

EVOLUTION OF NUTRIENT DATABASES AND COMPUTER SOFTWARE

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Early table of food composition provide the historical basis for the evolution of nutrient data bases. Although computer did not exist when early food composition data were produced, that early work was the starting point for data that were eventually revised and expanded. Hertzler and Hoover (1) have previously summarized the work of early scientists and the evolution of computerized collections of food composition data. A brief chronological summary of the historical perspective follows:

- 1869 1st analysis of an American food (Indian corn, by Atwater, Sheffield Scientific School, Yale University
- 1892 3,267 items, Jenkins and Winston, Compilation of analysis of American feeding stuffs - USDA Bulletin No. 11 - mostly animal feeds - vegetable and dairy data used by Atwater and Woods
- 1892 900 foods, mostly meats, Atwater and Woods - 4th Annual Report of Agricultural Experiment Station, Storrs, Conn
- 1896 660 foods, USDA Bulletin No. 28, Atwater and Woods - The Chemical Composition of American Food Materials
- 1926 Sherman's Chemistry of Food and Nutrition, 3rd ed. - a textbook included proximates and minerals
- 1937 Bowes and Church - Food Values of Portions Commonly Served - 314 foods
- 1940 Chatfield and Adams - Proximate Composition of American Food Materials - 1,227 items

The number of food and food constituents varied in each of the tables. Likewise, data were acquired from a variety of sources. The number of sources and availability of data have gradually expanded. A brief list of some of the sources follows:

German labs - prior to 1880 - for European products

- 1893 World Columbian Commission, Chicago - 500 food specimens - fruits, vegetables, grains

USDA Wiley did some very early work studying adulteration of foods, particularly canned vegetable. Over time many other projects were conducted or sponsored; scientists have produced data for many more food and constituents

Various Analyses of food for specific food constituents - such as fats, carbohydrates, vitamins, minerals

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EXPANDED NUTRIENT DATA BASES

By the 1960's, some individuals had begun to augment collections of data available from government sources with data for additional food constituents and foods. Pioneers in this effort were Harold Houses at Case Western University who collaborated with Highland View Hospital in 1962 and Margaret Moore at Louisiana State University who developed the Extended Table of Nutrient Values for her research. Descriptions of their efforts first appeared in the literature in 1969. A similar effort at Ohio State University was described in 1973 by Shaum, Mason and Sharp.

MOST RECENT DECADE

During the most recent decade, new and expanded sources of data have become available. These include:

USDA Nutrient Data Base for Standard Reference

Data bases used for analysis of food intake for NFCS and NHANES

Canadian Nutrient Data Base with nutrient profiles reflecting the food available in Canada

USDA Primary data base

An expanded marketplace has developed as microcomputers have made computer technology more accessible for many nutritionists and dietitians. Each year more nutrient data bases and software have been developed for use on microcomputers. Acknowledgement of this trend occurred in December 1984 when composition data on floppy diskettes.

SOFTWARE EVOLUTION

Software applications have been reported since the 1960's describing demonstrations of computer technology in nutrition. Some of the trends are briefly highlighted below:

1960's Coronary heart disease studies - (mentioned previously)

Menu analysis - VA - Brisbane - 1964

Menu planning - Tulane - Balintfy - 1964

Epidemiology studies

Metabolic diet calculation

Dietary appraisal

Patient interviewing

1974 Professional productivity enhanced when computer is used to calculate dietary intake records - Flook and Alford

1980's Microcomputer software marketplace expands

Nutrition awareness - clients, health fairs, etc.

