

## LINKING NUTRIENT DATABASES--1977-78 NFCS TO CSFII 1985

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The Human Nutrition Information Service (HNIS) of the U.S. Department of Agriculture (USDA) is responsible for conducting Nationwide Food Consumption Surveys. The current survey being conducted by USDA is the Continuing Survey of Food Intake by Individuals, which began in April 1985. It is the first nationwide dietary intake survey designed to be conducted year-by-year in this country and is targeted at population subgroups. In the first year, data were collected for women 19 to 50 years of age and their children 1 to 5 years and for men 19 to 50 years of age. The Continuing Survey complements the larger Nationwide Food Consumption Surveys conducted by USDA approximately every 10 years, which includes dietary intake data on males and females of all ages as well as data on household food use and cost.

One of the biggest jobs in preparing for these surveys is developing a nutrient data base that includes all of the foods that Americans report eating. The nutrient data base is used to calculate the nutrient intakes of survey respondents. The nutrient data base developed for the 1977-78 Nationwide Food Consumption Survey contained over 4,500 food items, reflecting the abundance of food choices that Americans have. In preparing for the Continuing Survey, the food codes and nutrient data base used in the 1977-78 Nationwide Food Consumption Survey (NFCS) were updated and expanded. We developed a linkage system that allows the food codes used in the NFCS to be updated with nutrient values appropriate for 1985. This article explains the linkage system of the two data bases that was developed by USDA and is available to the public. It also briefly summarizes the changes made in updating and expanding the nutrient data base.

To understand the system that links the 1977-78 food codes with the 1985 nutrient data, we need to be aware of the changes that were made in the 1977-78 data base. The 4,500-plus foods in the nutrient data base of 1977-78 NFCS are identified by 7-digit food codes. In preparing for the Continuing Survey, the food codes and corresponding nutrient values were reviewed, updated, and expanded. Revisions to the food coding system generally include:

- elimination of items no longer marketed or infrequently reported in the 1977-78 NFCS
- addition of new food items on the market
- combination of items previously coded separately but which were reported infrequently and had very similar nutrient composition values, such as several varieties of fish
- separation of items--those coded as mixtures in 1977-78 such as coffee and cream or salad and dressing, into their component parts; and similar foods previously coded together, such as low-sodium and regular products. This was done because of the expansion of the nutrient data base to include fatty acids and sodium.

- changes made to food item descriptions to provide clarification and detail.

Based on the revisions to the food codes, all nutrient values in the nutrient data base were reviewed and updated to reflect new research information and the most current available data. There have been major changes in food composition data since 1977. Data for magnesium and vitamins B<sub>6</sub> and B<sub>12</sub> are more reliable. Calcium and phosphorus values for some foods are higher. For example, more calcium has been added to some breakfast cereals. Phosphorus also increased as calcium was added in the form of calcium phosphate. Bacon now has phosphate added to reduce shrinkage during cooking.

Iron values have also changed. They are higher for white flour and for bread and other baking products made with white flour because of an increase in iron enrichment standards in 1983. They are lower for meat because of improved data. Vitamin A values are higher for carrots, sweet potatoes, and other deep-yellow vegetables because of the development of new varieties that are more intense in color, thus higher in beta-carotene, the precursor of Vitamin A. Vitamin A values for fruits are generally lower because of improved data.

#### NUTRIENTS

The revision of the food coding system, and moreover, the major review and expansion of the nutrient composition of the foods represents the largest change to a USDA survey nutrient data base over the past 20 years. In 1965-66, the NFCS covered food energy and 10 nutrients:

- |               |             |
|---------------|-------------|
| ·protein      | ·vitamin A  |
| ·fat          | ·vitamin C  |
| ·carbohydrate | ·niacin     |
| ·calcium      | ·thiamin    |
| ·iron         | ·riboflavin |

Four nutrients were added in 1977-78. They were phosphorus, magnesium, vitamins B<sub>6</sub> and B<sub>12</sub>. In 1985 for the Continuing Survey, 14 nutrients and dietary constituents were added to the data base:

