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THE ABILITY OF RESEARCH VOLUNTEERS TO ACCURATELY IDENTIFY FOODS USING A FOOD CATALOG DESIGNED FOR THE COMPUTERIZED FOOD SCALE SYSTEM

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The Computerized Food Scale System (CFSS), developed at the Western Human Nutrition Research Center, was designed to provide accurate food intake information while substantially reducing data processing costs and data turnaround delays. An important component of the CFSS is the Food Identification Catalog (FIC). The FIC, which has over 3000 foods, is used with a barcode reader to identify and record food codes. The catalog is organized into approximately 30 food groups and has a barcode and description for each food item. The barcode represents the identifying food catalog number in the WHNRC computerized nutrient database. Over 60% of the food catalog numbers are from the Agriculture Handbook No. 8 and Revised Handbook No. 8-1 through 8-9. About 20% of the food catalog numbers were created for mixed dishes and convenience foods while the remainder were reserved for future additions. Version No. 1 of the catalog was evaluated in a research metabolic study using an 8-day rotational menu designed to include food from each of the food-groupings. Twenty one adults, 12 males and 9 females between 21-37 years of age, with 11-16 years of education participated in the study. Each participant received 3-one hour training sessions on the FIC. At the conclusion of the training period, each volunteer practiced locating 15 foods in the FIC. Then, for each day during the second cycle of the rotational diet, participants located and recorded food catalog numbers for every food served. Recipes and food products labels were provided during the coding sessions, and each session was closely monitored to insure that no information was exchanged between volunteers. More than 200 foods were recorded by each participant over the 8 days. To evaluate selection accuracy, the catalog numbers chosen by each subject were compared against those selected from the FIC by a registered dietitian. Analysis of variance showed no statistically significant differences between sex, age, and educational groupings for ability to select accurate food catalog numbers. The female participants were able to correctly select 81% $\pm$ 4 (S.D.) of the food catalog numbers whereas the males correctly selected 76% $\pm$ 4 (S.D.). The overall group mean was 78% $\pm$ 4 (S.D.). The common errors made by the volunteers primarily resulted from improper selection of the correct processing/preparation procedures for the food item. Future modifications of the FIC, based on knowledge gained from this study, should further improve the accuracy of food code selection.

DEVELOPMENT OF "GOOD SOURCES" OF NUTRIENT FOOD LISTS FROM A NUTRIENT DATA BASE

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The USDA Nutrient Data Base for Individual Food Intake Surveys, Release 2, was used to develop food lists of good sources of sixteen vitamins and minerals - vitamin A, vitamin E, vitamin C, thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B23, calcium, phosphorus, magnesium, iron, zinc, copper, amd potassium. A food list of good sources of dietary fiber was also developed from the data base. The data base used was developed for the 1985 Continuing Survey of Food Intakes by Individuals (CSFII). The following computations were made to determine which foods in the nutrient data base qualified as good sources of each of the nutrients:

1. Amount of the nutrient in a designated serving of food.
2. Percent of the U.S. RDA for the nutrient provided by the designated serving of food for all vitamins and minerals with a U.S. RDA (all except potassium).
3. An index of nutritional quality (INQ) for the vitamins and minerals with a U.S. RDA.

Foods were selected for the list of good sources of a nutrient if they provided at least 10 percent of the U.S. RDA for the nutrient in a serving and if they had a INQ of at least 1.0. Good sources of potassium selected are those foods containing 200 milligrams or more of potassium in a serving. Good sources of dietary fiber delected are those foods providing 1 or more grams of dietary fiber in a serving. Other selection factors for the lists included the frequency of reporting in the 1985 Continuing Survey of Food Intakes by Individuals and the USDA-DHHS Dietary Guidelines for Americans. The information from this study will be used in the development of nutrition education materials for consumers.

USING A PROBLEM ITEM CODE TO HANDLE ENTRY JUDGEMENT CALLS

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Dietary data as collected do not always match what is available in nutrient data bases. Judgement calls are made in order to enter such data. How these judgment calls are documented and adhered to over time is of concern to those who design and use nutrient data bases.

To address this concern, Version 4 of the University of Pittsburgh's Nutrient Data Base features a problem item code. Whenever an entry person enters an item or amount that does not exactly match the collected data, the entry person also enters a problem item code which includes up to three parts.

First, the problem category is always included (1 = food not clearly described or not enough details given; 2 = amount can't be converted to what's available in data base; 3 = food not in data base; 4 = miscellaneous).

Second, an ID number is included only if the problem has been encountered previously. The entry person finds this ID documented in the Problems Items Notebook which includes, for every entry problem, the solution, source of the solution, and ID of the record in which the problem was first encountered. The problems Items Notebook is continually reviewed by the Data Base Manager, and the source of solutions must be either the Data Base Manager or a standard reference with the page number(s) documented.

Third, a food group code is always included.

