# **/\* The SAS program (HEI-2005 at the population/group level using ASA24-2011 to ASA24-2014 data)**

# **Population Ratio Method.SAS \*/**

/\* This program creates component and total scores of the HEI-2005 for a population or a group. The 12 components include: Total Fruit, Whole Fruit, Total Vegetables, Dark Green and Orange Vegetables and Legumes, Total Grains, Whole Grains, Milk, Meat and Beans, Oils, Saturated Fat, Sodium, and Calories from Solid Fat, Alcohol, and Added Sugar (SoFAAS). \*/

/\*Please see accompanying readme file. \*/

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**/\*INSTRUCTIONS – complete tasks 1-4 in this section, and run these SAS codes before proceeding to the HEI-2005 scoring program that follows\*/**

/\*1. Create a folder on your computer “home folder”, and save the ASA24 data, and the required HEI-2005 macros in it. Specify the path to the folder. \*/

%let home = C:\Users\Documents\ASA24; /\*In this Example, the “home” folder is in C Drive, within Documents, and is called ASA24. \*/

/\*2. Filenames here specifies the input files. \*/

filename inf4 “&home\inf4\inf4.xls”;

filename tn4 “&home\tn4\tn4.xls”; /\*In this Example, the ASA24 Individual Foods data “inf4”, and the Total Foods data “tn4”, are in folders called “inf4” and “tn4”, all saved within the “home” folder. The data are in Excel format. \*/

/\*3. Create a folder in the "home" folder, where the output file, containing HEI-2005 component and total scores are to be exported. Specify the name of the folder. \*/

filename res “&home\res”; /\*In this Example, the folder is called “RES”, within the “home” folder, and the exported results will be a csv file called “result”. \*/

/\*4. Read in required HEI-2005 scoring macros. These macros must be saved within the home folder. \*/

%include “&home\hei2005.beanspeas.allocation.macro.doc.sas”;

%include “&home\hei2005.score.macro.doc.sas”;

/\*NOTE: Once you have completed all the steps above, all you need to do is run the SAS program below. Unless you used different names for your dataset and folders, no other action is required from you. \*/

TITLE 'ASA24 - HEI-2005 scores';

/\*Section (I): Calculations at the individual participant level to obtain variables needed to calculate HEI-2005 scores. \*/

/\*Step 1: Locate the required datasets and variables\*/

\*Input the food data;

**proc** **import** datafile=inf4

out=inf4

dbms=xls

replace;

getnames=yes;

**run**;

\*proc contents varnum;

\*proc means n nmiss min max mean;

**data** food;

set inf4;

\*move soy milk from soy to dairy;

/\*FOODCODE=11310000, MILK, IMITATION, FLUID, SOY BASED (1 cup=244 grams)

FOODCODE=11320000, MILK, SOY, READY-TO-DRINK, NOT BABY (1 cup=245 grams)

FOODCODE=11321000, MILK, SOY, READY-TO-DRINK, NOT BABY'S, CHOCOLATE (1 cup=240 grams)

FOODCODE=11330000, MILK, SOY, DRY, RECONSTITUTED, NOT BABY (1 cup=245 grams) \*/

IF FOODCODE=**11310000** THEN DO;

M\_SOY=**0**;

D\_TOTAL=ROUND(FoodAmt/**244**,**.001**);

END;

ELSE IF FOODCODE=**11320000** THEN DO;

M\_SOY=**0**;

D\_TOTAL=ROUND(FoodAmt/**245**,**.001**);

END;

ELSE IF FOODCODE=**11321000** THEN DO;

M\_SOY=**0**;

D\_TOTAL=ROUND(FoodAmt/**240**,**.001**);

END;

ELSE IF FOODCODE=**11330000** THEN DO;

M\_SOY=**0**;

D\_TOTAL=ROUND(FoodAmt/**245**,**.001**);

END;

\*get alc cals;

THREED=INT(FOODCODE/**100000**);

IF (**931** <= THREED <= **935**) and foodcode ne **93401300** then alc=**1**; /\*alcoholic beverages of beer, wine, and distilled spirits\*/

\*IF FOODCODE=93401300 THEN DELETE; /\*Remove cooking wine\*/

if alc=**1** then do; \*food contains beer/wine/liquor;

