partially to foods selected in the food packages and partially to
215 updates in scoring. For example, in the previous assessment that used HEI-2005, the component
216 of total grains received a maximum score of 5, while in the current assessment the scores for
217 whole grains results in a score lower than the maximum (8 out of 10) and refined grains resulted
218 in score significantly lower than the maximum (3 out of 10) [34]. Grain foods randomly selected
219 for this assessment were split into the updated categories of refined grains and whole grains.
220 Grain foods in the previous assessment were placed in the total grains category. In one additional
221 example, the component of saturated fat scored relatively close to the maximum in the HEI-2005
222 analysis (9.8 out of 10), while in the current assessment fatty acids scored relatively low (4.8 out
223 of 10) [34]. This is in part due to the replacement of oils and saturated fats component with fatty
224 acids in the HEI-2010. Improvements in the refined, whole grain, and fatty acids category are
225 warranted. Although changes in national dietary guidance are usually minimal, these examples
226 demonstrate the importance of assessing nutrition quality of FDPIR foods using new iterations of
227 the Healthy Eating Index to capture important nuances in diet quality.

The HEI-2010 mean total score for FDPIR cannot be compared to other HEI-2010 scores in different food assistance contexts, as these analyses do not currently exist. Although there are limitations to comparing HEI-2005 and 2010, the nutrient quality of the current FDPIR food packages using the HEI-2010 analysis is higher than some other federal FANPs, including comparison to dietary intake of SNAP[34] and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)[45] participants using HEI-2005. Comparison of the FDPIR nutrient quality with SNAP and non-SNAP participants dietary intake shows that the FDPIR has higher scores. These findings may be in part due to the analysis of actual participant dietary intake in SNAP and WIC programs, where the analysis in the current study measured nutrient quality of randomized food packages. Researchers working with FDPIR programs should analyze dietary intake of FDPIR participants to understand the value of what nutrients are consumed in addition to the nutrient value of food package offerings. Specifically, dietary intake of SNAP participants were found to have a HEI-2005 total score of 47 and non-participants were found to have a total score 51[46], which is considerably lower than the average HEI-2010 mean score of 66 found in the present study for the nutrient quality of FDPIR packages. Furthermore, dietary intake of children participants in the WIC program received a HEI-2005 total score of 58 compared to dietary intake of children not participating in the WIC program that received a score of 60[45], which are both lower than the mean nutrient quality score for FDPIR food package score. The differences in findings may also be due to greater access to processed and sugar-added foods of SNAP compared to the FDPIR and lack of dietary analysis of intake of FDPIR participants. In contrast to SNAP that can be used by participants to purchase "foods of minimal nutritional value" including soda, water ices, chewing gum, and candy, foods in the FDPIR package are selected to address some nutritional need[47]. Participants in the FDPIR program may also supplement their diet with purchased processed and sugar-added foods or other foods (e.g., hunted, grown, gathered), but the current analysis does not account for dietary intake.

The FDPIR program still has nutritional shortcomings that need to be addressed in order to decrease the risk of diet-related chronic disease on American Indian reservations. In our current study and other observational work in progress, shortcomings of the FDPIR may derive from limited offerings of greens and total vegetables, nutrient profile of foods, sensory appeal of individual FDPIR offerings and the physical environment of the FDPIR center, time needed to prepare FDPIR foods versus convenience foods, and lack of knowledge in preparing FDPIR

foods. These issues are germane to improving diet quality of program participants.

Increasing offerings of vegetables may require an increase in the budget allocated to the FDPIR if other aspects of the program are to remain unchanged given the relatively high price of produce in the US compared to non-specialty crops. Modifying the structure of the FDPIR to offer greater selection of fresh fruits and vegetables may encourage produce consumption, particularly if this offering was coupled with a nutrition information and cooking demonstrations on preparing recipes that are culturally compatible. In recent years, the quality of FDPIR food has been improved by the Fresh Fruits and Vegetables Program in which most programs now participate[47]. It will be important that these fresh fruit and vegetable offerings be kept fresh, or that canned or frozen produce is utilized, in order to retain maximum phytonutrients to benefit human health.