The problem item code allows the University of Pittsburgh's Dietary Data Center to:

1. Record every entry judgment call
2. Apply entry judgment calls consistently over time
3. Discover gaps in the data base, such as items not included, and provide a rationale for updating the data base by monitoring how often particular gaps present a problem
4. Tally the problems encountered in each problem category and food group between data base updates.

For others who design and use nutrient data bases, a problem item code might serve, as it has at the University of Pittsburgh, to increase the accuracy and efficiency of data entry and data base maintenance.

RECIPE CALCULATIONS IN THE GRAND NUTRIENT DATABASE SYSTEM

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The recipe calculation method used in the GRAND system is a modification of the procedure described in ARS bulletin 62-13. The method allows coding the ingredients in a recipe either as the raw or cooked form, with adjustments for nutrient changes during cooking, if applicable. Recipe calculations require information from four files:

1. The Food Description Master File which includes a food code for each food and recipe, a description, a flag to indicate if the food is a recipe, and common household measurements
2. The Recipe Master File which, for each recipe, consists of the ingredients and amounts of each, a flag to indicate use of the factors for nutrient retention appropriate for a particular food classification, an adjustment factor for percent water and fat gain or loss during cooking, and the food code for the type of fat used (from this information, the weights of the total recipe, and of water and fat gained or lost are calculated and stored)
3. A Retention Factor File, which includes cooking losses for 18 nutrients for several classifications of food
4. A file which contains the nutrient values in 100g edible portion for each food (ingredient) in the system

The nutrient calculation for the recipe is carried out each time the working database is updated, so the values for a recipe are automatically changed to reflect the updated nutrient values. The most recent nutrient values for each ingredient are adjusted for vitamin and mineral retention factors and summed for the total recipe. The values for moisture are adjusted for the total water gain or loss. The nutrient values are also adjusted for the nutrient content of the specified fat. Finally, the nutrient totals are divided by the total weight of the recipe, and expressed per 100g edible portions. While the system has the advantage of automatically updating nutrients on recipes, as with other systems it is limited by the incomplete data available on nutrient changes during preparation.

COMPARISON OF NUTRIENT, INGREDIENT, AND RECIPE DATABASES USED IN FOODSERVICE

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ABSTRACT

Forty-three (43) foodservice software companies that marketed a foodservice software system containing a nutrient analysis module were surveyed in 1988. Sixteen questionnaires (37%) were returned, and seven were incomplete. Nine completed questionnaires (21%) were analyzed. The purpose of this study was to compare foodservice databases for size, price, source of information, type of users and algorithms used to relate nutrient to recipe databases. Approximately 66% of the purchasers of foodservice software users chose foodservice software with a nutrient analysis function; 33% of such users utilized this function on a regular basis. Seventy-eight percent (78%) of the software companies employed dietitians. A variety of sources were used by these companies for the development of their nutrient databases. Eighty-eight percent (88%) chose the U.S.D.A. Handbook No.8. Databases price increased as the number of fields and records within the database increased. In some cases, software prices reflected database costs only, whereas in other cases the price reflected both the cost of the database and the software system necessary to operate the database. The most commonly used algorithm to relate nutrient to recipe databases was the Yield Factor Method. Although the accuracy of any algorithm is not 100%, the Yield Factor Method is the most precise and practical to use of the four choices listed below. Important factors for making purchasing decision by dietitians or other potential software users were identified.

Four algorithms used to determine the relationship of nutrient databases to recipe databases:

NAME OF ALGORITHM	FORMULA
Yield Factor Method	TNV = RW x Y% x NV as served
Retention Factor Method	TNV = RW x Y% x NV as served x NRF
Summing Method, Raw	TNV = RW x NV raw product
Summing Method, Cooked	TNV = RW x RV as served

RW = raw weight of the ingredient in grams
NV = nutrient content of the ingredient per gram.
Y% = Yield % of ingredient following prepreparation
NRF= Nutrient Retention Factor = NV at final preparation divided by the NV at prepreparation
TNV= Total nutrient value of the end product.

Baltzer, Lynne E., Sawyer, Carol A., and Gregorie, Mary:

COMPARISON OF NUTRIENT, INGREDIENT, AND RECIPE DATABASES USED IN FOODSERVICE

Foodservice Database Management (Ch. 18: p.78), 1987.

Names of Companies that returned answered questionnaires:

The CBORD Group, Inc.
Genesee Intermediate School District
N-Squared Computing
Wellsource, Inc.
Center for Science in the public Interest
Computrition, Inc.
Ohio State
DFM Business Software
ESHA Research

ESTIMATES OF PORTION SIZES MADE BY NUTRITION PROFESSIONALS

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Serving sizes reported in food records or recalls are often poorly described. Imputation of appropriate quantities by coders is most difficult where portion sizes vary greatly and are not characterized in standard units of measure. 179 dieticians and other nutrition professionals were given a list of 16 such items (for example, "cream in coffee", "mayonnaise in tuna sandwich" and "hamburger on bun") and asked to estimate the quantities they would code for nutrient analysis using standard units of measure such as ounces and tablespoons.

