21st National Nutrient Databank Conference Proceedings

Baton Rouge, LA
June 20-22, 1996

NEW ADVENTURES IN DATABASES

Foreword

The 21st National Nutrient Databank Conference was held in Baton Rouge, Louisiana on June 20-22, 1996. The Conference is organized by several committees of volunteers who give of their time and skills generously to assure a successful and informative meeting for all attendees.

Chairs of the 1996 Conference committees were: Steering Committee, Al Riley of Campbell Soup Company; Program Committee, Joanne Holden of the Nutrient Data Laboratory and Jack Smith of the University of Delaware; Committee on Data Quality, Suzanne Murphy of the University of California, Berkeley; Communications Committee, David Haytowitz and Ruth Matthews of the Nutrient Data Laboratory; Database Committee, Charlene Hamilton and Jack Smith of the University of Delaware; and Arrangements Committee, Catherine Champagne of the Pennington Biomedical Research Center. Special thanks are extended to the rest of the Arrangements Committee whose attention to detail in several areas enabled the success and smooth completion of this conference. They included Ray Allen, Nancy Baker, Mary Dawson, Anne Duke, Barbara Eberhardt, Pam Fisher, Philippe Hebert, Stacy Heilman, Olivia Lara, Patrick Marquette, Cheryl Parker, Kelly Patrick, Baldwin Sanders, and Ralph Underwood, all from the Pennington Biomedical Research Center. A special word of thanks to Pam Fisher who assured that the timing of the activities was strictly adhered to, on one occasion causing a couple of attendees to miss a bus ride because they were not there at the appointed time and on another occasion to elicit a remark from one participant that “Pam must have gone to each person’s hotel room and reset the clocks to make sure they got up on time.” In addition to Pam Fisher, Pat Marquette and Ralph Underwood spent untold hours keeping the budget straight for this conference.

The expertise of previous organizers of the Conference was especially valuable in preparing for this Conference. Special thanks go to Jack Smith of the University of Delaware, Loretta Hoover of the University of Missouri-Columbia and Roberta Markel and Darwin Dennison of DINE Systems for providing notebooks from the previous conference, with words of wisdom from their past year’s experiences. I would fail in my acknowledgments if I didn’t express thanks to Suzanne Murphy of the University of California, Berkeley for providing detailed notes on putting together this conference from my first experience in 1993 to this year’s adventure. I only wish she could have helped in providing advice to facilitate the speedy submission of all papers presented so that the proceedings could have been published in a more timely and complete manner than I have been able to accomplish.

This Conference was made possible by funding support by several Federal agencies and corporations, who are again listed in the acknowledgments. Sincere appreciation is expressed to the following Federal agencies: Department of Health and Human Services, National Institutes of Health, National Cancer Institute; and the United States Department of Agriculture, Agricultural Research Service. Special thanks go to national corporate sponsors: Best Foods-CPC International, Campbell Soup Company, The CBORD Group, The Coca Cola Company, Frito-Lay Incorporated, The Gerber Companies Foundation, Kleinpeter Dairies Incorporated, Kraft Foods, McNeil Specialty Products Company, National Cattlemen’s Beef Association, Nestle USA Incorporated, and Procter & Gamble. Donations were received from a number of Louisiana based companies which are listed separately in this publication.

This Conference was dedicated to the memory of Dr. Margaret C. Moore, recipient of the First Pioneer Award given by the National Nutrient Databank Conference, who died on October 11, 1995, two days after her 99th birthday. When we offered to host this conference, it was to have been in recognition of the 100th birthday of one of the great leaders in the field of nutrient database research and development. In honor of this prestigious benefactor of the Pennington Biomedical Research Center and Foundation, we include an article that appeared in *Inside Pennington*, the official newsletter of the Pennington Biomedical Research Center. We have truly missed this great lady.

The proceedings contain copies of papers submitted by the presenters. In the event, no submission of a formal paper was received, the slides, outline, transcribed paper, or simply an abstract is provided. Papers presented in concurrent sessions normally will contain only an abstract.

MAJOR FUNDING FOR THIS CONFERENCE WAS PROVIDED BY THE FOLLOWING UNITED STATES GOVERNMENT AGENCIES:

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National Institutes of Health
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United States Department of Agriculture
Agricultural Research Service

The National Nutrient Databank Conference extends sincere appreciation to the individuals representing these agencies that made this support possible.

The 21st National Nutrient Databank Conferences wishes to thank the following sponsors, listed in alphabetical order, for their generous and enthusiastic support:

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The 21st National Nutrient Databank Conference acknowledges the following Louisiana companies for their product donations:

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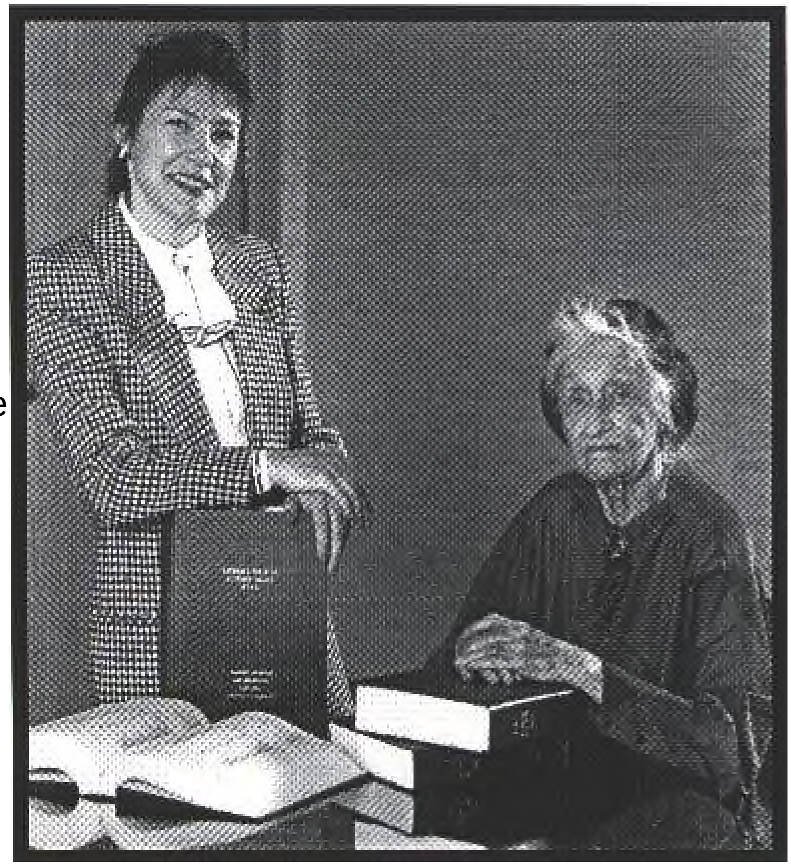
We extend our thanks and appreciation for their valuable contributions throughout this conference.

In Memoriam

Margaret Carrington Moore (October 9, 1896 - October 11, 1995)

Tribute

Margaret C. Moore:
Calculating the Value of Nutrition



It was the 1920=s and, according to the times, a woman=s place was in the home. But lucky for the Pennington Center, Margaret C. Moore knew her place was in the chemistry lab.

Moore=s calling went a step beyond the world of chemicals. As the computer age dawned, Moore pioneered the Extended Table of Nutrient Values, a data base which now plays a pivotal role in the Pennington Center=s clinical and food science research. These days, although 95 years old, she still works closely with the Pennington Center staff in managing and updating the data base.

The Extended Table of Nutrient Values (ETNV) allows researchers to calculate nutritional intake on a daily and weekly basis, or even periods of up to 999 days. In addition to the standard U.S. Department of Agriculture information on more than 10,000 foods, the ETNV has detailed nutritional breakdowns on some 2,700 foods and approximately 3,000 recipes in its files.

Just as the ETNV represented the cutting edge of science at the time it was developed, Moore was blazing new territory for women when she embarked on her career in chemistry and nutrition.

Few women went to college in those days, but Moore was hardly discouraged. AI wanted to study chemistry. Harvard, which was the best school in the country, wouldn=t accept women. But the next best, University of Chicago would. So I went there.@

After graduation, Margaret went to work for the American Medical Association and, later, the Louisiana Department of Health. She became interested in nutritions role in health following one of the great floods which ravaged South Louisiana during the early part of the century.

"I went on the health train to see people, how they were and how they lived. I was interested in what people ate. People ate poorly and I recognized that," she says. You can influence your own health through nutrition-- that I know.

As her interest intensified, Moore and her colleagues collected and analyzed nutrition tables distributed by the USDA for use in their research. By 1960, Moore and nutritionist Mary Helen Goodloe of Georgia developed the ETNV to calculate the nutritional content of recipes and foods.

Over the years, Moore and her colleagues utilized the ETNV in a wide variety of nutritional studies, including analyses of the dietary intake of pregnant women, hospital patients, New Orleans families and Louisiana school lunches as part of a 10-state study of pre-adolescent girls.

Even after retiring from the Department of Health in 1964, Moore singlehandedly maintained the data base from her New Orleans French Quarter apartment. But realizing she could not continue her task forever, Moore began searching for a qualified successor with a working knowledge of chemistry.

Meanwhile at LSU, Dr. Catherine Champagne, a registered dietitian and analytical chemist, was developing a keen interest in the ETNV after utilizing the data base in her doctoral dissertation. As a result, Moore is now confident the data base rests in good hands.

"If I had died before I found a successor, the data base would be lost. But now I am confident that it will live on," she says. "Cathy has both the chemistry and nutrition backgrounds that I was looking for. Nutrition came from chemistry like a twig comes from a tree. You need to know food values and need to have chemistry knowledge."

The ETNV is now licensed to Louisiana State University, and the Pennington Center is responsible for housing, maintaining and enhancing it, according to Pennington Center Grants Administrator Pat Marquette.

Says Champagne who, in Moore=s honor, keeps a picture of the data base=s co-founder hanging above her desk, AWe manage it, we maintain it, and we decide what projects it will be used forCall the things Margaret used to do and wants to see continued.@

Note: Reprinted from AInside Pennington,@ the official newsletter of the Pennington Biomedical Research Center (Volume 3, Issue 3, May/June 1992). The ETNV was renamed Moore's Extended Nutrient (MENu) Database following the official donation of Dr. Margaret C. Moore to the Pennington Biomedical Research Foundation in October 1992. The original ETNV continues to exist and be updated as a mainframe resource at LSU Medical Center in New Orleans. MENu is PC-based and is housed and maintained at the Pennington Biomedical Research Center, 6400 Perkins Road, Baton Rouge, LA. For additional information on the life and contributions of Margaret Moore, look for the following article: Frank, Gail C., Margaret Carrington MooreCHer Contribution to Nutrition Education, Journal of Nutrition Education, Volume 15, Number 2, pages 42-44, 1983.

Program Schedule

WEDNESDAY, JUNE 19, 1996

7:00 pm	**Opening Mixer**.....................................*Crown Sterling Suites Hotel*

ALL SESSIONS AT THE CLAUDE B. PENNINGTON, JR. CONFERENCE CENTER

THURSDAY, JUNE 20, 1996

7:30 - 8:30 am	**Registration**...................................*East Entrance Registration Desk*
	GENERAL SESSION.. *Main Hall*
8:30 - 8:45 am	**Welcome and Introductions** George A. Bray, MD, Executive Director Donna H. Ryan, MD, Associate Executive Director Pennington Biomedical Research Center
8:45 -10:00 am	**Plenary Session 1: Keynote Addresses** Moderator: Jack Smith, University of Delaware
8:45 - 9:15 am	***Opening Keynote: New Strategies and Directions for Food Databases*** *Rhona Applebaum, NFPA*
9:15 - 9:45 am	***Technical Keynote: NAPRALERT: A Database of Non-Nutrient Components in Plants*** *Christopher W. W. Beecher, University of Illinois at Chicago*
9:45 - 10:00 am	***Discussion***
10:00 - 10:30am	**Break**.. *Upper Level Reception Area*
	Posters... *Middle Level Reception Area*
	Exhibits.. *Lower Level Reception Area*
10:30 - 12:00 noon	**Plenary Session 2: New Adventures in Food Design....** *Main Hall* Moderator: Alison Eldridge, University of Minnesota
10:30 - 10:50 am	***Food Design: Trends and Changes*** *J. Samuel Godber, Louisiana State University*
10:50 - 11:10 am	***New Products in the Food and Agricultural Biotechnology Pipeline*** *Martina McGloughlin, University of California, Davis*

Program Schedule

THURSDAY, JUNE 20, 1996 (CONTINUED)

