The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1.90
C2088
C3

Proceedings

OUTLOOK '90

66th Agricultural Outlook Conference
U.S. Department of Agriculture
Washington, D.C.
November 28 - November 30, 1989

ANNUAL AGRICULTURAL OUTLOOK CONFERENCE
United States Department of Agriculture
Washington, D.C.

Outlook '90, Session # 12 For Release: Wednesday, November 29, 1989

USDA'S NUTRIENT DATA BASE FOR NATIONWIDE DIETARY INTAKE SURVEYS

Betty P. Perloff
Senior Nutritionist
Human Nutrition Information Service
U.S. Department of Agriculture

One of the most important functions of dietary intake surveys is to provide information on average nutrient intakes for the designated population groups. This task is performed through use of average, or representative, nutrient composition data for the foods consumed by survey respondents. Nationwide dietary surveys conducted within the Federal government's National Nutrition Monitoring System use a nutrient data base especially designed and maintained for this purpose by the Human Nutrition Information Service (HNIS) of the U.S. Department of Agriculture (USDA).

The nationwide surveys using this data base are--

(1) USDA's large Nationwide Food Consumption Survey (NFCS) which takes place every 10 years. The most recent NFCS was conducted in 1987 and 1988. The previous NFCS took place in 1977.

(2) The Continuing Survey of Food Intakes by Individuals (CSFII), a smaller survey conducted by USDA that was initiated in 1985 and 1986 to track consumption between the larger decennial surveys. Continuing surveys were not conducted in 1987 and 1988 while the NFCS was underway, but resumed this year and are planned annually until the next NFCS begins.

(3) The National Health and Nutrition Examination Survey (NHANES III) conducted by the Department of Health and Human Services' National Center for Health Statistics. Interviewing for NHANES III began last fall and will continue through 1994.

This paper focuses on this nutrient data base and includes information about data base organization and documentation, data sources, and the automated process for generating updates to the data base. It also includes information about how individuals can access the nutrient data base for their own projects.

The current operating version of this data base contains almost 6,000 items. Foods have been organized to facilitate summarization of dietary intake data by food groups. Each food has a 7-digit numeric code in which the first position represents one of nine major food groups. Positions 2 and 3 represent subgroups. For example, all foods with "5" in the first position are grain products or mixtures with grain as the major ingredient, those beginning with "51" are yeast breads or rolls, and those beginning with "512" are whole-wheat yeast breads or rolls.

The Survey Nutrient Data Base includes data for foods in the forms in which they are generally consumed. For example, both raw broccoli and cooked broccoli are present, but only cooked forms of pork are included. Data for mixtures of foods are also included, with as much detail and for as many different variations as needed to distinguish among those with different nutrient profiles. For example, 14 different types of lasagna are in the data base: eight fall under the subgroup of "Grain Mixtures, Bread or Dough Dishes," and six are classified as "Diet Frozen Meals" within the subgroup of "Frozen Plate Meals with Grain as the Major Ingredient."

The nutrient values for each item are given for 100 grams of the edible portion of the foods. These values are translated into the amounts of nutrients in the portions consumed using information from a computerized "Manual of Food Codes for Individual Intake." The Manual, which can stand alone as an important resource data base, provides a complete description of each food item on the data base, as well as information on weights of common portions for each food.

The current data base includes data for energy and the 28 food components listed below. For the NFCS in 1977, this list included energy and 14 nutrients. It was expanded to the current 28 in 1985 in time for the first CSFII. In selecting the food components to include on this data base in 1985, the key consideration was the needs of the scientific community, but, by necessity, adequacy of available data was taken into account. The final selection was made jointly by HNIS and the National Center for Health Statistics.

The 1977 nutrient data base included data for the following items:

- Energy
- Protein
- Total fat
- Carbohydrate
- Calcium
- Iron
- Magnesium
- Phosphorus
- Ascorbic Acid
- Thiamin
- Riboflavin
- Niacin
- Vitamin B-6
- Vitamin B-12
- Vitamin A (IU)

In 1985 data for the items listed below were added.