The range of estimated values for all items was at least three-fold except for orange juice (glass) and tuna (in sandwich), hamburger (on bun) and coffee (cup) where the high estimates were still double the lowest. The coefficient of variation was under 50 percent for all items, but this overall variability is high, with significant implications for nutrient values. Mean portion size estimates were compared to median intakes for similar foods as reported in the 1977-78 Nationwide Food Consumption Survey (USDA Home Economics Rept. 44, 1982). For items with comparable data, serving size estimates were not significantly different, except for sugar in coffee (about a third lower) and salad dressing (about double). Where NFCS values were unavailable, estimates were significantly different from values suggested by the NFCS coding manual. This suggests that where actual population information is not available, use of unvalidated portion information may be inappropriate for many items.

THE COPPER CONTENT OF FOODS: A CRITICAL EVALUATION OF PUBLISHED ANALYTICAL DATA

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Increasing interest in the copper intake of Americans has generated a need for the compilation, evaluation, and improvement of data for copper in foods. Surveys of copper intake have indicated that dietary copper levels may be lower than previously believed. Recently, low dietary copper has been correlated with specific forms of cardiovascular disease. In order to assess copper nutriture, accurate and precise copper values for foods are needed. A system of criteria developed to evaluate the quality of published selenium data (1) has been adapted to evaluate analytical data for copper in foods. Mean copper values for each food were calculated from the evaluated data and combined with USDA frequency of consumption data resulting in a list of 218 major contributors of dietary copper. Confidence codes, indicators of the relative degree of confidence the user of the data can have in that mean value, were included. More than half of the values for foods listed are of limited quality/quantity, indicating a great need for improvement in food copper data. The dynamic system for the compilation and evaluation of data can be used to generate nutrient data bases for specific purposes, provide a ranked list of foods which are significant contributors of individual nutrients, and establish priorities for further improvements in the data base.

1. Holden, J.M., Schubert, A., Wolf, W.R., and Beecher, G.R., in Rand, W.M., et al. (eds) Food Composition Data: A Users Prospective, Food and Nutrition Supplement, 12. pp 174-193 (1987)

A MICROCOMPUTER SYSTEM FOR INTERACTIVE COLLECTION AND CALCULATION OF DIETARY INTAKE DATA

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The microcomputerized Nutrient Calculation System (NCS) collects dietary intake data, automatically assigns food codes and generates nutrient information which can be printed, viewed on the computer screen or merged with standard statistical analysis packages. The NCS is designed to meet the needs of research studies that investigate the relationship between diet and disease by ensuring a standardized procedure for data collection and by providing detailed and precise description and quantification of foods. Foods are entered using common food names and brand names. Each entry is followed by system generated menu selection screens which prompt for additional description of the preparation method and ingredients affecting the fat or the sodium content of the food. Food quantity may be expressed in metric or household units and can also be described by the dimensions of a food or in terms of a food specific unit such as slice. Nutrient calculations are based on the Nutrition Coordinating Center's nutrient database, Version 15. Calculations, including comparisons of nutrient intake with Recommended Dietary Allowances, are available for up to 73 nutrients and other food components. Calculation reports which rank food intake by amount consumed, number of times consumed or contribution to a specific nutrient may also be generated.

The system is currently being tested as a counseling and research tool in eight clinical centers including a national study of diet intervention in children, a cancer research center and a clinic investigating the role of diet in renal disease.

FOODSERVICE POSITION/SOFTWARE SYSTEM RESPONSIBILITIES

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The purpose of this study was to determine the relationship(s) between position in a foodservice organization and use of foodservice applications software systems. Questionnaires were sent to 300 users of CBORD software systems (Menu Management, Access Control, Recipe Development, and Diet Analyzer by The CBORD Group, Inc., Ithaca, N.Y.). Twenty-five facilities returned usable questionnaires (8%) which represented 143 positions in foodservice. Of those returned, 52% were from colleges/universities, 8% from contract feeders, 4% from hospitals, 4% from school systems. 32% chose not to identify their facility.

To statistically analyze the data, job titles were classified into three organizational levels: upper, middle and lower management. System related responsibilities were classified into thirteen catagories.

Based on percent participation (Table 1), results showed that upper management positions such as Foodservice Directors were primarily involved in managing software system operation and report analysis. Middle management and staff positions such as Foodservice Manager, Administrative and Clinical Dietitians were highly involved in use and analysis of software system printouts from Food Item Data Files, menu, production, inventory and other subsystems. As might be expected, lower level management positions such as Foodservice, Supervisor, Cook and Head Cashier were involved with data entry, running reports and/or performing work based on reports such as recipes.

The sample in this study was small. Also the wide range of job titles given and some vague responsibility descriptions led to assumptions being made when categorizing data. Therefore, conclusions drawn from this study are tentative. More research with a revised questionnaire is suggested.

Results of studies in this area could be used by companies such as CBORD to improve implementation training procedures and management of software systems. Dietitians could apply such information (1) to develop more realistic job expectations for themselves relating to computers, and (2) to improve writing of job descriptions for foodservice employees involved with computers.