- |                              |  |
|------------------------------|--|
| ·sodium                      | ·total monounsaturated fatty acids         |
| ·potassium                   | ·total polyunsaturated fatty acids         |
| ·zinc                        | ·vitamin A as retinol equivalents          |
| ·copper                      | ·carotene as retinol equivalents           |
| ·folacin                     | ·vitamin E as alpha-tocopherol equivalents |
| ·cholesterol                 | ·dietary fiber                             |
| ·total saturated fatty acids | ·alcohol                                   |

#### LINKAGE SYSTEM

The expansion of data reflects the significant advances in assessing the nutrient composition of our food supply. Because of the major expansion and revisions to the data base in 1985, we wanted to provide a means of allowing the 1977-78 NFCS food code system to be used with nutrient values appropriate for 1985. We are also interested in evaluating the effect of these changes on the nutrient content of dietary intake data of the population. To address

these areas, a linkage system was developed that matched every individual food item in the 1977-78 NFCS to the identical or most similar individual food item in the CSFII 1985 by means of the 7-digit food code. The linkage system provided the mechanism to match the food codes of 1977-78 NFCS with the most appropriate 1985 nutrient values. The linkage system consists of two parts:

- a computer listing of all 1977-78 NFCS individual food codes and the 1985 CSFII food codes that they match, as well as a link code that provides an explanation of the match.
- a data tape that includes all 1977-78 individual food codes and descriptions with their assigned 1985 nutrient values. The nutrient values were derived from the 1985 food code(s) matched to the 1977-78 food code.

The computer listing of the linkage file include the following information:

- the 1977 food code and description
- a weighting factor (WT) used when a 1977 food code is matched to more than one 1985 food code
- 1985 food code and description that match the 1977 food code
- a two-letter link code that identifies what happened to the 1977 food code in relation to the 1985 food code.

We categorized the matches by five different link codes. Most of the items in the 1977 food code system--about 3,800 out of nearly 4,600 (83 percent)--were retained essentially as in the 1985 food code system. Those matches were identified by the SS code. Our in-house definition of the SS abbreviation is that these food items stayed the same in the 1985 food code system. These food items, although the same, do not always have the identical description or food code number. Some of the descriptions were revised or expanded for clarity. Some food codes were changed because the item was moved to a different section in the food code manual. Some examples of matches that were given an SS code are listed below:

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>	<u>Description</u>
1111100	milk, cow's, fluid whole	1111100	milk, cow's fluid, whole
2140112	beef roast, roasted, lean only	2140112	beef roast, roasted, lean only eaten
2100020	beef steak, NFS	2110100	beef steak, ckd,NS as to fat
2110111	beef steak, with bone, broiled, lean and fat or NFS	2110112	beef steak, broiled, lean and fat eaten
2110112	beef steak, with bone, broiled, lean only	2110113	beef steak, broiled, lean only eaten

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>	<u>Description</u>
---	-----	2110111	beef steak, broiled, NS as to fat
2410611	chicken, drumstick, with bone, broiled, skin eaten/NFS	2414121	chicken, drumstick, with or without bone, without skin, broiled
2410612	chicken, drumstick, with bone, broiled, skin not eaten	2414122	chicken, drumstick, with or without bone, without skin, broiled
---	-----	2414120	chicken, drumstick, with or without bone, broiled, NS as to skin
1461010	cheese cake	5310450	cheesecake
2736003	burrito, with cheese	5810012	burrito with beef, beans, and cheese
6340206	peach crisp	5341550	crisp, peach

The first two examples are food items which did not have changes in the description or food code. 'Fluid whole milk' and 'roasted beef roast, lean only eaten', are described the same and have the same food codes in 1985 as they did in 1977.