Given the variable HEI-2010 scores of different FDPIR food packages, directing food options to increase nutrient diversity would likely result in improved nutrition and health outcomes of participants. Healthy food choices may be encouraged through enhancing the sensory appeal of individual FDPIR offerings – for example, researchers should consider studying the consumer appeal components that FDPIR foods, packages, and program centers provides, as to the authors' knowledge no study has been conducted about the attractiveness of these variables to native populations. Additionally, increasing availability and diversity of culturally appropriate foods in specific food components that do not meet minimum recommendations would also assist in increasing the HEI-2010 score, specifically for Total Fruit, Total Vegetables, Greens and Beans, Dairy, Total Protein Foods, Refined Grains, or Sodium. The addition of limes would add to overall availability of Total Fruit, replacing refined grains with whole grains such as wild rice, barley, quinoa, blue cornmeal, sorghum, and rye has the potential to improve the Refined Grains score, and adding bison to the offerings would improve access to Total Protein Foods. Recently, Congress directed that a portion of FDPIR funding be used to purchase bison meat because of its low fat content and cultural value for American Indians, even if this is not tribally specific[47].

There is promising opportunity to implement nutrition education and cooking demonstrations on how to supplement FDPIR offerings with culturally appropriate, accessible, and healthy foods, especially since federal grant mechanisms exist to support nutrition education related to the

FDPIR through the USDA Food Distribution Program Nutrition Education (FDPNE)[48]. Several successful initiatives have been launched to date that serve to enhance the food choices of FDPIR participants in culturally appropriate ways, including cooking demonstrations, taste tests, cooking competitions, gardening demonstrations with traditional foods, health wellness programs, and special events such as health fairs[47].

This study has several limitations that are important to address when interpreting findings and examining implications. As with many other studies that utilize HEI to study nutritional adequacy in various settings (e.g., foods offered to children at child-care centers, foods offered to children through backpack programs, the dollar menu displayed at a fast-food restaurant)[43,44,49], it is important to note that this evaluation of FDPIR involves analysis of food products and not actual consumer consumption. For example, this study assessed the quality of five randomly generated food packages of the FDPIR rather than actual food package selections made by participants. In addition, this study does not take into consideration other foods with which participants may supplement their food assistance packages such as local wild and cultivated foods or purchased foods. Finally, the availability of individual products is subject to market conditions, ITOs and state agency orders, and seasonal availability. The current study did not limit USDA foods or options according to these factors and no published list is available to reflect that information to the authors' knowledge. Despite these limitations, this study contributes to the sparse published literature assessing nutritional quality of a national food commodity program geared toward a specific racial demographic.

There is a need for future studies to establish the linkages between FDPIR participation and long-term nutrition and health outcomes. Specifically, such future studies should examine the complex interplay between the FDPIR and other aspects of the food environments and food access along with consumer lifestyle behavior and dietary choices, food quality, genetics, epigenetics, and food sovereignty. Studies that examine the HEI-2010 on actual FDPIR packages and diets of participants would further enhance the understanding of the contribution of this federal assistance program to nutrition and health outcome. Research on the FDPIR is particularly pressing because of the lack of available studies on the federal nutrition program that serves an extremely vulnerable population in the USA that is at high risk of diet-related chronic disease[31].

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Tables

Table 1: USDA Food codes and foods for five sample monthly FDPIR food packages

USDA Food Code	Grams Per Food Item	Food Item
Food Package 1		
GRAINS, CEREAL, RICE and PASTA		
57134000	400	Corn flakes, NFS
56206990	2744	Wheat, cream of, cooked, NS as to regular, quick, or instant, NS as to fat added in cooking
56101000	1248	Macaroni, cooked, NS as to fat added in cooking (x 2)
56112000	1184	Noodles, cooked, NS as to fat added in cooking
56205330	2880	Rice, white and wild, cooked, NS as to fat added in cooking
50020000	2250	Flour, whole wheat (x 2)
50010000	2250	Flour, white (x 0.25)
54325000	453	Crackers, saltine
VEGETABLES and SOUP		
73102203	440	Carrots, cooked, from canned, NS as to fat added in cooking
75216050	440	Corn, NS as to form, NS as to color, cream style
73201003	440	Pumpkin, cooked, from canned, NS as to fat added in cooking
73101010	488	Carrots, raw