11:10 - 11:40 am	***Olestra and Its Impact on Nutrient Databases*** *Ronald Webb, Procter & Gamble*
11:40 - 12:00 noon	***Discussion***
12:00 - 1:30 pm	**Lunch..** *Lower Level Reception Area*
	Posters.. *Middle Level Reception Area*
	Exhibits... *Lower Level Reception Area*
1:30 - 3:20 pm	**CONCURRENT SESSIONS**
	CONCURRENT SESSION I: Analytical Methods...... *Main Hall B/D* Moderator: Joanne Holden, USDA/ARS/NDL
1:30 - 2:05 pm	***Guidelines for Obtaining High-Quality Laboratory Data*** *Carol S. Davis, USDA/ARS/FCL*
2:05 - 2:40 pm	***Measurement of "New" Health-Related Food Components*** *Gary R. Beecher, USDA/ARS/FCL*
2:40 - 3:15 pm	***Dietary Fiber in the National Nutrient Databank: Data and Methods*** *Karen Andrews, USDA/ARS/NDL*
	CONCURRENT SESSION II: Submitted Papers....... *Main Hall A/C* Moderator: Jean Pennington, NIH/NIDDK
1:30 - 2:00 pm	***USDA Nutrient Data Base for Standard Reference, Release 11*** *David Haytowitz, USDA/ARS/NDL*
2:00 - 2:20 pm	***United States and Australia: Sharing National Nutrition Survey Methodology*** *Suzanne Brodney, University of Texas School of Public Health*
2:20 - 2:40 pm	***Americans' Salt Use in Food Preparation--1994 CSFII & DHKS*** *Deirdre Douglass, University of Texas School of Public Health*
2:40 - 3:00 pm	***Assessment of Fish Consumption among Sportfishers on the St. Lawrence River in the Montreal Region: Reliability/Calibration Study*** *Bryna Shatenstein, Sante Publique-Unite Sante Environmentale, Montreal, Quebec, CANADA*

Program Schedule

THURSDAY, JUNE 20, 1996 (CONTINUED)

3:00 - 3:20 pm	***Improvement in Matching Energy Expenditure to Food Intake in a Metabolic Chamber Utilizing Prior Measurements of Free-Living Activity*** *Heli Roy, Pennington Biomedical Research Center, LSU, Baton Rouge, LA*
3:20 - 3:30 pm	**Break..** *Upper Level Reception Area*
	Posters... *Middle Level Reception Area*
	Exhibits...*Lower Level Reception Area*
3:30 pm - 5:00 pm	**CONCURRENT SESSIONS**
	CONCURRENT SESSION III: Vendor Presentations.........… *Main Hall A/C* Moderator: Phyllis Stumbo, University of Iowa
3:30 - 3:45 pm	***Taking a "Data Tour" with FIAS: How to Examine CSFII Survey Data with a Nutrient Analysis Program*** *Deirdre Douglass, University of Texas Food Intake Analysis System*
3:45 - 4:00 pm	***How Restaurants Will Handle Mandatory Labeling in 1997*** *Nancy Belleque, ESHA*
4:00 - 4:15 pm	***Supporting Research with a Dietary Assessment Service and a Nutrient Data Clearing House*** *Laura Winter Falk and John Alexander, CBORD*
4:15 - 4:30 pm	***Re-engineering Research Software: A Modern Face for an Old Standby*** *Lori Beth Dixon, Nutrition Coordinating Center, University of Minnesota*
4:30 - 4:45 pm	***Empowering Your Databank: A Food Classification System and Its Applications*** *Linda Nowbar, First DataBank, The Hearst Corporation*
4:45 - 5:00 pm	***Discussion***

Program Schedule

THURSDAY, JUNE 20, 1996 (CONTINUED)

	CONCURRENT SESSION IV: Update Panel......................... *Main Hall B/D* Moderator: Karen Andrews, USDA/ARS/NDL
3:30 - 3:45 pm	***Nutrient Data Laboratory (USDA/ARS****)* *Joanne Holden, Research Leader*
3:45 - 4:00 pm	***Food and Drug Administration-Total Diet Study*** *Jean Pennington, NIDDK (formerly with the FDA)*
4:00 - 4:15 pm	***Food and Drug Administration-Labeling*** *Tom O'Brien, FDA Consumer Scientist*
4:15 - 4:30 pm	***Food Composition Laboratory (USDA/ARS****)* *Gary Beecher, Research Leader*
4:30 - 4:45 pm	***INFOODS*** *Barbara Burlingame, Nutrition Programme Leader, New Zealand Institute for Crop and Food Research*
4:45 - 5:00 pm	***Questions***
6:00 pm	**Annual Banquet..................** *Louisiana State University Faculty Club* Speaker: George A. Bray, MD, Executive Director, Pennington Biomedical Research Center

FRIDAY, JUNE 21, 1996

7:30 - 8:30 am	**Registration ....** *East Entrance Registration Desk*
	Posters .... *Middle Level Reception Area*
	Exhibits .... *Lower Level Reception Area*
8:30 - 10:00 am	**PLENARY SESSION 3: Survey Reports.........................** *Main Hall* Moderator: Betty Perloff, USDA/ARS/FSRG
8:30 - 8:55 am	***1994 CSFII/DHKS: Results and Products*** *Alanna Moshfegh, USDA/ARS/FSRG*
8:55 - 9:20 am	***1996 Update: The Third National Health and Nutrition Examination Survey (NHANES III)*** *Margaret McDowell, NCHS*

<u>Program Schedule</u>

<u>FRIDAY, JUNE 21, 1996 (CONTINUED)</u>

9:20 - 9:45 am	***Canadian Food Consumption Surveys: A Federal-Provincial Partnership*** *Danielle Brulé, Health Canada*
9:45 - 10:00 am	***Discussion***
10:00 - 10:30 am	**Break**.. *Upper Level Reception Area* **Posters**... *Middle Level Reception Area* **Exhibits**... *Lower Level Reception Area*
10:30 am - 12:00 noon	**PLENARY SESSION 4: Food Supplements**................................. *Main Hall* Moderator: Judi Douglass, TAS, Inc.
10:30 - 11:00 am	***Dietary Supplements in the U.S. Market - Major Contributors to Nutrient Intake*** *John Hathcock, Council for Responsible Nutrition*
11:00 - 11:40 am	***U.S. Government Efforts to Collect Dietary Supplement Intake Data*** *Alan Levy, FDA; Bethene Ervin, NCHS; Alanna Moshfegh, ARS*
	Discussion
11:40 - 12:00 noon	***Dietary Supplement Intake Data from the German NVS Study*** *Judi Douglass, TAS, Inc*
12:00 - 1:30 pm	**Lunch**.. *Lower Level Reception Area* **Posters**... *Middle Level Reception Area* **Exhibits**... *Lower Level Reception Area*
1:30 - 3:15 pm	**PLENARY SESSION 5: CSFII Methodology**................................. *Main Hall* Moderator: Frankie Schwenk, USDA/ARS/BHNRC
1:30 - 2:05 pm	***Recent and Current CSFII Methodology Research*** *Sharon Mickle, ARS*
2:05 - 2:40 pm	***Data Collection: Training and Monitoring Interviewers*** *Suzanne W. McNutt, Westat, Inc*

Program Schedule

FRIDAY, JUNE 21, 1996 (CONTINUED)

2:40 - 3:15 pm — ***Translating Food Intakes Into Data***
Betty P. Perloff, ARS

3:15 - 3:30 pm — **Break..** *Upper Level Reception Area*

Posters... *Middle Level Reception Area*

Exhibits... *Lower Level Reception Area*

3:30 - 5:15 pm — **CONCURRENT SESSIONS**

CONCURRENT SESSION V: Submitted Papers...........................
Main Hall
Moderator: Gary Beecher, USDA/ARS/FCL

3:30 - 3:50 pm — ***The UK Approach to Determining Nutrient Composition of Meat***
Susan Church, Ministry of Agriculture, Fisheries and Food, London, UK

3:50 - 4:10 pm — ***Analytical Methods for the Analysis of Mycocaster Coypus (Nutria)***
Fatemeh Ramezanzadeh, Pennington Biomedical Research Center, LSU

4:10 - 4:30 pm — ***Comparison of the Nutritional Value of Mycocaster Coypus (Nutria) with Other Food Sources Utilizing the MENu Database***
Richard Tulley, Pennington Biomedical Research Center, LSU

4:30 - 5:15 pm — ***Lower Mississippi Delta Nutrition Intervention Research Initiative***
Frankie Schwenk, USDA/ARS
David Harsha, Pennington Biomedical Research Center, LSU
Bernestine McGee, Southern University, Baton Rouge, LA
Margaret Bogle, Arkansas Children's Hospital, Little Rock, AR
Sungchan Kim, University of Arkansas, Pine Bluff, AR
Carol Connell, University of Southern Mississippi, Hattiesburg, MS
Ed Parmer, Alcorn A & M, Alcorn, MS

Program Schedule

FRIDAY, JUNE 21, 1996 (CONTINUED)

3:30 - 5:15 pm

CONCURRENT SESSION VI: .... *G3012 West Wing*
Computer Demonstrations
Moderator: Jack Smith, University of Delaware

USDA Nutrient Data Base for Standard Reference, Release 11 - Demonstration of New File Formats
David Haytowitz, USDA/ARS/NDL

Comparison of Available Nutrient Data on Selected CD-ROM Cookbooks
Charlene Hamilton and Jack Smith, Univ. of Delaware

CSFII/DHKS 1994 CD-ROM -- Accessing the Survey MicroData
John Wilson, USDA/ARS/FSRG

CSFII/DHKS 1994 CD-ROM -- Accessing the Technical Support Files
Randy LaComb, USDA/ARS/FSRG

3:30 - 5:15 pm

CONCURRENT SESSION VII: Committee Work............ *G3002 West Wing*
Moderator: Joanne Holden, USDA/ARS/NDL
Committees of the National Nutrient Databank Conference will meet at this time to discuss their projects and prepare for presentations scheduled on Saturday morning prior to the Capstone Presentation.

SATURDAY, JUNE 22, 1996

7:30 - 8:30 am

Registration .... *East Entrance Registration Desk*

Posters .... *Middle Level Reception Area*

Exhibits .... *Lower Level Reception Area*

8:30 - 10:15 am

PLENARY SESSION 6: Food Composition Variability ……….....
Main Hall
Moderator: Catherine Champagne
Pennington Biomedical Research Center

8:30 - 8:55 am

Proximate Methods and Modes of Expression: Variability as a Harmonization Issue
Barbara Burlingame, New Zealand Institute for Crop & Food Research

Program Schedule

SATURDAY, JUNE 22, 1996 (CONTINUED)

8:55 - 9:20 am	***Variability of Minerals in Foods*** *Jean A. T. Pennington, NIDDK*
9:20 - 9:45 am	***Analytical Methods for Trans-Fatty Acid Analysis*** *Mike Kennedy, Cargill Analytical*
9:45 - 10:10 am	***Food Composition Data: Making Use of Variability*** *Gustaaf Sevenhuysen, University of Manitoba, CANADA*
10:10 - 10:40 am	**Break..** *Upper Level Reception Area*
10:40 -11:30 am	**CLOSING SESSION..***Main Hall* Moderator: Catherine Champagne Pennington Biomedical Research Center
10:40 - 11:00 am	***Committee Reports:*** *Steering Committee* *Program Committee* *Database Committee* *Communications Committee* *Data Quality Committee*
11:00 - 11:30 am	***Capstone Presentation*** *Jean H. Hankin, Cancer Research Institute of Hawaii* *University of Hawaii*
11:30 am	**ADJOURN**

POSTER PRESENTATIONS (Alphabetical listing)
TITLE OF POSTER, AUTHORS & AFFILIATION (PRESENTER IN CAPS)

CARBOHYDRATE DATA FOR SELECTED FOODS IN USDA'S NATIONAL NUTRIENT DATA BASE. *K.W. ANDREWS, P.R. Pehrsson, U.S. Department of Agriculture, Riverdale, Maryland 20737*

DEVELOPMENT OF A PRICE DATABASE FOR THE CSFII89-91 FOODS. *S.A. BOWMAN, J. Hirschman. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 1120 20th St., N.W. Suite 200, N. Lobby, Washington, D.C. 20036*

Program Schedule

POSTER PRESENTATIONS (Alphabetical listing) *(CONTINUED)*
TITLE OF POSTER, AUTHORS & AFFILIATION (PRESENTER IN CAPS)

COMPARISONS OF IRON STATUS, PHYSICAL ACTIVITY, AND NUTRITIONAL INTAKE OF WOMEN ENTERING ARMY OFFICER AND ENLISTED BASIC TRAINING. *A.D. CLINE, A.E. Pusateri. U.S. Army Research Institute of Environmental Medicine, Natick, MA 01760*

ADDITION OF OXALIC ACID TO THE NCC NUTRIENT DATABASE*. ALISON L. ELDRIDGE, PHD, RD, and Sally Schakel, RD, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN.*

FAT AND FATTY ACID CONTENT OF SELECTED FOODS CONTAINING TRANS-FATTY ACIDS. *J. EXLER, L. Lemar, J. Smith. Nutrient Data Lab, ARS, USDA, Riverdale, MD 20737*

ESTIMATING NUTRIENT CONTRIBUTIONS FROM RED MEATS IN THE U.S. FOOD SUPPLY SERIES. *S.A. GERRIOR, L. Bente. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 1120 20th St., N.W. Suite 200, N. Lobby, Washington, D.C. 20036*

COMPARISON OF ACCEPTABILITY SCORES OF MODIFIED RECIPES AMONG TEST SETTINGS. *A. HUNT, A. Cline, K. Patrick, C. Champagne, D.H. Ryan. Louisiana Tech University, Ruston, LA 71272, USARIEM-MND, Natick, MA 01760, and Pennington Biomedical Research Center, Baton Rouge, LA 70808*

