



Guide for Calculating HEI-2015 Total and Component Scores Using SAS Code Developed by the Nutrition Coordinating Center (NCC) for Dietary Recall, Record, and Record-Assisted Recall Record Types

In the first section of this document (Section 1) we describe how to generate output files and create needed SAS data files; and how to prepare and run the HEI-2015 SAS program file.

In the second section of the document (Section 2) we provide an overview of the HEI-2015 SAS program file.

In the third section of the document (Section 3) we answer frequently asked questions about the HEI-2015 SAS program file.

SECTION 1: Creating needed data files and running the HEI-2015 SAS Code

The following output files contain the variables needed to calculate HEI-2015 scores: File 04 (Intake Properties-Totals File) and File 09 (Serving Count Totals File). See Chapter 8 (Managing NDSR Output) in the NDSR User Manual for details regarding the content of each of these files.

Step 1 - Generate needed NDSR output files

Follow the instructions in the NDSR User Manual for generating output files (see Chapter 9 - NDSR Utilities) to generate output files without headers. The preference is on the User tab of the Preferences window available on the File menu (de-select the check box for 'Include column headers in output files.'). This preference must be selected prior to generating the output files.

Unzip the output files. We suggest unzipping to a new empty folder.

Locate the SAS programs provided in the NDSR Additional Files in this new folder (see Appendix 18 - Additional Files). These programs are written to load the output files in the SAS Program, assign formats and labels to the SAS variables, and define the relationships within a set of

output files. We suggest putting a copy of the SAS programs in the folder created for the output files.

Step 2 - Create needed SAS data files using the SAS programs copied from the NDSR Additional Files

The NDSINPUT.SAS file should be used to create a SAS data file for nutrient data in output file 04. Before running the program, edit the lines containing the libname and root file name near the beginning of the NDSINPUT.SAS program so they are tailored to your study data. Specify your project abbreviation by substituting it for the string of x's in the following line found near the beginning of the file: **%LET fname=XXXXXXX**. Also, specify the folder where SAS data files will be saved by substituting your folder for c:\sas\sasdata in the following line also found near the beginning of the file: **LIBNAME ndsdata 'c:\sas\sasdata' ;**

The FGSCINPUT.SAS file should be used to create a SAS data file for food group data in output file 09. Before running the program, edit the lines containing the libname and root file name near the beginning of the FGSINPUT.SAS program so they are tailored to your study data. Specify your project abbreviation by substituting it for the string of x's in the following line found near the beginning of the file: **%LET fname=XXXXXXX**. Also, specify the folder where SAS data files will be saved by substituting your folder for c:\sas\sasdata in the following line also found near the beginning of the file: **LIBNAME ndsdata 'c:\sas\sasdata' ;**

Step 3 - Prepare and run the HEI-2015 SAS program

Edit the line containing the libname near the beginning of the HEI-2015 SAS program you chose to run so that it is tailored to your study data. Specify the folder where SAS data files will be read from and saved to by substituting your folder for c:\sas\sasdata in the following line found near the beginning of the file: **LIBNAME ndsdata 'c:\sas\sasdata' ;**

Run the HEI-2015 SAS program to create a SAS data file of HEI data. This new file will include HEI-2015 total and index component scores.

SECTION 2: HEI-2015 Overview

The HEI is a tool developed by the United States Department of Agriculture and the National Cancer Institute to evaluate the extent to which diets are consistent with the Dietary Guidelines for Americans. Possible index points range from 0-100, with a higher score indicating greater consistency of the diet with the Guidelines.

With each release of the new Dietary Guidelines for Americans the HEI is updated. The HEI-2015, which conforms to the 2015-2020 Dietary Guidelines for Americans, includes thirteen dietary components (nine adequacy and four moderation components) that reflect key aspects

of diet quality. Table 1 lists the components, the optimal (maximum) number of points, and the criteria for assignment of the lowest and highest possible scores for each component. For more detail regarding scoring assignment, see information available on the [NCI website](#).

To calculate a HEI-2015 score, one must have measures for each of the index components, and these measures must conform (be consistent with) the units of measure included in the index. For example, the total fruits component must be in the unit of 'total fruit servings in cup equivalents per 1,000 kcal'. The HEI-2015 SAS program is written to generate the needed measures (e.g. servings of total fruit in 1 cup equivalents per 1,000 kcal) and derive scores for each index component in accord with the HEI-2015 scoring system.