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75117020	440	Onions, mature, raw
73401000	238	Sweet potato, NFS
75103000	908	Cabbage, green, raw
75125000	416	Radish, raw
75109600	429	Corn, raw
74101000	300.2	Tomatoes, raw
75122100	357	Pepper, sweet, green, raw
28315100	720	Beef vegetable soup with potato, stew type (x 2)
74601000	320.2	Tomato soup, NFS
FRUIT and JUICE		
63101000	546	Apple, raw (x 2)
61101010	512	Grapefruit, raw (x 2)
63137010	534	Pear, raw
63127010	640	Honeydew melon, raw
63126500	414	Kiwi fruit, raw
63143010	198	Plum, raw
62122100	387.5	Prune, dried, uncooked
64104010	1984	Apple juice
61201220	1977.6	Grapefruit juice, canned, bottled or in a carton

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MEAT, POULTRY, FISH, BEANS, EGGS, and NUTS		
21500000	453.6	Ground beef, raw
23326100	352	Bison, cooked
21401000	704	Beef, roast, roasted, NS as to fat eaten
22311000	368	Ham, smoked or cured, cooked, NS as to fat eaten
41106000	279	Red kidney beans, dry, cooked, NS as to fat added in cooking
41205010	447.6	Refried beans (x 2)
41104000	310	Pinto, calico, or red Mexican beans, dry, cooked, NS as to fat added in cooking
33102010	360	Scrambled egg, made from powdered mixture (x 2)
42501000	420	Nut mixture with dried fruit and seeds
MILK and CHEESE		
14410200	2268	Cheese, processed, American or Cheddar type (x 0.5)
11212050	384	Milk, evaporated, skim (formerly NS as to dilution, used in coffee or tea) (x 4)
11112210	976	Milk, cow's, fluid, 1% fat (x 4)
OIL		
82101000	1308	Vegetable oil, NFS
Food Package 2		
GRAINS, CEREAL, RICE and PASTA		

Tables

57207000	400	Bran flakes, NFS (formerly 40% bran flakes, NFS)
57602100	1200	Oats, raw
58145110	200	Macaroni or noodles with cheese (x 3)
56101000	1248	Macaroni, cooked, NS as to fat added in cooking
56102000	1248	Macaroni, whole wheat, cooked, NS as to fat added in cooking
56205330	2880	Rice, white and wild, cooked, NS as to fat added in cooking
56201510	14640	Cornmeal mush, made with water
50020000	2250	Flour, whole wheat
50010000	2250	Flour, white (x 0.25)
54325000	453	Crackers, saltine
VEGETABLES and SOUP		
56200990	440	Grits, cooked, corn or hominy, NS as to regular, quick or instant, NS as to fat added in cooking
74404010	440	Spaghetti sauce, meatless
73101010	488	Carrots, raw
71000100	334	White potato, NFS
73302010	280	Squash, winter type, raw
75128000	392	Squash, summer, yellow, raw
73401000	238	Sweet potato, NFS

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75103000	908	Cabbage, green, raw (x 2)
75109000	400	Celery, raw
75111000	402	Cucumber, raw
75607030	305	Mushroom soup, canned, undiluted (x 3)
FRUIT and JUICE		
63311110	437.9	Fruit cocktail, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener (x 2)
63105010	402	Avocado, raw
63311050	440	Fruit salad, fresh or raw, (including citrus fruits), no dressing
63123000	377.5	Grapes, raw, NS as to type (x 3)
63126500	414	Kiwi fruit, raw
63143010	198	Plum, raw
62122100	387.5	Prune, dried, uncooked
64116020	1996.8	Grape juice
61210000	1990.4	Orange juice, NFS
MEAT, POULTRY, FISH, BEANS, EGGS, and NUTS		
24198570	600	Chicken, canned, meat only
23326100	352	Bison, cooked
24201310	960	Turkey, light and dark meat, roasted, NS as to skin eaten