SUGGRAM=ADD\_SUG\***4**; /\*convert from teaspoons to grams of added sugars=grams of carbohydrate from added sugars\*/

NOSCARB=CARB-SUGGRAM; /\*subtract grams of carbohydrate from added sugars from the total carbohydrate\*/

IF THREED IN (**931**,**932**,**934**) THEN BWCARBC=NOSCARB\***4**; /\*SoFAAS calories from carbohydrate in alcoholic beverages\*/

ETHCAL=ALC\***7**; /\*SoFAAS calories from alcohol (ethanol) in alcoholic beverages\*/

end;

else do; \*no alcohol so zero cals;

bwcarbc=**0**;

ethcal=**0**;

end;

**run**;

**proc** **sort** data=food;

by username recallno;

**run**;

**proc** **means** data=food noprint;

by username recallno;

var d\_total m\_soy bwcarbc ethcal;

output out=adjsum sum=d\_total\_adj m\_soy\_adj bwcarbc ethcal;

**run**;

\*Input the day total data;

**proc** **import** datafile=tn4

out=tn4

dbms=xls

replace;

getnames=yes;

**run**;

**proc** **sort** data=tn4;

by username recallno;

**run**;

**data** tn4;

merge tn4 adjsum;

by username recallno;

**run**;

**DATA** both;

SET tn4;

by username recallno;

V\_DOL=V\_ORANGE+V\_DRKGR;

ALLMEAT=M\_MPF+M\_EGG+M\_NUTSD+m\_soy\_adj;

/\*\*Calculate intake of Calories from SoFAAS\*\*/

/\*Calculate SoFAAS Calories from Added sugars, solid fat, and alcoholic beverages\*/

ADDSUGC=**16**\*ADD\_SUG; /\*calories from added sugars\*/

SOLFATC=DISCFAT\_SOL\***9**; /\*calories from solid fat\*/

IF ETHCAL < **0** THEN ETHCAL=**0**;

IF BWCARBC < **0** THEN BWCARBC=**0**;

EXFAAS=ADDSUGC+SOLFATC+ETHCAL+BWCARBC; /\*total SoFAAS calories as in kcal\*/

**run**;

/\*Section (II): Calculation of weighted means and a variance-covariance matrix and generation of a Monte Carlo dataset, enabling standard errors to be calculated.\*/

/\*Step 1. Calculate the weighted means and the variance/covariance matrix for the dietary variables of interest. \*/

**proc** **corr** data=both outp=covdata cov nocorr nomiss noprint;

var KCAL F\_TOTAL WHOLEFRT V\_TOTAL V\_DOL legumes G\_TOTAL g\_whl d\_total\_adj

allmeat DISCFAT\_OIL SFAT SODI EXFAAS;

**run**;

**proc** **print** data=covdata noobs;

title2 "Cov, Mean, Std, and N from Corr Procedure.";

**run**;

**data** count (keep=\_TYPE\_ sampsize);

set covdata;

if \_TYPE\_='N';

sampsize=KCAL;

\_TYPE\_='COV';

**run**;

**data** mean;

set covdata;

if \_TYPE\_='MEAN';

**run**;

**proc** **sort** data=count;

by \_type\_;

**run**;

**proc** **sort** data=covdata;

by \_type\_;

**run**;

**data** covdata;

merge count covdata;

by \_type\_;

**run**;

**data** covdata;

set covdata;

array diag KCAL F\_TOTAL WHOLEFRT V\_TOTAL V\_DOL legumes G\_TOTAL g\_whl d\_total\_adj

allmeat DISCFAT\_OIL SFAT SODI EXFAAS;

do over diag;

diag=diag/sampsize;

end;

if \_TYPE\_ ne 'COV' then delete;

**run**;

**data** covdata;

set covdata mean;

**run**;

**proc** **print**;

title2 'input to simnormal';

**run**;

/\*Step 2. In this step, a Monte Carlo data set with 10,000 rows is generated using the weighted means

and variance/covariance matrix from step 1\*/

**proc** **simnormal** data=covdata(type=cov) numreal=**10000** seed=**51230077** outseed out=sim\_data;

var KCAL F\_TOTAL WHOLEFRT V\_TOTAL V\_DOL legumes G\_TOTAL g\_whl d\_total\_adj

allmeat DISCFAT\_OIL SFAT SODI EXFAAS;