NEW METHOD FOR PROCESSING FOODS WITHOUT SURVEY CODES IN THE 1994 CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII). *L.A. INGWERSEN, A.L. Green, A. Tong, E. Anderson, M. Berlin. USDA-ARS and Westat, Inc., Maryland*

MODIFICATIONS TO VEGETABLE RECIPES IN THE CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) 1994. *N. ISLAM, L. Steinfeldt, R.S. McPherson, D. Douglass, J. Anand, L. Ingwersen. University of Texas-Houston School of Public Health and USDA-ARS*

FOLATE FORTIFICATION OF BREAD AND GRAINS: INTAKE OF THE ELDERLY IS AFFECTED BY FOOD SOURCES OF FOLATE. *K.M. KOEHLER, S.L. Pareo-Tubbeh, L.J. Romero, R.N. Baumgartner, P.J. Garry. Univ. of New Mexico School of Medicine, Albuquerque, NM 87131*

Program Schedule

POSTER PRESENTATIONS (Alphabetical listing) *(CONTINUED)*
TITLE OF POSTER, AUTHORS & AFFILIATION (PRESENTER IN CAPS)

ASSESSMENT OF FISH CONSUMPTION AMONG ASIAN-ORIGIN SPORTFISHERS ON THE ST. LAWRENCE RIVER IN THE MONTREAL REGION. *T. Kosatsky, B. SHATENSTEIN, N. Kishchuk, M. Tapia, J-P Weber, S. Lussier-Cacan, Y. Marchand. Montreal Regional Public Health Board. Environmental Health Unit. 75 Port-Royal east, Montreal, Quebec CANADA. H3L 3T1*

ESTIMATED VITAMIN B-12 VALUES FOR FOODS ON A FOOD FREQUENCY, THE HEALTH HABITS AND HISTORY QUESTIONNAIRE. *S.L. PAREO-TUBBEH, R.N. Baumgartner, L.J. Romero, P.J. Garry, K.M. Koehler. Clinical Nutrition Program, University of New Mexico School of Medicine, Albuquerque, NM 87131*

IDENTIFICATION OF KEY FOODS AS MAJOR CONTRIBUTORS OF ANTIOXIDANT VITAMINS. *P.R. Pehrsson and D.B. HAYTOWITZ. Nutrient Data Laboratory, USDA-ARS, Riverdale, MD 20737*

COMPARISON OF FOOD AND NUTRIENT INTAKES AS MEASURED BY TWO SIMILAR FOOD FREQUENCY INSTRUMENTS IN AN HISPANIC POPULATION. *P. PILLOW, R. Gonzalez, R.A. Hajek, S.A. Gomez, J. Chilton, M. Spitz, L.A. Jones, UT M.D. Anderson Cancer Center, Houston, TX*

CONSUMPTION OF READY-TO-EAT CEREALS AND ITS EFFECT ON SELECTED NUTRIENTS AND FOOD GROUP INTAKE. *N.K. SINHA, W.O. Song, S.H. Cash, J.N. Cash. Dept. of Food Science and Human Nutrition, Michigan State University, East Lansing, MI 48824*

NUTRIENT DATA AQUISITION AND QUALITY ASSURANCE RESEARCH INITIATIVE. *L.WINTER-FALK, C.C. Heiser. The CBORD Group, Inc.,Ithaca, New York and Indiana University School of Medicine GCRC, Indianapolis, Indiana*

CLASSROOM INSTRUCTION AND WRITTEN MATERIAL HELPED PARTICIPANTS KEEP 3-DAY DIET RECORDS. *R.S. WOLD, S.T. Lopez, S.L. Pareo-Tubbeh, R.N. Baumgartner, L.J. Romero, P.J. Garry, K.M. Koehler. Clinical Nutrition Program, University of New Mexico School of Medicine, Albuquerque, NM 87131*

NEW STRATEGIES AND DIRECTIONS FOR FOOD DATABASES

Rhona Applebaum, Ph.D.
National Food Processors Association, Washington, DC.

ABSTRACT

This presentation will address two key facts related to today's food databases: (1) Food databases are increasingly being used to fulfill a variety of regulatory requirements, establish public health policies, set standards for health care and feeding programs, and establish research priorities; and (2) More "reliable" information is needed for input into food databases to ensure conclusions reached from their use are scientifically accurate and justified. In view of these facts, several strategies and directions for improving the usefulness and reliability of food databases will be discussed. Points for consideration from a policy and philosophical perspective will include: the need for a uniform federal policy; the need for an "omnibus" database with different quality characteristics; the need to include non-nutrient data; the need for improving data acquisition; and the need to raise the priority for a national database to a higher level.

Good Morning. I want to begin by stating it is a privilege to be here with you today, giving the opening key note address for this year's conference. And I'd be remiss if I did not personally thank David Haytowitz for extending the invitation to me, while I was on maternity leave from NFPA, and so sleep deprived I didn't know what I was agreeing to do—

I say this-partly in jest—because I do indeed look upon the invitation as a privilege, but I also say this with a hefty dose of reality, because I am in no way shape or form an expert in database development, be they nutrient, consumption, pesticide, heat penetration or any other.

Based on my work experience, I fall more readily into the "user" category, than the "developer" category. Nevertheless, from my perspective as a user of databases, I have identified several challenges that require new strategies and directions for resolving. The three challenges which I hasten to add will not be addressed by me today include:

- Weak statistical methodologies—Better statistical methods are needed for acquiring data, standardizing data, analyzing data and using data. And I refer to data from both food composition and intake surveys—which together are the bases for dietary assessment and public health recommendations dealing with diet and health;

Which leads us to challenge #2:

- Variation in data due to inadequacies in measurement tools—which raises bigger issues, specifically in regard to extrapolating from a specific day or days to what is "typically" consumed over an extended period; or problems inherent when extrapolating from a random sample to an entire population;

And lastly challenge #3:

- Weaknesses inherent in approximations—which because of the strong probability for imprecise estimates may result in failure to detect individuals at risk, both individuals at risk for over and under consumption.

I realize it is bad form to begin a speech by listing the items that won't be addressed. However, the opportunity to present what is needed to a roomful of individuals more than qualified to develop the strategies and directions to get the answers was more than I could pass up.

So I will leave discussion of new directions and strategies for solving the problems specific to today's databases to the experts in the database development. Instead, the focus of my talk today will be identifying where new strategies and directions are needed to reach a particular goal designed to ensure today's food composition databases are better able to meet the demands of the 21st century. And as stated in the abstract, these goals or points for consideration are more of a policy and philosophical nature.

The background information and the choice in terminology represents the views of the NFPA and the experts on staff who are responsible for the developing and maintaining of our food composition databases, primarily Dr. Roy Lyon, Director of our food chemistry and packaging department, who has spoken at past Conferences (in fact, as recently as last year). We feel we are entitled to our views-based on the number of databases we have developed, which total over 25. All fall into the category of "commodity" databases, which I will discuss momentarily, and all have received interim approval from FDA, and continue to be upgraded and expanded.

Because of NFPA's uniqueness as the science based trade association for the processed food industry, we rely on the data we generate to support various regulatory and/or legislative policy initiatives. To achieve sound public policy, you must have as your base sound scientific principles and information. NFPA advances no policy without having up-front a strong scientific argument.

I'll digress for one moment here to provide one example--germane to this topic—since it involves our databases which constitute the sound scientific information and advancing sound public policy, in this instance use of the term "healthy". As many of you know, FDA published a final rule defining "healthy" as a claim for nutrition labeling. In this final rule, raw fruits and vegetables were permitted to use the term "healthy" and certain processed fruits and vegetables were excluded.

In June 1994, NFPA, using the sound scientific information accumulated on the nutrient content of various processed fruits and vegetables, filed with FDA a petition for reconsideration. We argued that the final rule was not logical based on the facts, and that FDA should delete the single word "raw" from the healthy rule, and thereby extend the use of the claim to all fruits and vegetables.

On February 12, 1996, FDA published a proposed rule to amend the "healthy" definition by extending the use of the term to single ingredient frozen fruits and vegetables, and to enriched cereal products conforming to standards of identity. FDA denied NFPA's petition for reconsideration, but indicated a willingness to consider extending the use of the term "healthy" to other single ingredient processed fruits and vegetables (i.e., commercially sterile), provided it receives appropriate data supporting the positive nutritional profiles of other forms of processed fruits and vegetables.

We guarantee this information will be submitted to FDA by the July 18 deadline for comments. Far be it for NFPA to remind FDA that they already have the data since it was necessary they review the nutrient data for our databases before giving us interim approval. Digression over.

As most of you know, there are two types of nutrient databases. The first type is commodity databases, or whole food databases. These databases are typically derived from chemical analysis of the food so that the effect of processing is automatically accounted for. The NFPA databases are commodity databases.

The second type of database, what we refer to as "recipe calculating databases", are databases consisting of nutrient data of the ingredients used in formulated foods. Nutrient profiles of foods are calculated from their ingredients, data which come from the commodity databases. We believe, when used appropriately, ingredient-type databases generate nutrition label information that correlates very closely with laboratory-generated data, though more work is needed to demonstrate this point to FDA.

Let's review the driving forces behind food composition databases. With the advent of NLEA, nutrient database popularity increased, due primarily for a need for a less resource intensive means of labeling products. In addition to the economic benefit databases provide, it is also true that pooling information on a particular food, which is what databases do, increases the accuracy of the information. This we must all agree is better for the consumer.

The ability for databases to assist industry in their reformulating of old and their development of new products was also a driving force—specifically as it related to reducing time requirements and other important resources. Food labeling databases enable processors to develop unified labels for single ingredient type products or commodity products. Such use reduces consumer confusion since for example, all peas have the same information. In addition, competitiveness in the private label industry is enhanced since distributors can source product from multiple manufacturers without fear of compliance issues.

The impact on public health needs also constituted a major driving force for databases. Food composition databases together with databases containing information on dietary intake and lifestyle characteristics are used to identify current and emerging biomedical issues; set standards of care, be they for the elderly, infants, or other subpopulations which may fall into the at-risk category; and to generate hypotheses needed to set national research priorities or to revisit and rethink current public health recommendations as they relate to diet and health.

Having completed the overview and brief review of the driving forces behind food composition databases, it is time to address the issues confronting today's food databases for which new strategies and directions are needed. First and foremost, new strategies and directions are needed to ensure that a uniform federal policy on databases is promulgated. The reasons for this are numerous, but I think the one phrase, "for purposes of efficiency, reliability and accuracy" best sums it up. It makes no sense to operate under the two agency approach.

New strategies and directions are needed to obtain more reliable food consumption data in order to better assess the nutrient adequacy of diets in the US population. In this regard more concentration is needed on targeting the data collection as well as improving the collection methodology.

A more flexible database structure is needed in order to increase use and participation. A sure way to increase the probability that this occurs is to provide data entry which is flexible and a system that is user friendly. In addition, a database with increased flexibility will allow for the addition of more information, such as levels of polyphenols and other non-nutrients, which have important biological activity and need to be assessed. It goes without saying that the addition of more data from a variety of sources will require the data be given a quality indication so the users of such data are aware of the data's strengths as well as weaknesses.

New strategies and direction are needed to stress the benefit of a central repository and the need to improve the means by which data are collected, organized and distributed. A central repository carries with it benefits similar to that underlying a uniform federal policy for databases—efficiency, reliability and accuracy. The importance of databases and the need for increased participation, particularly by industry, needs to be better communicated—and communicated to a broader audience in order to get the support needed. And last but not least, the manner by which the data are collected, organized and distributed needs to be user friendly.

NFPA had similar problems in collecting, organizing and distributing its nutrient data. What we did was raise the importance of the databases not only in-house, but more importantly, with our members; we then trained the appropriate people and established a standard operating procedure to ensure members submitted data in a manner that was as painless as possible…or I should say as user friendly as possible. If we didn't make the necessary changes we would not have expanded as successfully as we have. Asking for too much information or requiring data submission be cumbersome and complex does not make for willing participants.

NFPA is not the only one who had to implement changes. I believe USDA in the development and maintenance of the Nutrient Standard Planning database also had to change its procedures in order to increase participation and strengthen the database.

And the last issue confronting food databases is money. More money for food composition research is needed—this is the strategic goal—the strategy and direction to achieve, a challenge to all of us. But the need is absolutely essential if we are to address or at least keep abreast with changing and emerging consumption trends, maintaining and increasing the quality of existing information and obtaining more information specifically in regard to processing factors.

I realize I have not given you specific answers for how to improve databases. Rather my intent this morning was to leave you with some thoughts on where new strategies and directions are needed to improve today's nutrient databases. When I think about it, my job this morning was easy. Simply put, I provided examples of where and why new strategies and directions for food databases are needed. It's easy to identify what is needed--where we want to be, if you will. The difficult job is knowing how to get there—developing the strategic plans, implementing them and achieving the strategic goals. Most of you have the knowledge and expertise to work together to do this--to help us, database users, get to where we need to be.

Simply put, people like me can identify in part what is needed, but it's people like you with your knowledge and commitment that will make these needs reality. As both a user of databases and a consumer who benefits from their use, I thank you, the audience, the active participants involved in these conferences and this area of key scientific study for where we are today.

And in closing, I thank you in advance for your dedication and continued hard work in identifying, developing and implementing the new strategies and directions needed to improve today's databases for tomorrow's uses.