Client education

Specialized applications - such as nutritional support

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NUTRIENT DATA BANK DIRECTORY

In 1980, the first directory of nutrient data bases was compiled as a service to attendees at the 5th National Nutrient Data Bank Conference. Donna Hay and Tony Fisher assumed responsibility for compiling that first edition that listed 29 systems. Revised directories have been prepared in subsequent years with more systems cited in each new edition. A list of the directories follows:

1st Ed.	1980 5th NDB Conf	East Lansing, MI	29 systems
2nd Ed.	1982 7th NDB Conf	Philadelphia, PA	39 systems
3rd Ed.	1983 8th NDB Conf	Minneapolis, MN	55 systems
4th Ed.	1984 9th NDB Conf	Amherst, MA	69 systems
4th Sup.	1985 10th NDB Conf	San Francisco, CA	87 systems
5th Ed.	1986 11th NDB Conf	Athens, GA	99 systems
6th Ed.	1987 12th NDB Conf	Houston, TX	109 systems
7th Ed.	1988 13th NDB Conf	Framingham, MA	112 systems

Each year, new systems have been added while some former systems have been deleted to reflect the changing marketplace. In 1980, all of the systems were used on either a mainframe or a minicomputer; in 1988, over 70% of the systems operation microcomputers.(2) While compiling the 1988 directory, the following observations were made:

- Old sources of data were phased out by some developers
- Several developers have multiple products
- Many developers include information such as brand names, fast foods, supplements
- Omega-3 fatty acids were included in 20 systems
- Software developers integrate software for nutritional care and foodservice.

Software functionality has been catalogued in the NDB Directory since the 4th Edition in 1984 according to the following categories:

- DB inquiry
- Recipe Calculations
- Menu analysis and planning
- Nutrient intake analysis
- Comparisons - such as % RDA
- Nutrient Sources/Relationships - such as nutr/1000 c, P:S ratio
- Nutritional assessment - such as BEE calculation
- Dietary guidance and output

NEEDS OF DEVELOPERS

For several years, developers of nutrient data base systems have been surveyed at the time data are provided their initial entry into the Nutrient Data Bank Directory. In 1984, Joanne Holden compiled a summary of responses to the survey of needs. Many developers expressed a desire for data for specific constituents such as fiber, individual sugars, carbohydrate fractions, vitamins, minerals, caffeine and alcohol. Some mentioned the need for data on mixed foods, snacks, etc.

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CURRENT DYNAMIC SITUATION

The current dynamic situation is a blend of encouragement and challenges. Some aspects on the current situation are:

Obsolete Data Bases

Some organizations are probably using nutrient data bases that have not been maintained in a timely fashion. This situation is probably due to a lack of priority for updating or naivety on the part of practitioners.

New Releases of Data

Keeping up with all of the new data available from government sources, in the literature, and from international sources is a challenge to even the most conscientious data base developer.

Documentation

Documentation of the use of nutrient data base is often deficient in the professional literature. In 1983 at the 8th National Nutrient Data Bank Conference, Grace Petot reported on her review of citations for nutrient data bases mentioned in the professional literature. To her disappointment, most citations were inadequate.

Quality Control

Maintenance of the integrity of a nutrient data base requires that quality control measures be utilized. Diagnostic methods can be utilized to safeguard a database from errors that could be introduced while updating nutrient values. In 1986 at the 11th National Nutrient Data Bank Conference in Athens, GA, a special session was devoted to this topic with database validation being addressed by Marilyn Buzzard and data integrity by Suzanne Murphy.

Methodological Progress

The growing interest in the use of computerized nutrient data bases has stimulated methodological progress. A few of the areas are:

- Validation of calculation method - mixed dishes
- Enhancement of methods for intake estimation and coding
- Development of analytical methods for assessment of constituents

No Gold Standard

Due to the dynamic situation in the area of nutrient data bases, a gold standard does not exist. If it did, it would probably be a moving target. Thus, knowledgeable nutrient data base developers and knowledgeable users are essential as we continue to address issues relative to the compilation and application of nutrient data bases.

CITED REFERENCES

1. Hertzler, A.A. and Hoover, L.W.: Review of nutrient data bases: Development of food tables and use with computers. Journal of the American Dietetic Association 70: 20-31, 1977
2. Hoover, L.W., Ed.: Nutrient Data Bank Directory. 7th Edition. Columbia, MO: University of Missouri Printing Services, 1988