Tables

22311000	368	Ham, smoked or cured, cooked, NS as to fat eaten
41101100	2240	White beans, dry, cooked, NS as to fat added in cooking
33102010	360	Scrambled egg, made from powdered mixture (x 2)
42501000	420	Nut mixture with dried fruit and seeds
MILK and CHEESE		
14410200	2268	Cheese, processed, American or Cheddar type (x 0.5)
11212050	384	Milk, evaporated, skim (formerly NS as to dilution, used in coffee or tea) (x 4)
11121300	2587.2	Milk, dry, reconstituted, nonfat (x 0.5)
OIL		
82101000	1308	Vegetable oil, NFS
Food Package 3		
GRAINS, CEREAL, RICE and PASTA		
57000100	400	Oat cereal, NFS
56206990	2744	Wheat, cream of, cooked, NS as to regular, quick, or instant, NS as to fat added in cooking
58145110	200	Macaroni or noodles with cheese (x 3)
56112000	1184	Noodles, cooked, NS as to fat added in cooking (x 2)
56205330	2880	Rice, white and wild, cooked, NS as to fat added in cooking
56201510	14640	Cornmeal mush, made with water

50010000	2250	Flour, white
50010000	2250	Flour, white (x 0.25)
54325000	453	Crackers, saltine
VEGETABLES and SOUP		
75216050	440	Corn, NS as to form, NS as to color, cream style
71501300	440	White potato, from dry, mashed, NS as to milk or fat (x 2)
74404010	440	Spaghetti sauce, meatless
73201003	440	Pumpkin, cooked, from canned, NS as to fat added in cooking
73101010	400	Carrots, raw
75129000	366	Turnip, raw
75103000	908	Cabbage, green, raw
75102750	416	Brussels sprouts, raw
72116000	376	Endive, chicory, escarole, or romaine lettuce, raw
74101000	300.2	Tomatoes, raw
28315100	720	Beef vegetable soup with potato, stew type
74601000	320.2	Tomato soup, NFS (x 2)
FRUIT and JUICE		
63103110	425	Apricot, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener

63137110	437.9	Pear, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener
63105010	402	Avocado, raw
61119010	393	Orange, raw
63135010	450	Peach, raw
63123000	377.5	Grapes, raw, NS as to type (x 2)
63127010	640	Honeydew melon, raw
63131010	408	Nectarine, raw
62125100	439.4	Raisins
64116020	1996.8	Grape juice
61210000	1990.4	Orange juice, NFS
MEAT, POULTRY, FISH, BEANS, EGGS, and NUTS		
21500000	453.6	Ground beef, raw
23326100	352	Bison, cooked
24100000	1152	Chicken, NS as to part and cooking method, NS as to skin eaten
22311000	368	Ham, smoked or cured, cooked, NS as to fat eaten
41205010	447.6	Refried beans
41102000	342.9	Black, brown, or bayo beans, dry, cooked, NS as to fat added in cooking

41104000	310	Pinto, calico, or red Mexican beans, dry, cooked, NS as to fat added in cooking (x 2)
33102010	360	Scrambled egg, made from powdered mixture (x 2)
42202000	256	Peanut butter
MILK and CHEESE		
14410200	2268	Cheese, processed, American or Cheddar type (x 0.5)
11212050	384	Milk, evaporated, skim (formerly NS as to dilution, used in coffee or tea) (x 4)
11121300	2587.2	Milk, dry, reconstituted, nonfat (x 0.5)
OIL		
81104010	425	Margarine-like spread, reduced calorie, about 40% fat, tub, salted (x 2)
Food Package 4		
GRAINS, CEREAL, RICE and PASTA		
57207000	400	Bran flakes, NFS (formerly 40% bran flakes, NFS)
57602100	1200	Oats, raw
56101000	1248	Macaroni, cooked, NS as to fat added in cooking
56102000	1248	Macaroni, whole wheat, cooked, NS as to fat added in cooking (x 2)
56205330	2880	Rice, white and wild, cooked, NS as to fat added in cooking
56201510	14640	Cornmeal mush, made with water