This is the 21st Conference--it has achieved legal, adult status. May the next 21 years be even more productive than the last.

Thank you.

NAPRALERT: A DATABASE OF NON-NUTRIENT COMPONENTS IN PLANTS

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ABSTRACT

The use of information management techniques in determining the presence of biologically active compounds in the diet will be reviewed. The literature suggests many classes of compounds that may have a significant biological effect on the people who consume them. Since they are often present in the diet from many of the more common foods, especially those of plant origin, it is likely that these compounds may be responsible for the epidemiologically-based beneficial health phenomena that are so commonly reported but only weakly understood. At a time when the level of vitamin supplementation means that few people in this country are likely to be seriously deficient, the presence of flavonoids, isoflavonoids, saponins, carotenoids and other classes of compounds in the diet may have as much to do with general health conditions as any other phenomema (habitual or enviranmmental).

FOOD DESIGN: TRENDS AND CHANGES

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ABSTRACT

Food design, or designer foods, or functional foods, or nutritionally modified foods, or genetically modified foods --- are some of the myriad of terms that appear in the popular and scientific food and nutrition press. The similarities and differences in the meanings of these terms, and the implications for nutritional composition are not always clear. The goal of this paper will be to explore the motivation for and consequences of food product design in the highly dynamic, ever changing food industry. Factors that are considered by food industry marketing departments will be characterized as to how the ever present need to provide food products that consumers want is realized. Food product development trends over the past five years will be established to help understand the motivation for new food products. Future trends will be projected. Technological innovations will be highlighted and the impact of food design on nutritional composition will be examined.

Approved for publication by the Director of the Louisiana Agricultural Experiment Station as manuscript number 97-21-0013.

The ensuing is the text of a plenary lecture given at the 21st National Nutrient Databank Conference. The author was asked to provide local color and perspective for this conference that was held in Baton Rouge at the Pennington Biomedical Research Center. Lest one wonder why a Yankee from Pennsylvania be asked to give such a perspective, it is said that "a Yankee can become a Southerner but a Southerner can't become a Yankee --- not that any Southerner would ever want to be a Yankee." In keeping with the charge, the author would like to invoke his honorary status as a Cajun, bestowed on him by the Cajun French Music Association, Baton Rouge Chapter, of which he is a charter member. Cajuns provide an interesting cultural backdrop for such a conference given their renown for creative cuisine and food usage. Although not everyone is enamored with this penchant; for example one disenchanted patron stated that " some of the stuff that stares out of gumbo should not be allowed out except for Halloween... ugly makes Cajuns hungry. The Elephant Man wouldn't last ten minutes in Louisiana... these people eat anything that moves. They don't even bother selling Raid in Louisiana except as a seasoning." Cajuns like to tell jokes on themselves, and of course, there is the famous Cajun Zoo joke with the punch line that the difference between a Regular Zoo and a Cajun Zoo is that in the Cajun Zoo the sign in front of the animal exhibit contains, in addition to all of the normal information like common name, Latin name, habitat, etc., a recipe for how to cook it.

The given topic, i.e. Food Design: Trends and Changes, will be covered relative to terminology, trends, technology and what this author terms the tyranny of data, which of course is the ultimate master of this particular audience.

Terminology

The term Food Design is in this author's view a relatively new description of an old process that food scientists have always called food product development. In this age of art deco, cuisine nouveau and designer jeans, it is perhaps appropriate that the creation of new food products be designated with more modern terminology. A similarly new term or concept is described as "Designer Foods." Are these concepts the same, similar or related in any way? The 1973 edition of Webster's New Collegiate Dictionary defines design as "to create, fashion, execute, or construct according to a plan," and one definition of designer is "to indicate with a distinctive mark, sign, or name," which was designated as archaic. What was archaic in 1973, however, has now become fashionable. Designer foods have become associated with foods that possess specific nutritional and/or therapeutic properties. These foods have also been referred to as functional foods. Food design may be thought of as an overall concept, with designer foods a component of food design strategies. As a food scientist, this author continues to think of this as food product development.

Trends

Food product development is essential to the stability and growth of any food company. However, the high cost of innovation necessitates a high likelihood of success and a high return on investment. Realization of a new product is normally a lengthy process that involves both marketing and technology components of the company. The number of new products produced in the food industry has grown steadily in recent years, as can be seen from figure 1. Bakery and beverage products have shown the most dramatic increases (figure 2), with processed meats and side dishes showing more modest increases. In light of the importance of new products to the growth and stability of food companies, it is no wonder that some of the largest food manufacturers have been quite active in developing new products (table 1). Other companies, such as Tyson Foods, have made concerted efforts this past year to increase their new product development.

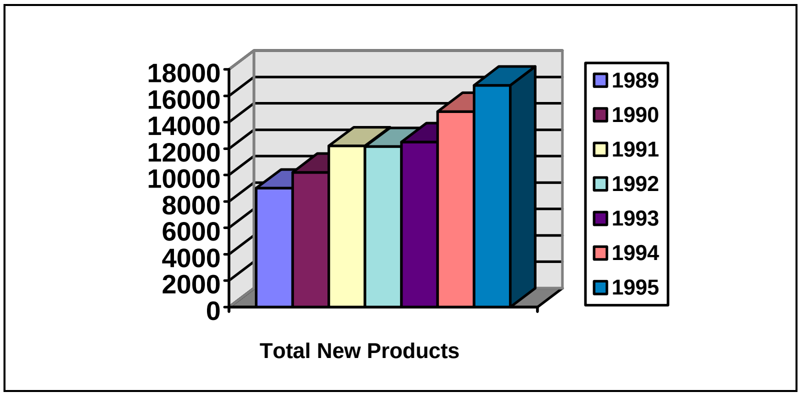


Figure 1. New food products, 1989-1995 (Friedman, 1995)

Mr. William Lynch, President and CEO of Leo Burnett Co., an advertising agency, has stated that "the key drivers of the future of prepared food products won't come as a surprise to anyone. They are found by studying change in the three classic benefits of prepared foods: convenience, nutrition and taste. And, most importantly, by studying changes in the consumer." Recent consumer interest in "designer foods" relative to health and nutritional benefits has increased the emphasis of food manufacturers on the production of new products with health-oriented features. The USDA Economic Research Service issued a report on the increase in sales of 37 nutritionally improved products versus their regular counterpart. They found that the volume of sales increased by a greater percentage between 1989 and 1993 for nutritionally improved foods than for regular products (figure 3). This occurred in spite of the fact that the majority (30 out of 37) of the nutritionally improved versions cost

Table 1. New product development by major food companies.

Company	1994	1995	% Change
1. Sara Lee	93	176	+89
2. Philip Morris	200	169	-16
3. Nestle	164	163	-1
4. ConAgra	99	157	+56
5. Campbell Soup	87	135	+55
10. Hormel Foods	121	89	-26
20. Tyson Foods	10	48	+380

From Friedman, 1995.

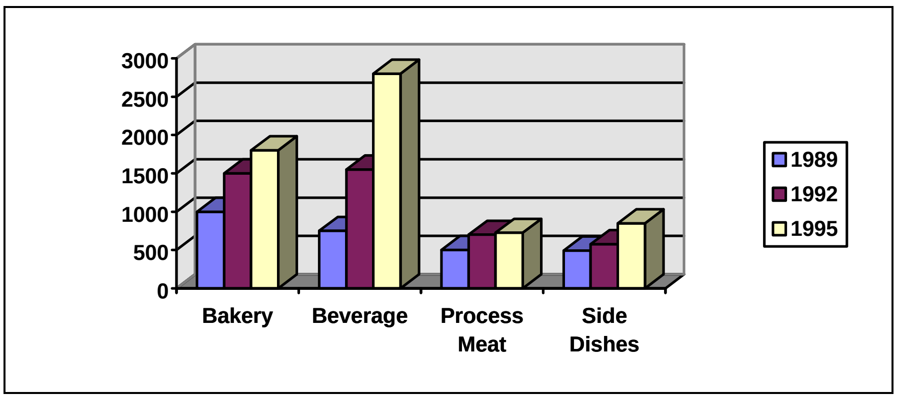
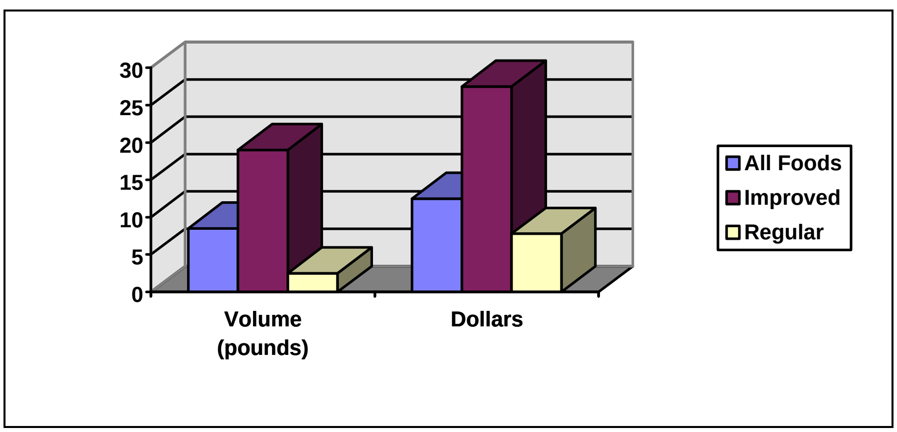


Figure 2. Specific new products (Friedman, 1995)



Economic Research Service, USDA

Figure 3. Percentage increase in sales of 37 food categories, 1989-1993

more than their regular counterparts. A seven-year trend for the development of new food products bearing health claims is depicted in figure 4. Reduced/low calorie and reduced/low fat claims have tended to be among the most often cited claims, especially in 1995. The number of new products

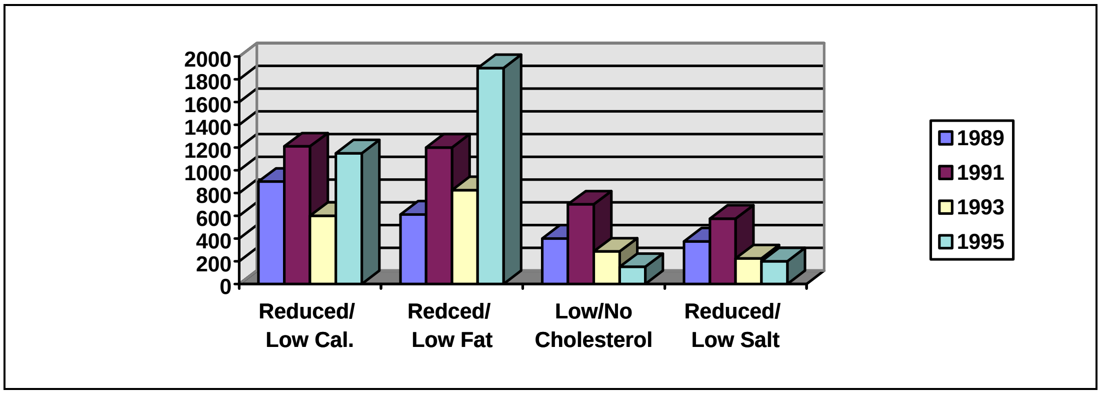


Figure 4. New products bearing health claims (Friedman, 1995)

bearing the claims of low/no cholesterol and reduced/low salt have declined in recent years. David Hettinga, Chief of Technical Services at Land O' Lakes, has stated that technologies that are at the forefront of the food processing industry and/or that are emerging as important new approaches to food processing include "low fat/no fat, functional foods, unique processing, edible films, unusual flavors and biotechnology." Food components that have been associated with health benefits and are therefore viewed as functional foods include thermogenic agents such as chromium picolinate, antioxidants such as tocopherols, phenolics, flavones and fiber.

Trend analysis is certainly an important component of modern day marketing strategy. Dr. Elizabeth Sloan, as a contributing editor for Food Technology, has written two articles on consumer trends and how they may affect the food industry. Her first top ten trends article, which appeared in 1994, listed the following: 1) kitchen cabinet versus medicine cabinet, 2) fresh is best, 3) the "O" (organic) word spells "opportunity," 4) more meatless eating, 5) energy-enhancing foods, 6) beyond speed, 7) microwave magic disappears, 8) an eat-where-you-are society, 9) upgrading the American palate and 10) active cultures to activate consumers. Many of these stated trends are self-explanatory and clearly reflect what appears to be an attitude towards more healthful food choices. In her 1996 update, Sloan indicates that the health orientation of consumer attitudes has been strong. Her new list includes: 1) sense appeal, 2) access and interception, 3) hunting for home meal replacements, 4) horse race for health-promoting ingredients, 5) perishables prevail, 6) lifestyle foods, 7) fruits and veggies flourish, 8) interaction, 9) where's the center of the plate and 10) impulse. Her new list continues to reflect health consciousness but has a much greater emphasis on convenience and taste. She predicts in trend #8, interaction, that consumer fascination, especially amongst younger individuals, with interactive devises will make innovative packaging attractive. This recognition calls attention to the changing demographics of the marketplace.