Some of the food item descriptions or codes were changed in 1985 to support the increased probing for detailed information that was implemented in the Continuing Survey. For example, the type of preparation method and explanation of "not further specified"--NFS--were added to many food descriptions in 1985. The 1977 item 'beef steak, not further specified', was matched to the 1985 item 'beef steak, cooked, not specified as to fat'. Food item descriptions were also changed to define fat moderation more specifically. In 1977, many meats were described as "lean and fat eaten" or "not further specified" as one item. These items were assumed to be untrimmed. In 1985, codes for these items were expanded to separate and designate "lean only eaten" and "lean and fat eaten". Most meat items also have a "not specified" designation in relation to fat for those respondents who did not know if they had trimmed or untrimmed meat. The 1977 item 'beef steak, with bone, broiled, lean and fat eaten or not further specified' was matched to 'beef steak, broiled, lean and fat eaten'. In 1985, a code has been added for 'broiled beef steak, not specified as to fat'. For codes not specified as to fat, it is assumed that fat is eaten. This assumption is based on the reasoning that the respondent is more likely to recall trimming the fat from meat.

Similar changes were made to poultry items. In 1977, many poultry items were described as "skin eaten" or "not further specified" as one item. In 1985,

codes for those items were expanded to separate and designate "with skin" and "without skin". The examples of broiled chicken drumstick illustrate the separation of with skin, without skin, and not further specified. As with meat items, the not further specified designation for poultry items assumes that skin is eaten.

Some of the food items were moved to different sections in the code book, resulting in changes to the code numbers. Some examples include cheesecakes moving from the milk and milk products section to the cake subgroup of the grain products section. Mixtures made with meat and grain products such as the 'burrito with cheese' were moved from the meat, poultry, fish, and mixtures group to the grain products group. These mixtures were moved to group all mixtures containing grains--either with or without meat--into one section of the code book. Fruit crisps such as 'peach crisp' were moved from the fruit group to the grain products group.

A CC code--codes combined--shows that the 1977 food was combined with one or more other 1977 food items and assigned one food code in 1985. The items were very similar in nutrient composition. The description of the 1985 item encompasses the combined items. This includes 326, or about 7 percent, of the food codes. Listed below are examples of some of the matches classified as CC:

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>	<u>Description</u>
1141100	yogurt, homemade	1141110	yogurt, plain, whole milk
1321031	custard, homemade	1321030	custard, NFS
2512021	pork heart, cooked	2512000	heart, cooked, cooking method NS
2512031	veal heart, cooked	2512000	heart, cooked, cooking method NS
2611030	fish, blackfish, cooked, NFS	2613111	pompano, cooked, NS as to cooking method (includes blackfish, bluefish, ...)
2611031	fish, blackfish, fillet, broiled	2613112	pompano, baked/-broiled (includes blackfish, bluefish, ...)
5110110	bread, white, enriched	5110100	bread, white
5110150	bread, white, not enriched	5110100	bread, white

Homemade items such as yogurt and custard were combined with a similar item not described as homemade. Animal designations of organ meats other than liver were eliminated in 1985. Several types of fish that were infrequently reported in 1977 were combined in 1985. Product distinctions were omitted where level of detail was more than the respondent might be reasonably expected to know, such as whether breads were made with enriched flour. Most breads--about 95 percent--are made with enriched flour.

A DM code--deleted and matched--shows that the 1977 food item was deleted in 1985. We matched such codes to a 1985 food item that was similar based on description and nutritive value. This includes 296 (about 6 percent) of the food codes. The following are examples of DM codes. They include items not frequently reported in the 1977-78 NFCS or items that are no longer on the market:

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>	<u>Description</u>
2150140	beef, ground, patties, canned	2140140	beef roast, canned
2332311	moose meat loaf	2726001	meat loaf, NS as to meat

'Canned ground beef patties' was deleted in 1985 and matched with 'canned roast beef'. 'Moose meat loaf' was deleted and matched to 'meat loaf, not specified as to meat'. We did, however, keep cooked moose in the 1985 code book.

These three link codes--SS, CC, and DM--are one-to-one matches between 1977 and 1985 food codes. For about 200 of the 1977 food codes, it was not possible to match them with a single 1985 code. The 1977 codes linked to more than one 1985 code can be identified on the computer listing by a two-digit number in the weighting factor column. These include items deleted in the new coding system for which a similar single 1985 food item was not available to match, and items separated into individual ingredient components for coding in 1985.