50010000	2250	Flour, white
50010000	2250	Flour, white (x 0.25)
54325000	453	Crackers, saltine
VEGETABLES and SOUP		
56200990	440	Grits, cooked, corn or hominy, NS as to regular, quick or instant, NS as to fat added in cooking
75224013	440	Peas, green, cooked, from canned, NS as to fat added in cooking
72125203	440	Spinach, cooked, from canned, NS as to fat added in cooking
71501300	440	White potato, from dry, mashed, NS as to milk or fat
73101010	400	Carrots, raw (x 2)
71000100	334	White potato, NFS
75102750	416	Brussels sprouts, raw
72116000	376	Endive, chicory, escarole, or romaine lettuce, raw
74101000	298	Tomatoes, raw
74101000	300.2	Tomatoes, raw
28315100	720	Beef vegetable soup with potato, stew type (x 2)
74601000	320.2	Tomato soup, NFS
FRUIT and JUICE		
63101110	437.9	Applesauce, stewed apples, NS as to sweetened or

		unsweetened; sweetened, NS as to type of sweetener (x 2)
63103110	425	Apricot, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener (x 2)
63311110	437.9	Fruit cocktail, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener
61101010	512	Grapefruit, raw
63137010	534	Pear, raw
63135010	450	Peach, raw
63127010	640	Honeydew melon, raw
63131010	408	Nectarine, raw
64116020	1996.8	Grape juice
74301100	1945.6	Tomato juice
MEAT, POULTRY, FISH, BEANS, EGGS, and NUTS		
22101000	336	Pork chop, NS as to cooking method, NS as to fat eaten (x 2)
21401000	704	Beef, roast, roasted, NS as to fat eaten
22311000	368	Ham, smoked or cured, cooked, NS as to fat eaten
41201020	492.1	Baked beans, vegetarian
41205010	447.6	Refried beans
41104000	310	Pinto, calico, or red Mexican beans, dry, cooked, NS as to fat added in cooking (x 2)

Tables

33102010	360	Scrambled egg, made from powdered mixture (x 2)
42202000	256	Peanut butter
MILK and CHEESE		
14410200	2268	Cheese, processed, American or Cheddar type (x 0.5)
11212050	384	Milk, evaporated, skim (formerly NS as to dilution, used in coffee or tea) (x 4)
11112210	976	Milk, cow's, fluid, 1% fat (x 4)
OIL		
82101000	1308	Vegetable oil, NFS
Food Package 5		
GRAINS, CEREAL, RICE and PASTA		
57148500	400	Crispy Brown rice cereal
57602100	1200	Oats, raw
58145110	200	Macaroni or noodles with cheese (x 3)
56102000	1248	Macaroni, whole wheat, cooked, NS as to fat added in cooking
56112000	1184	Noodles, cooked, NS as to fat added in cooking (x 2)
56201510	14640	Cornmeal mush, made with water
50020000	2250	Flour, whole wheat
50010000	2250	Flour, white (x 0.25)

54325000	453	Crackers, saltine
VEGETABLES and SOUP		
73102203	440	Carrots, cooked, from canned, NS as to fat added in cooking
75216050	440	Corn, NS as to form, NS as to color, cream style
72125203	440	Spinach, cooked, from canned, NS as to fat added in cooking
75311003	440	Mixed vegetables (corn, lima beans, peas, green beans, and carrots), cooked, from canned, NS as to fat added in cooking (x 2)
74204500	440	Tomatoes, canned, low sodium
71000100	501	White potato, NFS
75129000	366	Turnip, raw
75102750	416	Brussels sprouts, raw
75109600	429	Corn, raw
75122100	357	Pepper, sweet, green, raw
28315100	720	Beef vegetable soup with potato, stew type (x 2)
75654020	298	Vegetarian vegetable soup, undiluted
FRUIT and JUICE		
63103110	425	Apricot, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener
63135110	437.9	Peach, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener

63137110	437.9	Pear, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener
63311110	437.9	Fruit cocktail, cooked or canned, NS as to sweetened or unsweetened; sweetened, NS as to type of sweetener
63137010	534	Pear, raw (x 2)
63135010	450	Peach, raw
63126500	414	Kiwi fruit, raw
62122100	387.5	Prune, dried, uncooked
61201220	1977.6	Grapefruit juice, canned, bottled or in a carton
74301100	1945.6	Tomato juice
MEAT, POULTRY, FISH, BEANS, EGGS, and NUTS		
21500000	453.6	Ground beef, raw
24100000	1152	Chicken, NS as to part and cooking method, NS as to skin eaten
21401000	704	Beef, roast, roasted, NS as to fat eaten
22311000	368	Ham, smoked or cured, cooked, NS as to fat eaten
41106000	279	Red kidney beans, dry, cooked, NS as to fat added in cooking (x 2)
41102000	342.9	Black, brown, or Bayo beans, dry, cooked, NS as to fat added in cooking
41104000	310	Pinto, calico, or red Mexican beans, dry, cooked, NS as to fat