**run**;

**proc** **means** data=sim\_data n nmiss min max mean stddev;

var KCAL F\_TOTAL WHOLEFRT V\_TOTAL V\_DOL legumes G\_TOTAL g\_whl d\_total\_adj

allmeat DISCFAT\_OIL SFAT SODI EXFAAS;

title2 "Distributions of Simulated Data";

**run**;

**proc** **print** data=sim\_data(obs=**20**);

title2 "Listing of 20 Records from Simulated Data";

**run**;

/\*Section (III): Allocation of legumes to Meat and Beans and/or Total Vegetables and Dark Green and Orange Vegetables

and Legumes and application of the HEI-2005 scoring algorithm.\*/

/\*Step 1. Allocate legumes (beans and peas) using the Monte Carlo data set from Section II and the beans and peas allocation macro. \*/

%***LEGALLOC*** (indat=sim\_data,

kcal=KCAL,

allmeat=allmeat,

v\_total=v\_total,

v\_dol=v\_dol,

legumes=legumes,

outdat=lsim\_data);

/\*Step 2. Apply the HEI-2005 scoring macro.\*/

%***HEI2005*** (indat=lsim\_data,

kcal=KCAL,

f\_total=f\_total,

wholefrt=wholefrt,

lv\_total=legume\_added\_v\_total,

lv\_dol=legume\_added\_v\_dol,

g\_total=g\_total,

g\_whl=g\_whl,

d\_total=d\_total\_adj,

lallmeat=legume\_added\_allmeat,

oil=DISCFAT\_OIL,

sfat=SFAT,

sodi=SODI,

exfaas=exfaas,

outdat=aftermac);

**run**;

**proc** **means** data=aftermac n nmiss min max mean stddev;

var legume\_added\_v\_total legume\_added\_v\_dol legume\_added\_allmeat frtden whfrden vegden dgvden grnden wgrnden dairyden

meatden oilden pctsfat sodden sofa\_perc;

title2 'after legume allocation and hei 2005 scoring macro';

**run**;

/\*Section (IV): Calculation of mean HEI-2005 component and total scores and their confidence intervals.\*/

/\*Step 1. This step uses univariate and means procedures to compute total and component scores and their standard errors \*/

**proc** **univariate** data=aftermac noprint;

var HEI1\_TOTALFRUIT HEI2\_WHOLEFRUIT HEI3\_TOTALVEG HEI4\_DARKVEG HEI5\_TOTALGRAIN HEI6\_WHOLEGRAIN

HEI7\_MILK HEI8\_MEATBEAN HEI9\_OIL HEI10\_SATFAT HEI11\_SODIUM HEI12\_EXFAAS HEI2005\_TOTAL\_SCORE;

output out=ci pctlpts=**2.5** **97.5** pctlpre=h1\_ h2\_ h3\_ h4\_ h5\_ h6\_ h7\_ h8\_ h9\_ h10\_ h11\_ h12\_ totscore\_;

**run**;

**proc** **means** data=aftermac noprint;

var HEI1\_TOTALFRUIT HEI2\_WHOLEFRUIT HEI3\_TOTALVEG HEI4\_DARKVEG HEI5\_TOTALGRAIN HEI6\_WHOLEGRAIN

HEI7\_MILK HEI8\_MEATBEAN HEI9\_OIL HEI10\_SATFAT HEI11\_SODIUM HEI12\_EXFAAS HEI2005\_TOTAL\_SCORE;

output out=stat min=h1\_min h2\_min h3\_min h4\_min h5\_min h6\_min h7\_min h8\_min h9\_min h10\_min h11\_min h12\_min totscore\_min

max=h1\_max h2\_max h3\_max h4\_max h5\_max h6\_max h7\_max h8\_max h9\_max h10\_max h11\_max h12\_max totscore\_max

mean=h1\_mean h2\_mean h3\_mean h4\_mean h5\_mean h6\_mean h7\_mean h8\_mean h9\_mean h10\_mean h11\_mean h12\_mean totscore\_mean

stddev= h1\_stddev h2\_stddev h3\_stddev h4\_stddev h5\_stddev h6\_stddev h7\_stddev h8\_stddev h9\_stddev h10\_stddev h11\_stddev h12\_stddev totscore\_stddev;