The DD code--deleted and dropped--identifies that the 1977 food item was deleted in 1985, but that there was not a 1985 item that we considered to be a similar item to match it with. Therefore, the 1977 food item was matched to 1985 food items that make up its individual ingredient components. The value in the weighting factor column on the computer listing indicates the proportion of the ingredient in the 1977 food item, and the weighting factors total to 100. This factor is applied to each of the 1985 codes in determining the nutrient composition for the 1977 food code. This includes 80 (about 2 percent) of the food codes.

The following are examples of food items deleted in 1985 and matched to their individual components:

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>WT</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>
1461051	cheese, cream with nuts	9	walnuts	4211600
		91	cheese, cream	1430101
6340204	prunes, stuffed with carrot	10	carrots, raw	7310101
		90	prunes, dried,	6212222
			cooked, unsweetened	

'Cream cheese with nuts' is matched to 9 percent walnuts and 91 percent cream cheese. 'Prunes stuffed with carrot' is matched to 10 percent raw carrot and 90 percent dried prunes.

An IS code--which stands for item separated--identifies that the 1977 food item was separated into its individual ingredient components for separate coding in 1985. The 1977 food item was matched to 1985 food codes that make up its individual ingredient components. As mentioned for the DD codes, the proportion of the ingredient in the 1977 food item is applied to add up to 100 percent. This includes 94, or about 2 percent, of the food codes. Examples of IS codes are listed below:

<u>1977</u> <u>Food Code</u>	<u>Description</u>	<u>WT</u>	<u>Description</u>	<u>1985</u> <u>Food Code</u>
7212512	spinach, raw with dressing	23	French dressing	8310400
		77	spinach, raw	7212510
7511401	tossed salad with cheese, NFS, assume dressing	13	French dressing	8310400
		87	lettuce, salad with cheese, tomato and/or carrots, with or without other vegetables	7514320
9210105	coffee, from ground, with cream and sugar	3	sugar, NFS	9110100
		8	cream, half and half	1212010
		89	coffee, ground, regular	9210100
9230202	tea, leaf with cream	8	cream, half and half	1212010
		92	tea, leaf	9230200

Dressings for salads and cream and sugar in coffee and tea have been separated in 1985. Spinach and tossed salad with cheese have been coded separately from French dressing. Coffee and tea have been coded separately from the sugar or cream an individual would add to them. This separate coding was done as part of an overall procedural change in the 1985 Continuing Survey to

look more definitively at type and amount of fat for estimating fatty acid composition and cholesterol.

The five link codes were used to categorize the match of every 1977 food code to a 1985 food code or codes. Verification of every match was conducted by comparing nutrient values of the 1977 food item to the 1985 food item or items it was matched to. Using this linkage system, a data base was developed that includes each of the 1977-78 NFCS food codes with its 1985 nutrient value from the 1985 CSFII nutrient data base.

The name of the data set is 1977-78 NFCS Food Codes (from Release 1) Linked to 1985 Nutrient Data Base (from Release 2). Release 1 and 2 are food codes and nutrient data bases for the 1977-78 NFCS and 1985 CSFII, respectively. The purpose of release 1- and 2-linked data base is to allow use of the <sup>1</sup> 1977-78 NFCS food code system with nutrient values appropriate for 1985.

#### SELECTED EXAMPLES OF CHANGES

The nutrient values in this data base are appropriate for dietary data collected from 1985. Use of this data base for analysis or reanalysis of dietary intake data collected before 1985 must be carefully interpreted. There have been several changes to the data base since 1977. New foods have been introduced on the market. The nutrient value of many foods have changed --some changes in the data base represent actual changes in the foods such as reformulation of food products, development of new varieties for more desirable characteristics, and changes in enrichment standards and fortification levels. Some changes in the data base reflect improvement in the nutrient data--more and better data for certain nutrients such as magnesium, and vitamins B<sub>6</sub> and B<sub>12</sub> as well as improvement in analytical methods. The following illustrates some of these changes between the 1977 and 1985 data bases.