Table 1: Healthy Eating Index-2015 components and scoring standards¹

Component	Optimum Score	Standard for Maximum Score	Standard for Minimum Score of Zero
Total Fruits ²	5	≥0.8 cup eq/1,000 kcal	No fruit
Whole Fruits ³	5	≥0.4 cup eq/1,000 kcal	No whole fruit
Total Vegetables ⁴	5	≥1.1 cup eq/1,000 kcal	No vegetables
Greens and Beans ⁴	5	≥0.2 cup eq/1,000 kcal	No dark-green vegetables or legumes
Whole Grains	10	≥1.5 oz eq/1,000 kcal	No whole grains
Dairy ⁵	10	≥1.3 cup eq/1,000 kcal	No dairy
Total Protein Foods ⁴	5	≥2.5 oz eq/1,000 kcal	No protein foods
Seafood and Plant Proteins ^{4,6}	5	≥0.8 oz eq/1,000 kcal	No seafood or plant proteins
Fatty Acids ⁷	10	(PUFAs+MUFAs)/SFAs ≥2.5	(PUFAs+MUFAs)/SFAs ≤1.2
Refined Grains	10	≤1.8 oz eq/1,000 kcal	≥4.3 oz eq/1,000 kcal
Sodium	10	≤1.1 gram/1,000 kcal	≥2.0 grams/1,000 kcal
Added Sugars	10	≤6.5% of energy	≥26% of energy
Saturated Fats	10	≤8% of energy	≥16% of energy

¹ Intakes between the minimum and maximum standards are scored proportionately

² Includes 100% fruit juice

³ Includes all forms except juice

⁴ Includes legumes (beans and peas)

⁵ Includes all milk products, such as fluid milk, yogurt, and cheese, and fortified soy beverages

⁶ Includes seafood, nuts, seeds, soy products (other than beverages), and legumes (beans and peas)

⁷ Ratio of poly- and monounsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs)

SECTION 3: Frequently Asked Questions

Below are answers to questions frequently asked about the HEI-2015 SAS programs:

What is the difference between Approach 1 (SAS program for calculating HEI-2015 scores for each intake day for each person) and Approach 2 (SAS program for calculating HEI-2015 scores per person when multiple days of intake data are available for each person)?

With Approach 1 HEI-2015 total and index component scores are created for each intake day for each person (each intake record). For example, if a study participant had 3 dietary recall intake records an HEI-2015 total score would be generated for each of the participant's records (e.g. day 1 score =78; day 2 score=67; day 3 score =78). Scores for each index component would likewise be generated.

With Approach 2 a single HEI-2015 total and single index component scores are created for each study participant based on all of the intake days available for the person. For example, if a study participant had 3 dietary recall records an HEI-2015 total score would be generated based on food group and nutrient intake estimates summed across all three records.

Should I use Approach 1 (SAS code for calculating HEI-2015 scores for each intake day for each person) or Approach 2 (SAS code for calculating HEI-2015 scores per person when multiple days of intake data are available for each person)?

The answer to this question depends on your research question, and there are additional potential approaches for which we do not provide an HEI-2015 SAS program. The full listing of possible approaches are provided and described by [NCI](#). Note that the HEI-2015 SAS programs we provide are for what NCI describes as the 'simple HEI scoring algorithm'.

If you determine that a 'simple HEI scoring algorithm' approach is appropriate given your research question, generally Approach 2 is appropriate if more than 1 intake day is available for some or all of your study participants for the measurement period for which you wish to generate HEI-2015 scores (e.g. 3 dietary recalls collected at baseline).

Why is the sum of the NCC food serving counts for total fruits, whole fruits, vegetables, and greens and beans divided by two?

The totals are divided by two because fruits, vegetables and bean servings in the NCC food serving count system are in ½ cup equivalents. Thus, a divisor of two is needed to convert servings to 1 cup equivalents as needed for HEI-2015 scoring.

For the dairy index component, why is the variable 'rfgsciDOT0100' (frozen dairy dessert) divided by three?

This variable (rfgsciDOT0100) must be divided by three to convert to cup equivalents because 1.5 cups of a frozen dairy dessert is considered to be a cup equivalent in the dairy group, but a ½ cup of frozen dairy dessert counts as a serving in the NCC Food Serving Count System.

For the total protein foods and seafood and plant proteins index components why is the variable 'rfgsciVEG0700' (legumes and beans) multiplied by two?

This variable (rfgsciVEG0700) must be multiplied by two because ¼ cup legumes and beans are considered an ounce equivalent of protein, but they are in ½ cup servings in the NCC Food Serving Count System.

Why is the variable 'rfgsciVEG0700' (legumes and beans) included in multiple index components (total vegetable, greens and beans, total protein foods, and seafood and plant proteins index components)?

The HEI-2015 food coding and scoring rules specify that legumes and beans count toward each of these index components.

How do I calculate an HEI score for a menu?

The SAS programs for calculating HEI scores are written for record, recall, and record-assisted recall NDSR data, and rely on variables in output files 04 and 09. Calculating an HEI score for a menu requires the use of variables in output files 06 (Menu Properties-Totals file) and 11 (Serving Count Menu Totals File). Consequently, the HEI-2015 SAS programs cannot be used without first editing the code to specify the appropriate data files for the menu record type.