Today's generation is popularly referred to as the Baby-Boomers. The children of the Baby-Boomers are Generation X, and their children have already received the moniker Generation Next or the Millenials. No matter what you call them, the children of today will be the grocery shoppers of tomorrow, and understanding their likes and dislikes will be essential to food marketers. Selina Guber, President of Children's Market Research, has listed the top ten kid trends as: 1) high tech: computer, multimedia; 2) save the planet; 3) education as a means to an end; 4) family life, alive and well; 5) looking good; 6) sports - let the games begin; 7) money, brands, possessions; 8) race and gender issues; 9) multi-cultural media, advertising and products and 10) fitness and nutrition. On the surface, many of these kid trends do not appear highly related to food choice issues. Obviously, fitness and nutrition would be very much related, but future marketing strategy will also have to include an awareness that Generation X will be more environmentally and culturally conscious, high tech and sophisticated in their standards.

Technology

Technological developments have fueled the massive increases of new products in recent years. These developments can range from highly sophisticated genetic modification of food commodities to merely repackaging old product types. Many developments have been potentiated through new food additives or components, especially with the movement towards healthier foods. Olestra, as discussed at this conference, is a good example of this. Other approaches to new food products have focused on the manner in which foods are presented to the consumer. For example, fresh cut produce is a new approach to the marketing of fruits and vegetables. In this approach, vegetables and/or fruits are partially prepared, e.g. carrots could be peeled, or lettuce could be chopped, for more convenient incorporation into meals. This approach did not exist 10 years ago but is projected to account for eight billion dollars in sales by the year 2000 (Sloan, 1995). It is primarily salad driven at this time but provides great opportunities for creativity such as fresh produce-based meals.

A similar concept would be "speed scratch," which refers to home-cooked meals with minimal preparation, effort or time (Hollingsworth, 1995). Speed scratch combines premixed, pre-measured, quick cooking components into a meal, nearly ready to eat. It relies on pasta, specialty sauces, salad dressings, prepared soups, pre-cut veggies, pre-cut and seasoned meats, spice and seasoning mixes and frozen components. These items would be co-packed so that the consumer could easily prepare a nearly home-cooked meal.

A technology that is receiving quite a bit of publicity of late is the use of genetic engineering, or modification, to alter certain characteristics of typical food commodities. This technology has conjured up some pretty horrific scenarios in the public eye but has been shown to be quite safe scientifically. The term genetically modified organism is used in the scientific community in reference to plants, animals or microorganisms that have been genetically modified. In the food industry, the modification generally would be related to some aspect of food quality. Genetic material (DNA) from one or more donor organisms is identified, copied and introduced into replicating cells of the target organism. This allows for faster, more precise modification compared with genetic modification that occurs naturally, i.e. by natural selection. The technology of this process was covered in detail at this conference. What effect might genetic modification have on nutritional composition of foods?

The first FDA-approved genetically altered food product was the Flavr Savr™ tomato. The basic principle of the genetic modification in this case was to turn off the production of the enzyme polygalacturonase, which is partially responsible for the softening of the tomato during ripening due to the degradation of pectin. By doing this, it would be possible to allow the fruit to ripen longer on the vine, rather than harvesting in the green state, which is the current practice. The current practice reduces losses due to disease and damage during shipping and handling. Allowing vine ripening increases flavor as the fruit ripens. The problem becomes whether or not other typical characteristics of the tomato are changed through this genetic modification. This would include a concern for changes in nutritional value. The Calgene company, which developed the Flavr Savr™ tomato has published a book through the CRC Press (Redenbaugh et al., 1992) that describes the process that they undertook to obtain FDA approval for this product. In this book, many of the studies that they conducted as part of the approval application are described. A partial comparison of the nutritional analysis of the Flavr Savr™ tomato compared with the normal range is given in table 2. For the most part, the important nutrients all fall into the normal range.

Table 2. Nutritional analysis of the FLAVR SAVR[TM] tomato compared with the normal range.

Nutrient	Normal Range	Measured Range
	per 100g	
Protein	0.85 g	0.75-1.14 g
Vitamin A	192-1667 IU	330-1600 IU
Thiamin	16-80 :g	38-72 :g
Riboflavin	20-78 :g	24-36 :g
Vitamin B_6	50-150 :g	86-150 :g
Vitamin C	8.4-59 mg	15.3-29.2 mg
Calcium	4-21 mg	9-13 mg
Iron	0.2-0.95 mg	0.2-0.41 mg

From Redenbaugh et al., 1992

Tyranny of Data

The previous discussion leads nicely into the final component of this presentation, namely the need of this audience for reliable data as the food industry takes different approaches to food product design. A quick review of the literature of recent years revealed that there is not a great deal of data being generated relative to the effect of food processing/development on nutrient composition. Like the Flavr Savr example, much of the data that exists are in the hands of the food manufacturing companies and are of a proprietary nature. This will provide a challenge to the keepers of nutrient databases to obtain reliable data as the nature of food products change.

Several examples of the effect of processing on nutrient composition were published in the last two years. The first is related to the effect of calcium fortification of rice as affected by preparation method (Hettiarachchy et al., 1996). The objective of this research was to evaluate the relative effectiveness of calcium incorporation into rice that would be subsequently washed or exposed to water prior to or during preparation. They found that three percent calcium lactate fortification more than doubled the calcium concentration in the rice and that washing had a relatively minor effect (figure 5). Dialysis of a rice flour slurry against water did reduce the calcium content of the fortified rice, which indicates that the calcium is not tightly bound within the rice protein/starch complexes. However, this type of processing would not be encountered in normal rice preparation. Neither washing nor dialysis affected the calcium concentration of unfortified rice.

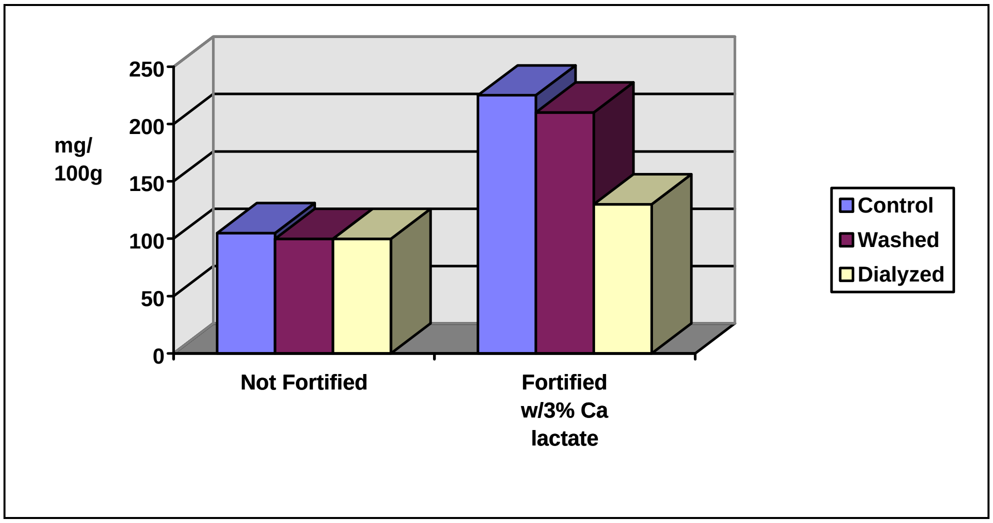


Figure 5. Calcium fortification of rice

Lane et al. (1995) described a study of food products that are processed specifically for use in the U.S. Space Program. They evaluated three different stages of processing vegetables for their effect on folate concentration. As can be seen in figure 6, the effect of processing was highly product specific. Asparagus, which is naturally high in folate, was greatly affected by cooking and freeze-drying after cooking. Broccoli and cheese, on the other hand, which are naturally low in folate, were not affected by these processing procedures.

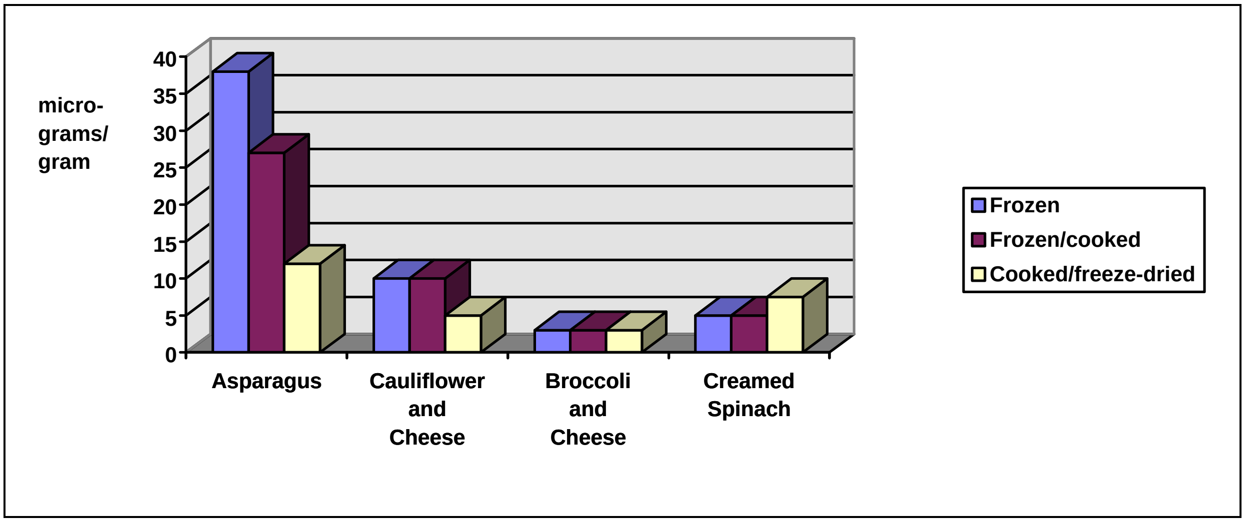


Figure 6. Folate content of vegetables after three stages of processing

A study done in my laboratory as part of an M.S. project (Liu, 1995) evaluated the relative effect of combining rice bran with ground beef on lipid composition. Adding either 5% or 10% rice bran to ground beef dramatically increased vitamin E and oryzanol content (figure 7). Also, the percentage of fatty acids that were saturated decreased and the percentage that were polyunsaturated increased as the percentage rice bran increased in the product.

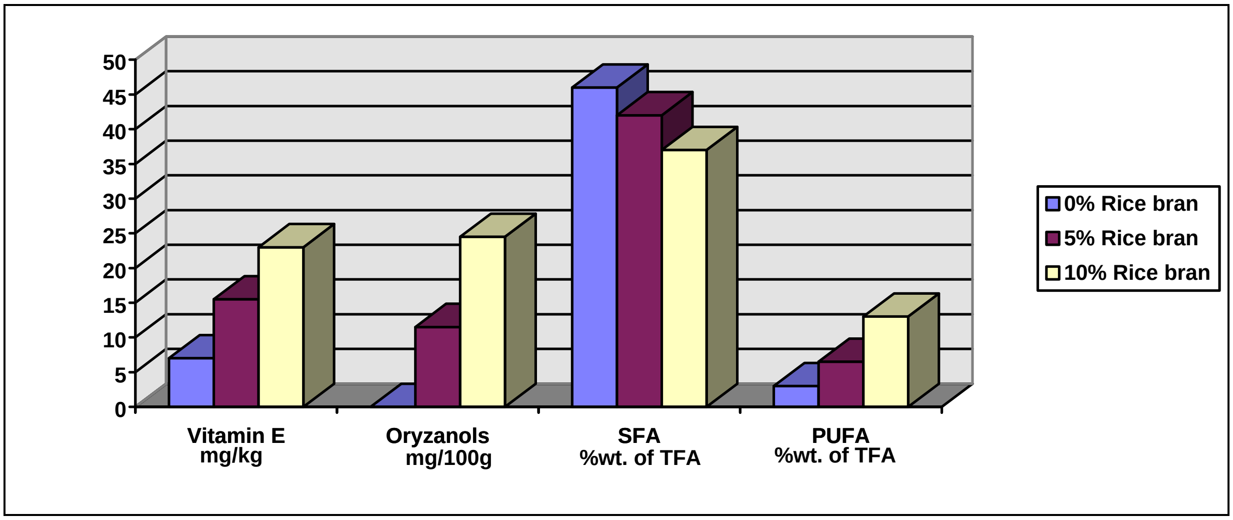


Figure 7. Nutritional modification of beef with rice bran

Each of these studies illustrates the potential effect that product development could have on the nutritional content of food products. Obviously, though, in each of these three studies, one or just a few nutrients was considered, which illustrates the magnitude of research that would be needed to adequately address nutritional composition of new food products. The challenge will be keeping up with the ever-changing food industry and obtaining the information that will satisfy the tyranny of data.

In closing, a couple of quotes may serve to put this topic into perspective. George Bernard Shaw has said, "there is no love sincerer than the love of food." This is, of course, what guarantees many of us our jobs. But perhaps Mark Twain may have been more to the point when he said, "part of the secret of success in life is to eat what you like and let the food fight it out inside." Thank you for your attention, and it is hoped that this presentation has provided sufficient local color and a bit a of useful information as well.

