# ReadMe for NIH-AARP Diet and Health Study

# HEI-2015 Per Day

This ReadMe file describes the methodology implemented in the SAS program that demonstrates how to calculate the Healthy Eating Index-2015 (HEI-2015) component and total scores, using FFQ data from the NIH-AARP Diet and Health Study. The provided SAS program, along with the required macro, can be used to calculate Healthy Eating Index (HEI)-2015 scores using food frequency questionnaire (FFQ) data. The specific instructions on how to successfully run the HEI procedure are within the provided SAS program.

The SAS program can be adapted to calculate HEI-2015 scores for other food frequency data.

The program includes one main section:

1. Calculation of food group, nutrient, and energy intakes at the individual participant level.

Only participants aged 2 years and older should be included in calculations of HEI-2015 scores because the Dietary Guidelines for Americans were not designed for younger children.

**Required dataset:**

* NIH-AARP Diet and Health Study dataset

**Required macro:** *available on the [NCI Healthy Eating Index website](https://epi.grants.cancer.gov/hei/sas-code.html).*

* [hei2015.score.macro.sas](https://epi.grants.cancer.gov/hei/sas-code.html)

The 13 components of the HEI-2015 calculated by the macro are:

* Total Vegetables (HEI2015C1\_TOTALVEG)
* Greens and Beans (HEI2015C2\_GREEN\_AND\_BEAN)
* Total Fruit (HEI2015C3\_TOTALFRUIT)
* Whole Fruit (HEI2015C4\_WHOLEFRUIT)
* Whole Grains (HEI2015C5\_WHOLEGRAIN)
* Dairy (HEI2015C6\_TOTALDAIRY)
* Total Protein Foods (HEI2015C7\_TOTPROT)
* Seafood and Plant Proteins (HEI2015C8\_SEAPLANT\_PROT)
* Fatty Acids (HEI2015C9\_FATTYACID)
* Sodium (HEIC10\_SODIUM)
* Refined Grains (HEI2015C11\_REFINEDGRAIN)
* Saturated Fats (HEI2015C12\_SFAT)
* Added Sugars (HEI2015C13\_ADDSUG)

Some of the variables needed to calculate these components come directly from NIH-AARP Diet and Health output, but others are created as part of the SAS program.

The NIH-AARP data provide the following variables used directly or as part of a calculation of the HEI-2015: Total Fruit; Whole Fruit; Whole Grains; Dairy; Refined Grains; Sodium; Saturated Fats; and Added Sugars.

*Additional steps are necessary to create the remaining components that are a combination of variables: Total Vegetables; Greens and Beans; Total Protein; Seafood and Plant Proteins and Fatty Acids.*

**The SAS program carries out 5 steps:**

1. **Reads in the NIH-AARP data.**

This data has already been linked to the MyPyramid Equivalents Database (MPED) and the CNPP MyPyramid Equivalents Database to generate MPED values.

1. **Sets Soy intake to zero.**

Calculation note for SOY**:** Since the public use AARP data does NOT contain a variable for SOY consumption, a variable is created and set to zero. This allows the program to successfully complete. If using data other than AARP – the code to create mped\_M\_SOY must be removed or commented out.

1. **Creates additional required variables: MONOPOLY**, **VTOTALLEG, VDRKGRLEG, PFALLPROTLEG, and PFSEAPLANTLEG.**

Calculation note for MONOPOLY: MONOPOLY sums up monounsaturated and polyunsaturated fatty acids (monopoly = fatmono + fatpoly). To estimate the fatty acid ratio of unsaturated fatty acids to saturated fatty acids, the scoring macro divides this summed value by saturated fatty acids (MONOPOLY/Total saturated fatty acids (g)).

Calculation note for VTOTALLEG and VDRKGRLEG: VTOTALLEG sums together all vegetables and legumes (VTOTALLEG = mped\_v\_total (cups)+ mped\_legumes (cups)); and VDRKGRLEG sums together dark green vegetables and legumes (VDRKGRLEG = mped\_v\_drkgr (cups) + mped\_legumes (cups)).

**NOTE:** Legumes here are in cup equivalents (for vegetables), not in cup equivalents (as they would be for protein foods).