Moisture	Copper
Total Saturated Fatty Acids	Zinc
Total Monounsaturated Fatty Acids	Folacin
Total Polyunsaturated Fatty Acids	Vitamin E
Alcohol	Vitamin A (RE)
Total Dietary Fiber	Carotenes (RE)
Sodium	Cholesterol
Potassium	

The nutrient profiles are developed by nutrient data specialists at HNIS who operate the National Nutrient Data Bank. Data that go into the Data Bank and are ultimately used for the Survey Data Base are collected from many sources. Data are contributed by food companies, by trade associations, and by government and university laboratories. Some analyses are performed under contract with USDA by commercial or university laboratories. Appropriate data are also selected from scientific literature. All data from any of these sources are evaluated for their reliability, and only those meeting the established criteria are entered into the Data Bank. When sufficient data exist for a food item, they are summarized into a representative nutrient profile for the item. These nutrient profiles are made available to the public through Agriculture Handbook No. 8, "Composition of Foods...Raw, Processed, Prepared," and its corresponding computer file, the USDA Nutrient Data Base for Standard Reference. For the last several years, revisions to Handbook 8 have taken place for one or two food groups at a time. As the revision to a food group has been completed, it has been published as a separate section of the handbook. Approximately once a year, data from newly revised sections are incorporated into the computerized USDA Nutrient Data Base for Standard Reference.

Survey Nutrient Data Base System

The Standard Reference Data Base, which is used by most computerized dietary analysis systems in the United States today, is the main source of data for the Survey Nutrient Data Base. HNIS uses a special information system to generate or update the Survey Nutrient Data Base, and data needed for the survey have been imported from the Standard Reference Data Base into the Primary Data Set (PDS), which is a part of this system. There are also items on the PDS used only for the purpose of calculating nutrient content of mixed foods from recipe components; for example, baking powder is not consumed as a food item but is included on the PDS because it frequently is used as an ingredient in food mixtures.

Values were added to the PDS for the nutrients missing from the Standard Reference Data Base, such as carotene. Complete nutrient profiles were added for missing food items. If analytical data were not available for the

missing items, the values were imputed from other forms of the foods or were estimated from data for similar foods. Included with each value on the PDS is a code to indicate whether or not it is from the Standard Reference Data Base and whether it is based on analytical data or is an imputed value. A date is also included with each value not from the Standard Reference Data Base to indicate when it was added to this data set. Documentation is maintained about the source of every value added to the PDS. For each estimated value, documentation includes information about its derivation.

The other major components of the survey nutrient data base system are the recipe file, a table of retention factors, and the computer program that updates the data base. Each of these components is discussesd briefly below.

Recipe File. The recipe file is the controlling file within the survey data base system. In this file, each survey food code is linked to one or more PDS item through a set of recipe codes. Approximately half of the recipes are actually direct links to the PDS. For example, the survey food code for whole milk is linked to the PDS item for whole milk. However, the survey food code for apple and cabbage salad is linked to the PDS items for cabbage, apples, and mayonnaise. Recipes contain information about changes in moisture or fat that occur during cooking, as well as information about the recipe ingredients, i.e., names, identification numbers, weights, and codes for accessing retention factors if applicable.

Table of Nutrient Retention Factors. This data set contains factors for calculating retention of 18 vitamins and minerals during cooking. The factors are organized into food categories, and each category is assigned a code for computer access. For example, the categories, computer access codes, and a sample of the retention factors for pasta are:

Code	Food and Cooking Method	thiamin retention (%)
0380	Pasta, baked	80
0381	Pasta, boiled, drained	65
0382	Pasta, boiled, drained, baked	55
0384	Pasta, boiled, not drained	80
0385	Pasta, reheated	95

Computer Program. The computer program uses the recipe file to determine what items will appear on the survey data base and which sets of nutrient values from the PDS will be used for each item. For one-component recipes, i.e., direct links between the survey and PDS, nutrient values are moved directly from the PDS to the survey data base. For multicomponent recipes, the values are calculated from data for the ingredients. Nutrient retention factors are accessed and used in the calculations when appropriate. The recipe calculation procedure is the same one used by the Nutrient Data Bank to calculate recipes for Agriculture Handbook No. 8.