References

1. Friedman, M. 1995. New Products come alive in '95. Prepared Foods. MID APRIL-1995.
2. Hettiarachchy, N.S., Gnanasambandam R., and Lee, M.H. 1996. Calcium fortification of ice:distribution and retention. J. Food Sci. 61:195-197
3. Hollingsworth, P. 1995. Speed Scratch: When you've got the itch to eat. Food Tech.49(5):36.
4. Lane, H.W., Nillen, J.L., and Kloeris, V.L. 1995. Folic acid content in thermostabilized and freeze-dried space shuttle foods. J. Food Sci. 60:538-554.
5. Liu, R. 1995. Use of stabilized full-fat rice bran in low-fat ground beef: effects on oxidative stability and sensory properties. M.S. Thesis, LSU, Baton Rouge, LA.
6. Sloan, A. E. 1994. Top ten trends to watch and work on: the more things change, the more they stay the same. Food Tech. 48(7):89-100.
7. Sloan, A. E. 1995. Fresh cut gets fresh. Food Tech. 49(5):38,40.
8. Sloan, A. E. 1996. The top ten trends to watch and work on. Food Tech. 50(7):55-71.
9. Redenbaugh, K., Hiatt, W., Martineau, B., Kramer, M., Sheehy, R., Sanders, R., Houck, C., and Emlay, D. 1992. Safety Assessment of Genetically Engineered Fruits and Vegetables: A Case Study of the FLAVR SAVR™ Tomato. CRC Press Inc., Boca Raton, FL.
10. Webster's New Collegiate Dictionary. 1973. G.&C. Merriam Company, Springfield, MA.

Paper P2-2	***New Products in the Food and Agricultural Biotechnology Pipeline*** *Martina McGloughlin, University of California, Davis*

NEW PRODUCTS IN THE FOOD AND AGRICULTURAL BIOTECHNOLOGY PIPELINE

Martina McGloughlin, PhD
Biotechnology Program, University of California, Davis, CA.

ABSTRACT

Biotechnology is not new, in thousands of years of agricultural history, the selection by prehistoric farmers of improved plant lines and of desired traits in the breeding of animals, and even the simple cullling of plants and animals with undesired characteristics, inevitably altered the genomes of the domesticated species. Similarly, prehistoric developments in food technology include the use of microorganisms in the production of bread, beer, wine, and cheese. All of theses endeavors have advanced rapidly in the 20th Century and especially in the past 15 years, because of new developments in genetics, plant breeding, biochemistry, and chemistry and most recently, in molecular genetics. New technologies have been applied in agriculture and food production as they evolved. Genetic engineering through the application of recombinant DNA methods is the new technology currently having the greatest impact. Its application in crop and animal agriculture and food production will be discussed. Tomato lines with improved ripening and shelf-life characteristics and squash resistant against specific viruses were the first to meet with regulatory approval and reach the market. Herbicide-tolerant crops, insect-resistant cotton and potatoes, rapeseed with altered lipid composition, and crops with reversible male sterility to allow efficient breeding control were next in the development pipeline. New, genetically-engineered crops are likely to be important not only to agriculture and the food industry but also in the chemical and pharmaceutical industries as production factories for economically important products such as thermostable biodegradable plastics. So, although biotechnology is the broadest sense is not new. What is new is the level of complexity and precision involved in scientists' current ability to manipulate living things, making such manipulation predictable, precise and controlled, with the potential to contribute to a safer more nutritional and more economic food supply and a healthier environment.

OLESTRA AND ITS IMPACT ON NUTRIENT DATABASES

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ABSTRACT

This presentation will provide an update on olestra (Olean®), Procter & Gamble's non-caloric fat replacer. The update will provide answers to such questions as: What is olestra and how is it made? In what foods can olestra be used and what impact does olestra have on the caloric density of such foods? How much olestra will people eat? What is the basis for fat-soluble vitamin addition? What impact will olestra foods containing added fat-soluble vitamins have on the nutrition information panel? What analytical methods are needed to distinguish olestra from digestible triglycerides for purposes of nutrition labeling? What is the information label that will appear on olestra foods and what forms the basis for this labeling requirement?

1. Presentation Overview

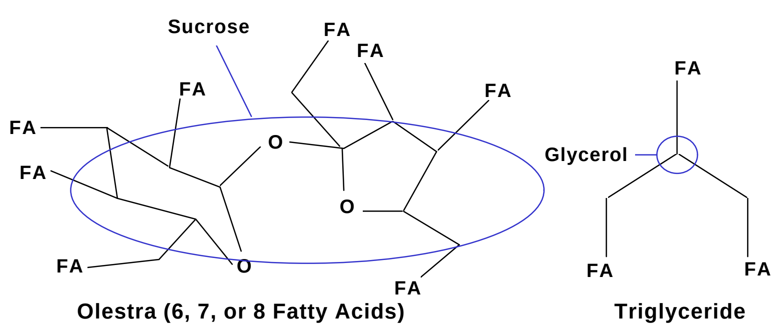
- Olestra - Structure, Manufacture and Safety
- Categories of Approved Food Use
- Caloric Density Implications
- Estimated Intakes
- Vitamin Addition - Rationale and Nutrient Panel Impact
- NLEA Analytical Method Considerations
- Information label - Carotenoid and Digestive Effects

2. Definition of Olestra

CFR 172.867(a)

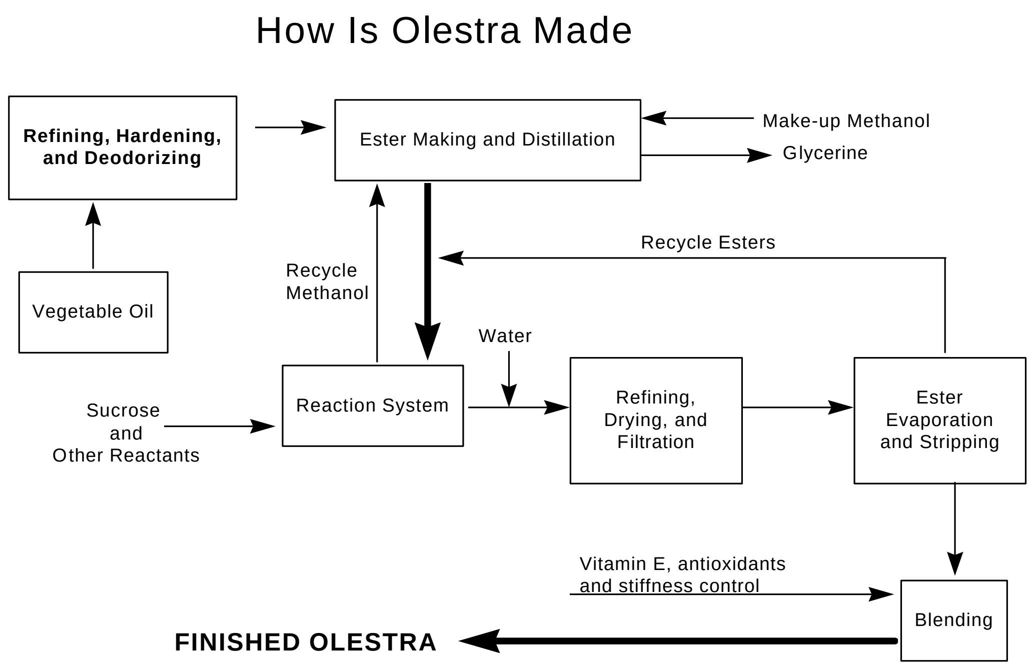
"Olestra is a mixture of octa-, hepta- and hexa-esters of sucrose with fatty acids derived from edible fats and oils or fatty acid sources that are generally recognized as safe or approved for use as food ingredients. The chain lengths of the fatty acids are no less than 12 carbon atoms."

Structural Model of Olestra



FA = Fatty Acid Side Chain

3. Manufacture of Olestra



4. Safety of Olestra

- FAP > 150,000 pages (about 300 volumes)
- More than 100 studies in 7 animal species show that olestra
  - Is not absorbed
  - Is not toxic
  - Does not cause cancer, birth defects or adverse reproductive effects
  - Does not affect gastrointestinal structure or function
  - Does not affect the absorption of medicines
- Olestra was tested in 98 human studies:
  - 43 were tightly controlled clinical studies in more than 4300 men, women and children up to 16 weeks in duration
  - 55 were human preference or sensory studies in more than 16,000 people with duration measured in years

Testing covered the general population, people with diabetes, obese people, those with GI disease and people with elevated serum cholesterol

- Amount of olestra consumed ranged up to 90 g/d
- No harmful effects were seen
- Clinical studies verified that olestra does not affect the absorption or efficacy of drugs

5. Environmental Assessment

- Olestra is safe for the environment:
  - Is effectively removed and has no adverse effects on wastewater treatment facilities
  - Major exposure compartment in environment will be soil
  - Biodegrades in the environment and does not accumulate
  - Is non-toxic to terrestrial, aquatic and benthic organisms
  - Has no adverse effect on soil physical properties

6. Versatility of Olestra

Fat Replacer	Dairy	Spreads	Dressings	Baking	Frying
Protein-based	✓	✓	✓		
Carbohydrate-based	✓	✓	✓	✓	
Fat-based, e.g., Olean	✓	✓	✓	✓	✓

7. The Olestra Regulation

CFR 172.867(c)

"Olestra may be used in place of fats and oils in prepackaged ready-to-eat savory (i.e., salty or piquant but not sweet) snacks. In such foods, the additive may be used in place of fats and oils for frying or baking, in dough conditioners, in sprays, in filling ingredients, or in flavors."

8. Categories of Approved Food Use

- Savory snacks under this regulation will include such products as:
  - Plain and flavored:
    - Potato chips
    - Tortilla chips
    - Corn chips
  - Cheese puffs/curls
  - Crackers (soda, plain, flavored and filled)

9. Current Test Market Activity

- Three cities:
  - Eau Clair, WI
  - Cedar Rapids, IA
  - Grand Junction, CO
- Four Frito-Lay Products:
  - Lays, Ruffles, Doritos, Tostitos
  - About 7 Stock Keeping Units (SKU)

10. Fat and Calorie Reduction in 1 oz. of Snack Foods

	Fat, grams	Calories, kcal
Potato chips:		
• current	10	160
• olestra	0	70
Tortilla chips:		
• current	7	140
• olestra	1	90

FIGURE. Example of Nutrition Facts Label for Olestra Containing Foods

Nutrition Facts	
Serving Size 1 oz (28 g about 22 chips)	
Servings Per Container 14	
Amount Per Serving	
Calories 70	Calories from Fat 0
	% Daily Value*
Total Fat 0 g	0%
Saturated Fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 180 mg	8%
Potassium 400 mg	
Total Carbohydrate 16 g	5%
Protein 1 g	
Vitamin C 10%	Iron 2%

Ingredients: Potatoes, Olestra (Olean Brand), Salt, alpha-Tocopheryl Acetate (Vitamin E), Tocopherols (to protect flavor), Vitamin A Palmitate, Vitamin K_1 and Vitamin D.

11. How Much Will People Eat?

- Intake of olestra for the total population of savory snack consumers at the 90th %tile is estimated at about 18 g/day on eating days and about 7 g olestra per day on a lifetime daily average basis
- Intake was determined using the MRCA method with conservative assumptions

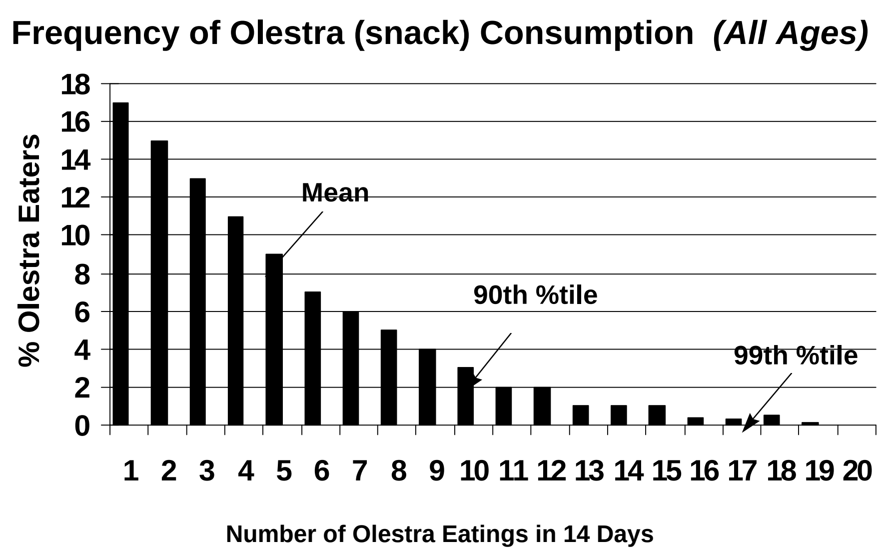
Intakes Estimated By The MRCA Menu Census Survey

- The intake survey includes 2,000 households and 5,000 subjects annually
- This survey, used by the FDA,:
  - is demographically balanced by age, gender, race and income
  - is geographically balanced
  - tracks the intake of food and drink consumed at home and away from home for 14 days
  - runs continuously throughout the year
- We used conservative assumptions which will result in an exaggeration compared to what actual population intake will be:
  - 100% of savory snacks are made with olestra
  - Then increased intake by 10%

12. Olestra Consumption

Olestra Intake on Eating Days (grams/day)