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		added in cooking
33102010	360	Scrambled egg, made from powdered mixture (x 2)
42111110	453.6	Peanuts, roasted, without salt
MILK and CHEESE		
14410200	2268	Cheese, processed, American or Cheddar type (x 0.5)
11212050	384	Milk, evaporated, skim (formerly NS as to dilution, used in coffee or tea) (x 4)
11112210	976	Milk, cow's, fluid, 1% fat (x 4)
OIL		
81100500	454	Butter, NFS

Tables

Table 2. HEI-2010[a] component and total scores for each of the five sample monthly food packages (n = 5)

Component	Maximum Value	Standard for Maximum Score	Standard for Minimum Score of Zero	Mean (SD)	Range	% Meeting Maximum Value (n) [j]
Total Fruit[b]	5	≥0.8 cup equivalent per 1,000 kcal	No Fruit	3.52 (0.73)*	2.60 – 4.40	0 (0)
Whole Fruit[c]	5	≥0.4 cup equivalent per 1,000 kcal	No Whole Fruit	4.60 (0.52)	3.90 – 5.00	40.0 (2)
Total Vegetables[d]	5	≥1.1 cup equivalents per 1,000 kcal	No Vegetables	2.58 (0.15)***	2.40 - 2.80	0 (0)
Greens and Beans[d]	5	≥0.2 cup equivalent per 1,000 kcal	No Dark Green Vegetables or Beans and Peas	0.92 (1.00)***	0.00 - 2.20	0 (0)
Whole Grains	10	≥1.5 oz. equivalents per 1,000 kcal	No Whole Grains	7.88 (3.68)	1.50 – 10.00	60.0 (3)
Dairy[e]	10	≥1.3 cup equivalents per	No Dairy	5.12	4.20 -	0 (0)

Tables

		1,000 kcal		(0.63)***	5.70	
Total Protein Foods[f]	5	≥2.5 oz. equivalents per 1,000 kcal	No Protein Foods	4.14 (0.56)*	3.30 - 4.80	0 (0)
Seafood and Plant Proteins[f,g]	5	≥0.8 oz. equivalent per 1,000 kcal	No Seafood or Plant Proteins	4.64 (0.53)	3.80 – 5.00	60.0 (3)
Fatty Acids[h]	10	(PUFAs+MUFAs)/SFAs >2.5	(PUFAs+MUFAs)/SFAs ≤1.2	4.80 (4.55)	0.00 – 10.00	20.0 (1)
Refined Grains	10	≤1.8 oz. equivalents per 1,000 kcal	≥4.3 oz. equivalents per 1,000 kcal	3.04 (2.90)**	0.00 - 6.40	0 (0)
Sodium	10	≤1.1 g per 1,000 kcal	≥2.0 g per 1,000 kcal	5.08 (3.15)*	0.70 - 9.30	0 (0)
Empty Calories[i]	20	≤19% of energy	≥50% of energy	20.00 (0)	20.00 – 20.00	100.0 (5)
Total	100			66.38 (11.60)**	49.50 - 79.50	--

Tables

note: *p<0.05; **p<0.01; ***p<0.001

[a]Intakes between the minimum and maximum standards are scored proportionately.

[b]Includes fruit juice.

[c]Includes all forms except juice.

[d]Includes any beans and peas not counted as Total Protein Foods

[e]Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages.

[f]Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met.

[g]Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods.

[h]Ratio of polyunsaturated fatty acids (PUFAs) and monounsaturated fatty acids (MUFAs) to saturated fatty acids (SFAs).

[i]Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is >13 g/1,000 kcal.

[j] Includes the 5 sample monthly food packages.