For the survey data base, recipes containing salt as an ingredient were calculated both with and without the salt, and both sets of nutrient values appear on the data base. A special field in each record indicates if a set of values was calculated directly from the recipe or calculated by omitting salt from the recipe. Recipes including fat as an ingredient or recipes involving the absorption of fat during cooking were calculated in several ways--by using data for the type of fat specified in the recipe and also by substituting data for several other types of commonly used fats. For example, if a recipe normally uses butter as the ingredient, the nutritive values were calculated by using butter as the ingredient and also by using nine other fats, including three vegetable oils, shortening, lard, three margarines, and one margarine-like product. Complete sets of nutrient values for these different calculations are included in the survey data base.

The entire data base is updated before each USDA food consumption survey. The first step in the process is to update the PDS with the most current version of the Standard Reference Data Base. For example, the version of the Standard Reference used for the 1985 survey was release number 5; the version used for the 1987 survey was release number 7. The difference between the two versions was that release 7 contained updated data from revised Handbook No. 8 sections for beverages, legume products, and fish and shellfish products.

During 1988-89, updated information on beef and eggs were processed through the Nutrient Data Bank. These data will be available soon in Handbook No. 8 revisions and Standard Reference updates, but for the interim new beef and egg values were inserted directly into the PDS. Thus, the Survey Nutrient Data Base was updated as quickly as possible, and NFCS results will be based on these newer data.

During the course of a survey, when new food items are reported by survey respondents, special forms are submitted to USDA. An interdepartmental food code committee, with representatives from both HNIS and NCHS, reviews these forms and decides what new food items should be added to the data base. When a new item is needed, a new code is assigned and the request for development of the nutrient profile is forwarded to HNIS nutrient data specialists. A new recipe is developed and inserted into a small temporary recipe file. If additional data are needed, they are obtained, or estimated if necessary, and placed on the PDS with appropriate codes and dates. The file of new recipes is periodically processed through the system. The resulting nutrient values are merged into the survey data base, and the corresponding new recipes are merged into the main recipe file.

Maintaining the data base is a complicated process. It must reflect improvements that are made to nutrient data and recipes, as well as changes in food products such as a new fortification level of iron in an existing

breakfast cereal. HNIS maintains computerized records of changes to the various components of the Survey Nutrient Data Base System. As surveys take place from year to year, or as the NHANES III progresses through several years, these records will be referenced to help determine how changes in foods have affected the nutrient intakes of individuals.

The benefits of the Survey Nutrient Data Base system go beyond the obvious ability to quickly update the data base. Another benefit of particular significance is the ability to convert data on the consumption of mixed foods into data on the consumption of PDS items. This conversion is possible by using the recipe file that designates the amount of each food component in mixed food items. Consumption data for the PDS items serve two important functions. They permit studying nutrient contribution at the primary food level, and they also provide a mechanism for evaluating the nutrient values on the PDS.

For example, using food consumption data from the 1985 CSFII and the recipe file in the survey data base system, amounts of mixed foods consumed were converted into amounts of ingredients consumed. Consumption data for foods at this primary food level were then aggregated. For each nutrient in the data base, the minimum number of PDS food items required to reach 80 percent of the total intake of the nutrient was determined. For most nutrients, 100-200 foods account for 80% of the consumption of the nutrient.

The nutrient values on the PDS for these foods were then evaluated to determine the greatest needs for nutrient analyses. Based on this evaluation, a project was conducted in 1987 to improve the anlytical nutrient base for the survey. Generally, the items analyzed were frequently consumed foods and foods that were major contributors of nutrients for which intakes were below the RDA in the 1985 CSFII. Emphasis was placed on analysis of vitamin E, since its analytical base was not as strong as those for other food components.