Group	Savory Snack Eaters	
	Mean	90th %tile
Total Population of Eaters	10.2	18.3
2-5 yr (males and females)	8.4	13.5
13-17 yr (males)	165	23.9
≥ 65 (males)	7.5	16.2



Olestra 14-Day Average Intake (grams/day)

Group	Savory Snack Eaters	
	Mean	90th %tile
Total Population of Eaters	3.1	6.9
2-5 yr (males and females)	3.0	6.4
13-17 yr (males)	4.7	10.9
≥ 65 (males)	2.4	5.4

13. The Olestra Regulation

CFR 172.867(d)

"To compensate for any interference with absorption of fat-soluble vitamins, the following vitamins shall be added to foods containing olestra:"

- 1.9 milligrams α-tocopherol equivalents per gram olestra (e.g., 2.07 mg *d*-α-tocopheryl acetate)
- 51 retinol equivalents per gram olestra (as retinyl acetate or retinyl palmitate) (e.g., 93 μg retinyl palmitate)
- 12 IU vitamin D per gram olestra (e.g., 300 ηg vitamin D)
- 8 micrograms vitamin K_1 per gram olestra

14. Comparison of Vitamin Compensation Levels With Foods In the Diet

Vitamin	RDI of Vitamin in a 1 oz Serving	Foods with Similar Amounts of Vitamin
A	0.3	1/3 serving of fortified breakfast cereal
D	0.1	1/3 cup milk
E	0.7	2 Tbs mayonnaise
K	1.0	1/6 cup of broccoli

15. NLEA Analytical Method Considerations

- Existing methods will over-estimate fat content in olestra foods because olestra will be extracted with the fat
- An AOAC Peer-Verified Method has been developed to separate dietary fat from olestra (PVM 4:1995, pp. 1-29)
- This method allows compliance with the U.S. NLEA guidelines for "fat-free" and "low-fat"
- Method overview:
  - $CHCl_3$ extraction
  - Lipase hydrolysis yielding free fatty acids (FFA) and intact olestra
  - FFA precipitation as Ca soaps
  - Olestra removal with hexane extraction
  - FFA formation via acidification
  - Methyl ester formation
  - Quantification by gas chromatography
- Recovery 101 ± 6%

16. The Olestra Information Label - Carotenoid and Digestive Effects

CFR 172.867(e)(1)

"The label of a food containing olestra shall bear the following statement in the manner prescribed in paragraph (e)(2) of this section (interim proposal):

This Product Contains Olestra. Olestra may cause abdominal cramps and loose stools. Olestra inhibits the absorption of some vitamins and other nutrients. Vitamins A, D, E and K have been added."

17. Key Technical Facts - Digestive Effects

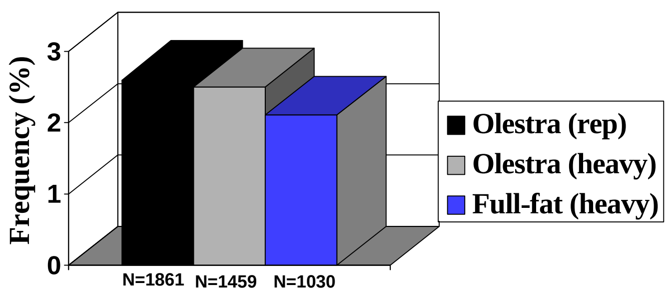
Most consumers will not experience digestive changes (e.g., change in stool consistency, bloating) when eating olestra snacks and for those that do, these will be no different than those that can occur with common foods

The FDA, the Food Advisory Committee, P&G and leading gastroenterologists concluded that these effects do not represent a potential for harm

The "oil-loss" reported when some people ate large amounts of early versions of olestra was addressed through product modifications before P&G filed the olestra FAP

- Clinical testing confirms that this has been resolved
- These clinical results form the basis for the olestra stiffness specification (at least 50 kilopascals/sec)

Reports of digestive effects at snack consumption levels, including heavy snackers, are similar as for current snacks based on voluntary comments



The increased reports of digestive changes by people in clinical studies eating exaggerated amounts (up to 32 grams per day) under unrealistic conditions (eaten with every meal for 56 consecutive days) are:

- The same <u>kind</u> of effects reported when subjects consume ordinary fat
- No more severe when larger amounts of olestra are eaten or when eating is maintained for weeks at a time

18. Key Technical Facts - Carotenoids

Olestra can reduce the absorption of some fat-soluble food components (e.g., carotenoids) <u>when consumed at about the same time</u>

The FDA, the Food Advisory Committee, P&G and leading nutrition researchers concluded that olestra will not adversely impact components of fruits and vegetables that may reduce the risk of chronic disease

This conclusion was based on the following three factors:

- Olestra does not affect most components in fruits and vegetables
- The effect of olestra on carotenoids is small and well within normal variations in carotenoid levels and is similar to the effect from other common foods
- There is no consensus on a carotenoid role in disease prevention

19. Impact of Olestra On Other Components of the Diet

- Olestra will not affect the other substances in fruits and vegetables that are associated with a health benefit
  - Antioxidants: Olestra will have no impact on water-soluble vitamin C. Any impact on vitamin E will be offset by vitamin E addition.
  - Other Substances: Olestra will have no impact on fiber or water-soluble folate. Any impact on vitamin A will be offset by vitamin A addition.

20. Phytochemicals In the Diet Are Not Lipophilic Enough To Be Affected By Olestra

Terpenoids
Flavonoids
Polyphenols
Isothiocyanates
Indoles
Organosulfides

21. Key Technical Facts - Carotenoids -

- This conclusion was based on the following three factors:
  - Olestra does not affect most components in fruits and vegetables
  - The effect of olestra on carotenoids is small and well within normal variations in carotenoid levels and is similar to the effect from other common foods
  - There is no consensus on a carotenoid role in disease prevention

22. Results of a Three-Part Carotenoid Research Program

Test	Reduction in b-Carotene Status
Extreme Case	60%
Exaggerated Case	25%
REALISTIC CASE	6-10%

23. Many Factors Can Potentially Reduce the Uptake of Dietary Components

Interaction	% Reduction at a Meal
Fat-free meal and *b*-carotene	100
Fiber and *b*-carotene	58
b-Carotene supplement and lutein	50
Cholesterol-lowering agents	30-70
Milk or cheese and iron	50
Tea or red wine and iron	60
Calcium supplement and zinc	85

24. Key Technical Facts - Carotenoids

- This conclusion was based on the following three factors:
  - Olestra does not affect most components in fruits and vegetables
  - The effect of olestra on carotenoids is small and well within normal variations in carotenoid levels and is similar to the effect from other common foods
  - There is no consensus on a carotenoid role in disease prevention

- Diets high in fruits and vegetables are recognized in observational clinical trials to provide a health benefit

- This does not establish a cause-and-effect health benefit role for carotenoids *per se*

- Such data are confounded because diets high in fruits and vegetables may confer a health benefit because such a diet:
  - is low in fat, iron and calories
  - is high in vitamin C, vitamin E and fiber
  - may be associated with regular exercise and lack of smoking

- Intervention trials support the conclusion that *b*-Carotene is not protective against chronic disease

- No Consensus for Role of Carotenoids In Prevention of Chronic Disease
  - 1994 “Antioxidant Vitamins and b-Carotene in Disease Prevention”, sponsors included the National Cancer Institute and the National Heart, Lung and Blood Institute.
  - 1993 “Antioxidant Nutrients and Cancer and Cardiovascular Disease”, FDA Conference.
  - 1993 “Role of Antioxidants on Health”, the International Life Science Institute.
  - 1987 UK Committee on Medical Aspects of Food Policy

Paper P4-1	***Dietary Supplements in the U.S. Market - Major Contributors to Nutrient Intake*** *John Hathcock, Council for Responsible Nutrition*

DIETARY SUPPLEMENTS IN THE U.S. MARKET – MAJOR CONTRIBUTORS TO NUTRIENT INTAKE

John N. Hathcock, Council for Responsible Nutrition, Washington, DC

ABSTRACT

Nutrient intakes come from three main sources: (1) the natural composition of foods, (2) fortified foods, and (3) dietary supplements. The increasing evidence that higher than usual intake of certain nutrients reduces the risk for some chronic diseases suggests that diets composed of only foods with the natural levels of nutrients cannot--or are not likely to--generate nutrient intakes high enough to produce the observed benefits. The only ways of reaching those higher intakes are fortified foods or dietary supplements. Fortification of specific foods, usually staples, with specific nutrients has the advantage that no effort or decision is required by the consumer, but the disadvantage is that fortification levels high enough to generate desirable intakes in some population subgroups may generate excessive intakes in others. Dietary supplements provide a unique advantage in permitting increased intakes only in those who chose to take them. Survey data indicate that intakes of calcium, chromium folic acid, vitamin E, vitamin C, and several other nutrients are commonly lower than the levels associated with decreased disease risk. Quite high levels of vitamin C intake can be achieved by careful selection of unfortified foods. National policy is changing to increase folic acid intake from fortified foods, in attempt to reduce the risk of certain birth defects. The higher levels of vitamin E shown to reduce heart disease risk cannot be achieved without use of dietary supplements, unless foods were highly fortified.

Paper P4-2	***U.S. Government Efforts to Collect Dietary Supplement Intake Data*** *Alan Levy, FDA; Bethene Ervin, NCHS; Alanna Moshfegh, ARS*

U.S. GOVERNMENT EFFORTS TO COLLECT DIETARY SUPPLEMENT INTAKE DATA

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ABSTRACT

There is widespread interest in quantifying dietary supplement intake by the U.S. population to determine contribution to total nutrient intakes and for other research purposes. However, because the nature of dietary supplements is complex and many different formulations are available in the U.S., data on supplement intake are difficult to obtain. U.S. Government efforts to obtain such data have included a special survey conducted by the Food and Drug Administration in the late 1970s; the addition of a dietary supplement section to the National Health Interview Survey in the mid 1980s; general supplement intake questions in the recent USDA Continuing Surveys of Food Intakes by Individuals; and more extensive data collection as part of the Third National Health and Nutrition Examination Survey (NHANES III), conducted between 1988 and 1994. NHANES III was designed to look at nutrient intakes both from foods and from dietary supplements. Dietary supplement intake data from ! NHANES III will be used to determine the prevalence of dietary supplement use and to assess the contribution of dietary supplements to total nutrient intake and nutritional status. This panel presentation and discussion will review the challenges presented in collecting dietary supplement intake data and the types of dietary supplement data available from U.S. Government sources.

DIETARY SUPPLEMENT INTAKE DATA FROM THE GERMAN NVS STUDY

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ABSTRACT

Nutrient intake from food supplements generally is not considered in assessment of the nutrition status of US populations, as data on intake of food supplements have been difficult to obtain. However, food supplement intake data were successfully collected in the German Nationale Verzehrsstudie (NVS), allowing assessment of the nutritional impact of supplements. The NVS was conducted in the former Federal Republic of Germany from October 1985 to January 1989. The NVS sample included over 24,000 individuals who completed 7-day weighed food records and 7-day activity diaries. NVS respondents recorded intakes of dietary supplements (e.g. multivitamins, garlic capsules, yeast tablets) in food records. All supplements were assigned food codes, and supplement intake data were integrated with food intake data. Intake of traditional vitamin and/or mineral supplements, identified by brand name, was reported by 361 NVS respondents. Although the percentage of individuals reporting supplement use was small, the average daily nutrient intake from supplements represented a substantial proportion of intake of specific vitamins and/or minerals for many of these individuals. These results indicate that US nutrition status assessments may be significantly enhanced by collection of supplement intake data in US food consumption surveys.

RECENT AND CURRENT CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) METHODOLOGY RESEARCH.

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ABSTRACT

The U.S. Department of Agriculture (USDA) has conducted national surveys of dietary intakes of individuals since the 1960's. Research to improve the methods for obtaining information on dietary intakes has been a vital component of survey-related activities. In preparation for the 1994-96 Continuing Survey of Food Intakes by Individuals/Diet and Health Knowledge survey (CSFII/DHKS), USDA sponsored collaborative research in two key areas: (1) a are view of the CSFII individual intake questionnaire by the Center for Surveys Method Research (CSMR) of the Census Bureau and research on the cognitive aspects of the 24-hour recall, and 92) a review and pretesting of the DHKS questionnaire by the demographics Survey Division of the Census Bureau. Cognitive interviews identified strategies employed by respondents to recall foods eaten on the previous day. This research led to the development of the multiple-pass approach for the 24-hour recall used in the 1994-96 CSFII. The pretesting of the DHKS resulted in improvements in t he structure of t he questionnaire and reduced respondent burden. A follow-up study focused on improving the reporting of intakes by children. Current research is focused in three areas: (1) cognitive testing of the DHKS by CSMR; (2) research on portion size estimation by Tennessee State University; and (3) development of methods for estimating distributions of usual food and nutrient intakes by Iowa State University.

This paper reviews methodological research sponsored by the Agricultural Research Service of the U.S. Department of Agriculture in support of the Continuing Survey of Food Intakes by Individuals (CSFII). Staff of the Food Surveys Research Group of the Beltsville Human Nutrition Research Center have directed and contributed to this research.

The research is part of the National Nutrition Monitoring and Related Research Program. Nutrition monitoring provides data for public policy decisions on issues related to nutrition education, food assistance programs, food regulatory activities, and public health programs, as well as for establishing future research priorities.