Since 1977, new sections of Agriculture Handbook No. 8, "Composition of Foods," have been published on pork products and on sausages and luncheon meats. One of the next sections to be published is on beef products. We have seen changes in vitamin B<sub>12</sub> from these major sources.

Examples of food items from the meat, poultry, and fish group frequently reported in the 1977-78 NFCS are listed below to illustrate some of the largest changes in composition values for vitamin B<sub>12</sub>:

	Frequency in 1977-78 NFCS	Data Base	
		1977	1985
--mcg per 100 gm--			
Beef, roasted	7,970	.84	1.88
Ground beef, fried	9,071	1.52	2.70
Bacon, cooked	15,181	.99	1.75
Pork chop, fried	2,472	.36	.60
Pork, roasted	808	.32	.87

<sup>1</sup> The data base is available for purchase in machine-readable form from the National Technical Information Service, Springfield, Virginia 22161.

In 1977, vitamin B<sub>12</sub> values for many foods had to be imputed, and we indicated in our publication that the data base was less reliable for this nutrient than for others. Since then analytical methods have improved and reliable vitamin B<sub>12</sub> data are available for many more foods.

Nutrient composition values for fruits and vegetables were also updated since 1977. Data in Handbook No. 8-9 on fruits and fruit juices and No. 8-11 on vegetables and vegetable products show the changes in vitamin A for numerous fruits and vegetables. Examples of food items from the fruit and vegetable groups frequently reported in the 1977-78 Nationwide Food Consumption Survey are listed below to illustrate some of the largest changes in the composition values for vitamin A:

	Frequency in 1977-78 NFCS	Data Base	
		1977	1985
		--IU per 100 gm--	
Apple	12,245	90	53
Banana	10,248	190	81
Carrots, cooked	2,861	10,500	24,408
Carrots, raw	2,615	11,000	28,129

Vitamin A values for fruits are generally lower because better data have been obtained. This change is illustrated by the levels for apples and bananas--two very popular fruits. The vitamin A in cooked and raw carrots more than doubled when updated in the 1985 nutrient data base. This is because new varieties of deep-yellow vegetables have been developed with more intense color.

Between the times when the 1977 data base and the 1985 data base were developed, two changes occurred that greatly changed the iron values of foods. New research on the nutrient content of meat and meat products showed lower iron levels than had been assumed earlier. Also, the Federal enrichment standard for levels of iron in white flour increased in 1983 from 2.9-3.6 mg per 100 grams to 4.4 mg per 100 grams. The decrease in the iron level of meats and increase in products made with enriched flour are represented by the following examples:

	Frequency in 1977-78 NFCS	Data Base	
		1977	1985
		--mg per 100 gm--	
White Bread	26,579	2.5	2.8
Ground Beef, fried	9,071	3.1	2.4
Fresh Ham, cooked	4,514	2.6	1.1
Pork, roasted	808	2.9	1.0

### CONCLUSION

Nutrient data bases are constantly changing, improving, and expanding. Whether or not even a large change in the nutritive value of a particular food has a significant effect on overall nutrient intake by individuals depends on the amounts of the food consumed and the counterbalancing effects of changes in the nutritive values of other foods in the diet.

At HNIS, we are examining the effects of changes in the nutrient data base from 1977 to 1985. We will do this by recalculating the nutrient levels of diets reported in the 1977-78 NFCS using, via the linkage system, the 1985 nutrient data base. For comparing the 1977 and 1985 nutrient data bases, it is not a concern that some of the 1985 nutrient values are not appropriate for foods consumed in 1977. But this is a factor that users of the linkage system need to keep in mind. Our intent in releasing the linkage system is to help users who want to continue using our 1977 food codes but with updated nutrient values.

In evaluating the reanalysis of the data, we will be carefully interpreting the results based on the changes that have occurred in the data base since 1977-78. We plan to publish an administrative report on the study in 1987.