Calculation note for SFALLPROTLEG and SFSEAPLANTLEG*:*  SFALLPROTLEG sums together all animal and plant proteins, including meat, poultry, fish, eggs, nuts, seeds, soy , and legumes (SFALLPROTLEG = mped\_M\_MPF (oz) + mped\_M\_EGG (oz) + mped\_M\_NUTSD (oz) + mped\_M\_SOY (oz) + protlegumes (oz)); while SFSEAPLANTLEG sums together all fish and plant proteins, including fish, nuts, seeds, soy, and legumes (SFSEAPLANTLEG = mped\_M\_FISH\_HI (oz) + mped\_M\_FISH\_LO (oz) + mped\_M\_SOY (oz) + mped\_M\_NUTSD (oz) + protlegumes (oz)).

**NOTE:** Legumes here are in ounce equivalents (for protein foods), not in cup equivalents (as they would be for vegetables).

Calculation note regarding conversion of cup equivalents to ounce equivalents:One-fourth cup of legumes is equal to 1 ounce equivalent of meat. Thus, the number of cup equivalents of legumes is multiplied by 4 to convert to ounce equivalents of meat.

1. **Runs the HEI-2015 scoring macro which calculates intake density amounts and HEI scores.**

The HEI-2015 scoring macro, [hei2015.score.macro.sas](https://epi.grants.cancer.gov/hei/sas-code.html), is called to calculate densities for each HEI-2015 component and then apply the scoring algorithm.

Below are the HEI-2015 Component Scoring Standards. For more information on HEI components, see [Comparing Versions of the HEI](https://epi.grants.cancer.gov/hei/comparing.html) on the NCI website.

**HEI–2015**[**1**](http://epi.grants.cancer.gov/hei/developing.html#f1) **Components & Scoring Standards**

|  |  |  |  |
| --- | --- | --- | --- |
| **Component** | **Max points** | **Standard for maximum score** | **Standard for minimum score of zero** |
| **Adequacy:** |  |  |  |
| **Total Fruits**[**2**](http://epi.grants.cancer.gov/hei/developing.html#f2) | 5 | ≥0.8 cup equiv. per 1,000 kcal | No Fruits |
| **Whole Fruits**[**3**](http://epi.grants.cancer.gov/hei/developing.html#f3) | 5 | ≥0.4 cup equiv. per 1,000 kcal | No Whole Fruits |
| **Total Vegetables**[**4**](http://epi.grants.cancer.gov/hei/developing.html#f4) | 5 | ≥1.1 cup equiv. per 1,000 kcal | No Vegetables |
| **Greens and Beans**[**4**](http://epi.grants.cancer.gov/hei/developing.html#f4) | 5 | ≥0.2 cup equiv. per 1,000 kcal | No Greens and Beans |
| **Whole Grains** | 10 | ≥1.5 oz equiv. per 1,000 kcal | No Whole Grains |
| **Dairy**[**5**](http://epi.grants.cancer.gov/hei/developing.html#f5) | 10 | ≥1.3 cup equiv. per 1,000 kcal | No Dairy |
| **Total Protein Foods**[**4**](http://epi.grants.cancer.gov/hei/developing.html#f6) | 5 | ≥2.5 oz equiv. per 1,000 kcal | No Protein Foods |
| **Seafood and Plant Proteins**[**6**](http://epi.grants.cancer.gov/hei/developing.html#f6) | 5 | ≥0.8 oz equiv. per 1,000 kcal | No Seafood or Plant Proteins |
| **Fatty Acids**[**7**](http://epi.grants.cancer.gov/hei/developing.html#f7) | 10 | (PUFAs + MUFAs)/SFAs ≥2.5 | (PUFAs + MUFAs)/SFAs ≤1.2 |
| **Moderation:** |  |  |  |
| **Refined Grains** | 10 | ≤1.8 oz equiv. per 1,000 kcal | ≥4.3 oz equiv. per 1,000 kcal |
| **Sodium** | 10 | ≤1.1 gram per 1,000 kcal | ≥2.0 grams per 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).

1. **Displays and saves the results** **to the specified output folder (see notes in the provided SAS program)**
   1. This program saves the HEI-2015 total score and set of component scores for each individual, based on one 24HR or food record, as a CSV file.
   2. Calculates an unweighted mean for all individuals in the group.

This step is included as a data check. The min and max can be compared to the bounds of HEI-2015 scores – if any scores <0 or >100, this is a red flag.

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