A second project is underway in which all nutrient values for 20 key foods are being analyzed as a check against the values currently being used. This project is a pilot study for a more extensive project tracking a larger set of foods which are major contributors of all food components reported by the surveys. This larger set of foods will be developed from results of the 1987-88 NFCS.

Plans are underway to add more nutrients to the data base. Expansion of the PDS to include individual fatty acids should be completed, and the addition of selenium should begin next year.

Agriculture Handbook No. 8

As previously described, the Survey Nutrient Data Base is linked to Agriculture Handbook No. 8 through the Primary Data Set and the USDA Nutrient Data Base for Standard Reference. To facilitate future updating of the handbook, the current edition is published in sections according to food groups, in loose-leaf format, one food item to a page. Complete sections may be updated if needed. When revisions are needed to only a few items within a section, they will be published in annual supplements to the handbook. These supplements, the first of which will appear in 1989, may include information for several different food groups. This information may be (1) revised data, which will be in the form of replacement pages; and (2) newly published data, which can be inserted into the looseleaf books at the appropriate places.

As previously mentioned, new data for eggs and beef were recently incorporated into the survey data base, and these data will soon be published in revisions of Handbook No. 8. New data for eggs, which showed lower cholesterol than previously reported, were received at HNIS in spring of 1989; summaries of these data will appear in the first supplement to Agriculture Handbook No. 8.

When it became apparent that the cholesterol values for eggs were too high and that these were based on the older colorimetric method, Nutrient Data Bank nutritionists immediately began investigating cholesterol values for other foods. They found that most of the cholesterol values used for Agriculture Handbook No. 8 and the Standard Reference Data Base were determined by newer chromatographic methods. For several foods whose cholesterol values were based on the older method, newer data were located to verify the accuracy of existing values, and most were found to be accurate. Steps have been taken to have new analyses run on the few foods that could not be verified.

A complete revision to the Agriculture Handbook No. 8 section on beef products is underway to reflect current retail market practices relative to the amount of external fat removed from beef cuts. In this revision, data will be presented for two different levels of fat trim: 1/4-inch remaining fat and "0 inch" remaining fat. The survey data base reflects the average trim level as determined by a study in which the amount of external fat found on various cuts was measured in a nationwide sampling of supermarkets. The data representing this average, approximately 1/8 inch of remaining external fat, were calculated for the survey by developing recipes with appropriate proportions of beef trimmed to 1/4 inch and 0 inch of remaining external fat.

Data Base Access

A great deal of interest has been shown in the Survey Nutrient Data Base as a possible data base for automated dietary analysis systems. It is already being used in an important new system that is under development jointly by HNIS and the University of Texas School of Public Health in Houston. In fact, all of the components of the Survey Nutrient Data Base system are used--the recipe file, the Primary Nutrient Data Set, the Table of Nutrient Retention Factors, and the recipe calculation program. The new joint system will maintain the integrity of the USDA data base but will allow users to add additional foods and nutrients. It also provides options of using the USDA recipes, modifying the USDA recipes, or entering new recipes.

The new joint system includes programs for use with both detailed food records and food frequencies. It will include on-line interactive procedures for both food intake and recipe coding. Plans are already underway to make this system available to the USDA Human Nutrition Research Centers. Once all phases are complete, other government agencies, and then private organizations, will have access to it as well.

As an essential component of the National Nutrition Monitoring System, the Survey Nutrient Data Base will be kept current to meet the needs of both CSFII and NHANES III. New foods will be added when they are reported on either survey, and updated nutrient values will be incorporated as they become available through Handbook No. 8 revisions. Data for priority nutrients will be added to the data base as they are identified and research completed to provide the necessary values. HNIS believes that the Survey Nutrient Data Base will become an important research tool during the 1990's, and other organizations are encouraged to explore the possibility of adapting it to meet their own needs.