**run**;

/\*Step 2. This step prepares the results for display\*/

**data** all;

merge ci stat;

**run**;

**data** result (keep=score slabel min max mean stderr low high);

set all;

score='HEI1 ';

slabel='HEI-2005 COMPONENT 1 TOTAL FRUIT';

min=h1\_min;

max=h1\_max;

mean=h1\_mean;

stderr=h1\_stddev;

low=h1\_2\_5;

high=h1\_97\_5;

output result;

score='HEI2';

slabel='HEI-2005 COMPONENT 2 WHOLE FRUIT';

min=h2\_min;

max=h2\_max;

mean=h2\_mean;

stderr=h2\_stddev;

low=h2\_2\_5;

high=h2\_97\_5;

output result;

score='HEI3';

slabel='HEI-2005 COMPONENT 3 TOTAL VEGETABLES';

min=h3\_min;

max=h3\_max;

mean=h3\_mean;

stderr=h3\_stddev;

low=h3\_2\_5;

high=h3\_97\_5;

output result;

score='HEI4';

slabel='HEI-2005 COMPONENT 4 DARK GREEN & ORANGE VEG & LEGUMES';

min=h4\_min;

max=h4\_max;

mean=h4\_mean;

stderr=h4\_stddev;

low=h4\_2\_5;

high=h4\_97\_5;

output result;

score='HEI5';

slabel='HEI-2005 COMPONENT 5 TOTAL GRAINS';

min=h5\_min;

max=h5\_max;

mean=h5\_mean;

stderr=h5\_stddev;

low=h5\_2\_5;

high=h5\_97\_5;

output result;

score='HEI6';

slabel='HEI-2005 COMPONENT 6 WHOLE GRAINS';

min=h6\_min;

max=h6\_max;

mean=h6\_mean;

stderr=h6\_stddev;

low=h6\_2\_5;

high=h6\_97\_5;

output result;

score='HEI7';

slabel='HEI-2005 COMPONENT 7 MILK';

min=h7\_min;

max=h7\_max;

mean=h7\_mean;

stderr=h7\_stddev;

low=h7\_2\_5;

high=h7\_97\_5;

output result;

score='HEI8';

slabel='HEI-2005 COMPONENT 8 MEAT & BEANS';

min=h8\_min;

max=h8\_max;

mean=h8\_mean;

stderr=h8\_stddev;

low=h8\_2\_5;

high=h8\_97\_5;

output result;

score='HEI9';

slabel='HEI-2005 COMPONENT 9 OILS';

min=h9\_min;

max=h9\_max;

mean=h9\_mean;

stderr=h9\_stddev;

low=h9\_2\_5;

high=h9\_97\_5;

output result;

score='HEI10';

slabel='HEI-2005 COMPONENT 10 SATURATED FAT';

min=h10\_min;

max=h10\_max;

mean=h10\_mean;

stderr=h10\_stddev;

low=h10\_2\_5;

high=h10\_97\_5;

output result;

score='HEI11';

slabel='HEI-2005 COMPONENT 11 SODIUM';

min=h11\_min;

max=h11\_max;

mean=h11\_mean;

stderr=h11\_stddev;

low=h11\_2\_5;

high=h11\_97\_5;

output result;

score='HEI12';

slabel='HEI-2005 COMPONENT 12 CALORIES FROM SOLID FAT, ALCOHOL & ADDED SUGAR (SoFAAS)';

min=h12\_min;

max=h12\_max;

mean=h12\_mean;

stderr=h12\_stddev;

low=h12\_2\_5;

high=h12\_97\_5;

output result;

score='TOTAL HEI 2005';

slabel='TOTAL HEI-2005 SCORE';

min=totscore\_min;

max=totscore\_max;

mean=totscore\_mean;

stderr=totscore\_stddev;

low=totscore\_2\_5;

high=totscore\_97\_5;

output result;

**run**;

/\*Step 3 - This step displays the results\*/

**proc** **print** data=result;

id score;

var slabel min max mean stderr low high;

title2 'simple unweighted survey design population method - mean and confidence interval of HEI 2005 using FEAST asa24 data';

**run**;

/\*Step 4 - This step provides an option to export the results into a CSV file that can be opened in Excel.\*/

**proc** **export** data=result

file=res

dbms=csv

replace;

**run**;