The Ten-Year Plan for Nutrition Monitoring and Related Research, developed in 1992, addresses the need for continued monitoring of food and nutrient intake and dietary attitudes and knowledge (Dept. of Health and Human Services and Dept. of Agriculture, 1993). Specific activities in the plan call for methodological research to improve the validity and reliability of dietary intake data. Earlier methodological research studies have been reported by Pao, Sykes, and Cypel (1989). Our continuing research and development efforts are aimed at meeting monitoring needs by improving the quality of dietary information on the U.S. population.

Cognitive Research on the CSFII Questionnaire

The first of the recent methodological studies we describe here was conducted by the Center for Survey Methods Research of the U.S. Bureau of the Census (CSMR). The major objective of this research was to use cognitive interviewing techniques to improve the CSFII questionnaire through a better understanding of the thought processes used by respondents to answer questions. We wanted to learn how respondents understand the questions, formulate the answers in their minds, and then report their answers. If a difference was observed between what is intended by the question and what the respondents thought was intended by the question, changes could then be recommended.

This project was conducted in two stages. The first stage consisted of six interviews. The questionnaire was revised based on these interviews, and the modified questionnaire was then used in 11 interviews in the second stage. Subjects included military personnel, day care instructors, and high school and college students. Elderly individuals and young children were not selected as subjects. About half of the interviews were conducted at the cognitive laboratory at CSMR in Maryland. The remaining interviews were conducted in the subjects' homes and in a classroom at a local high school. Each interview took up to 2 hours to complete.

The cognitive interviews were conducted by a team of two interviewers. One interviewer was called the "nutrition interviewer" and had the responsibility of asking the survey questions as well as probing for adequate answers -- just as a regular field interviewer would. The second interviewer was called the "cognitive interviewer." This person had the responsibility of keeping the subject thinking aloud. This could mean the use of a hand gesture or a subtle comment to "keep talking." If the respondent used a phrase which was vague or unclear, the cognitive interviewer would follow-up with a probe for the meaning. Also, if a term was used in a survey question that might be open to different interpretations, the cognitive interviewer would ask the subject what he or she thought it meant.

The cognitive interviews showed that respondents remembered what they ate in very different ways. Some respondents listed meals first and then reported snacks. Others reported food chronologically. While some began at the beginning of the day and worked forward, others began at the end of the day and worked backwards. Most respondents recalled foods eaten by associating them with activities rather than with the time of day.

Based on findings from the cognitive interviews, CSMR made recommendations on the flow of the questions on food intake to focus more on what foods were eaten. Another recommendation was to have the respondent recall what he or she ate in several different ways.

Additional information on this research and the procedures eventually used in the 1994-96 CSFII will be provided in the Design and Operations Report currently in preparation (Cypel and Tippett, 1996).

<u>Improving Reporting of Food Intake Data by Children</u>

The second methodological study was conducted at the University of Maryland's Survey Research Center (SRC) in College Park. The objective of this study was to recommend modifications to questionnaire designs and interviewing strategies for 6- to 11-year-old children. These researchers felt that the CSFII Day One questionnaire's wording and structure were too complex for school-age children and that alternative interviewing strategies should be developed to aid children's recall processes. After conducting a few pretests, Center staff proposed and tested three alternatives to the reference protocol.

The first alternative protocol was based on a meal/nonmeal format in which children were asked what foods and beverages were consumed at each meal and between meals. The assumption was that the memory of foods one has eaten may be organized by regular meals. In the second alternative protocol, children were asked to recall foods and beverages by location. Interviewers first asked children where they consumed the foods and then what was consumed. The SRC researchers believed that reporting about what one did on the previous day may be a more natural and engaging task than trying to remember a list of foods eaten and may be a good trigger for remembering foods eaten. The third alternative was an open protocol. Children were free to use any means to recall items consumed without the possibly inhibiting task of answering a series of formal questions. The reference protocol was an abbreviated and reformatted version of the CSFII 1989-91 Day One questionnaire. The alternative protocols were compared to the reference protocol.

A total of 36 subjects was recruited through local day-care centers or summer programs and random selection by telephone. Children were then randomly assigned to one of the four protocols. The children, without the assistance of an adult, reported their intake during interviews conducted at SRC. The interviewers used several techniques in all of the protocols to obtain more complete information from the children.

All children, parents, and interviewers were debriefed to get their reactions to the protocols. Debriefing questions were asked about comprehension, areas of difficulty, and why certain foods were not reported.

The CSFII Day One or the reference protocol took the longest to complete--23 minutes; the mean time for the open protocol was the shortest--13 minutes. All of the alternative protocols yielded greater numbers of food items reported on average than the reference protocol, although the differences in the numbers of food items reported among all protocols were small. The results from this study provide a good start for continued research and field testing of methods of collecting food intake data from children.

Further Cognitive Research on the Intake Questionnaire

Following the University of Maryland study, we asked CSMR to conduct another round of cognitive research focusing on: 1) improving the reports by children; and 2) obtaining more complete reports of food intake by subjects of all ages. We also targeted a few points in the 1994 CSFII instruments and procedures that we thought might benefit from additional work.

In this study, most of the cognitive interviews were conducted in subjects' homes. This allowed for some validation of responses, especially on food label information. Children 6 to 11 years old answered for themselves and were assisted by a parent during the interview. In addition, parents were asked about why they thought their children answered as they did and about their perceptions of the accuracy of their children's responses. Based on their findings, CSMR recommended that the introduction to the 24-hour recall be modified to inform both the parent and the child that the task is a joint one and that they need to work together to provide the best information. They also recommended that the standardized introductory statement used with all respondents be modified to include a specific statement of the main objective of the survey to motivate more complete reporting.

We had asked CSMR to investigate whether or not respondents could provide more details on how foods were prepared, especially with regard to salt and fat. They recommended that such probes be asked only of respondents who had prepared the foods. On the other hand, they recommended getting more details from labels by adding a standardized probe in appropriate places, saying "Please check the label and tell me..."

Recommendations included some revisions to the questions on plain drinking water and to the list of sources of foods. The research by CSMR from this phase will serve as a resource for USDA staff working on future surveys.

Cognitive Testing of the Diet and Health Knowledge Survey (DHKS)

USDA nutritionists wanted to learn how respondents interpreted the 1994-96 DHKS questions and identified concerns with some of them. We were also interested in exploring whether a “don’t know” response option should be made explicit for some questions. The literature suggested that providing a “don’t know” response option reduces the random error that occurs when people are forced to guess and select one of the provided responses. We were also concerned that the lack of an explicit “don’t know” might increase the perception of the questionnaire as a test. We wanted to learn how respondents interpreted specific questions and key terms, such as “healthy” and “serving.” We also wanted to investigate the type of response options best suited to the DHKS.

After listening to taped interviews and considering USDA concerns, CSMR revised some questions and added some explicit “don’t know” response options. They also added an introductory statement explaining that "don't know" answers were acceptable. In phase I of the cognitive testing, ten interviews were conducted to test the explicit “don’t know” options and to determine how respondents comprehended the questions.

The researchers found that respondents answered “don’t know” when they did not understand terms, such as "saturated fat," and when they did not have the knowledge to answer a question, such as "Which has more fat, yogurt or sour cream?" CSMR, therefore, believed that allowing an explicit “don’t know” response was appropriate for knowledge questions; however, the “test-like” feel of the questionnaire was not markedly diminished as had been hoped.

In phase II, CSMR is investigating which of two types of response options are best suited to the DHKS--response categories or anchored scales. We expect to apply many of CSMR's recommendations as we revise the DHKS for future use.

Research on Portion Size Estimation Aids

Both USDA and the National Center for Health Statistics of the U.S. Department of Health and Human Services (NCHS) use measurement aids in their food consumption surveys to help respondents estimate portion sizes of foods they consumed. Other nutrition researchers have used a variety of measurement aids.

Despite the wide use of measurement aids, research is lacking on their reliability and validity (Cypel, Guenther, and Petot, 1996). There is limited information on the usability of specific aids by the general population and population subgroups, particularly in 24-hour dietary recalls. Information on cognitive processing is also lacking for portion size estimation. This cognitive processing requires further investigation because it may contribute to errors associated with portion size. Such research may provide clues as to how portion size estimation procedures and aids might be improved for use in 24-hour dietary recalls.

USDA is supporting collaborative research to study portion size estimation in dietary recalls through a Capacity Building Grant with Tennessee State University (TSU). Other collaborators in the development of this research proposal included Government agencies involved in dietary methodology research: the Western Human Nutrition Research Center of USDA, NCHS, and CSMR of the Bureau of the Census. A psychologist at Kansas State University (KSU) is also a collaborator.

The purpose of the study is to examine portion size estimation methods in 24-hour dietary recalls. The research is divided into three stages, each with a defined goal. In Stage 1, we are examining the cognitive processes involved in using portion size estimation aids in 24-hour dietary recalls. We are using cognitive interview techniques to examine the recall strategies used by respondents when making portion size judgments and how respondents use various types of portion size estimation aids when making judgments. In Stage 2, we will assess the accuracy with which these aids are used and will determine which aids seem most promising for future field testing. In Stage 3, we will evaluate accuracy of two methods of reporting size: the use of descriptive terms (such as small, medium, and large) versus the use of dimensions.

Research on Estimating Distributions of Usual Intakes in a Population

More than a decade ago, USDA commissioned the National Academy of Sciences (NAS) to investigate the question of how to assess the adequacy of nutrient intake for a population. We have been working cooperatively with researchers at Iowa State University (ISU) to implement the approach outlined in the NAS report (Subcommittee on Criteria for Dietary Evaluation, 1986). This research was presented at this conference a couple of years ago and is discussed only briefly here (Guenther, 1994).

The centerpiece of the approach is a measurement error model that treats the intake observed for any individual on any given day as the sum of that individual's true usual intake and a random "disturbance" or "measurement error" for that individual on that day. We favor this approach because we assume that an individual can more accurately recall and describe the types and amounts of foods eaten yesterday than the types and amounts of foods eaten over any longer period of time.

The method developed at ISU controls the day-to-day variability of nutrient intake. Consequently, it requires a minimum of 2 independent days of food intake information or 3 consecutive days for at least a subsample of individuals. The method also addresses the problems of skewed intake distributions and complex survey designs. Because normal distributions are not required, intake values that are extreme, but perhaps valid, need not be discarded. A technical paper by Nusser, Carriquiry, Dodd, and Fuller (1996) describes the method in detail.

The research first focused on distributions of usual nutrient intakes. The current research builds on the earlier work and extends it to the estimation of usual intake distributions for foods or food groups (Nusser, Fuller, and Guenther, 1996). This research has to solve the additional problem of the high fraction of zero intakes in the food intake data. The zeros come from people who never consume the food and from people who do consume the food but did not do so any of the surveyed days. The approach used involves modeling an individual's usual intake on days that the food is consumed multiplied by his or her probability of consuming the food on any given day. When there is a sizable correlation between the frequency of consumption and the amount consumed in one day, a more complex modeling approach will be required.

Conclusion

A great deal of preliminary work is needed to develop a dietary intake survey questionnaire. Additional evaluation and field testing of research recommendations will be needed.

The outcomes of these collaborative efforts will contribute to improvements in the development of future USDA food consumption surveys. We also expect benefits for the Nutrition Monitoring and Related Research Program in general through (1) coordinated use of resources, (2) increased survey comparability, and (3) enhanced data quality. As nutrition researchers, we can all benefit from a better understanding of the cognitive processes our subjects use when responding to our dietary assessment questionnaires as well as new statistical approaches for using the data more efficiently and effectively.

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References

Cypel, Y. S., Guenther, P. M., and Petot, G. J. (1996) Validity of portion size measurement aids--a review. Journal of the American Dietetic Association (in press).

Cypel, Y. S., and Tippett, K. S., eds. (1996) Design and Operation: The Continuing Survey of Food Intakes by Individuals and the Diet and Health Knowledge Survey, 1994-96, NFS Report No. 96-1, U.S. Department of Agriculture, Agricultural Research Service (in preparation).

Dept. of Health and Human Services and Dept. of Agriculture (1993) Ten-Year Comprehensive Plan for the National Nutrition Monitoring and Related Research Program. Federal Register 58(111): 32769-32770.

Guenther, P. M. (1994) Adjusting for intra-individual variability when estimating nutrient intakes. In: Hoover, L. W., and Perloff, B. P. (eds.) 19th National Nutrient Databank Conference Proceedings, pp. 107-109

Nusser, S. M., Carriquiry, A. L., Dodd, K. W., and Fuller, W. A. (1996) A semiparametric transformation approach to estimating usual daily intake distributions. Journal of the American Statistical Association (in press).

Nusser, S. M., Fuller, W. A., and Guenther, P. M. (1996) Estimating usual dietary intake distributions: adjusting for measurement error and nonnormality in 24-hour food intake data. In: Survey Measurement and Process Quality (Lyberg, L., Biemer, P., Collins, M., De Leeuw, E., Dippo, C., Schwarz, N., and Trewin, D., eds.), Wiley and Sons, New York, NY (in press).

Pao, E. M., Sykes, K. E., and Cypel, Y. S. (1989) USDA Methodological Research for Large-Scale Dietary Intake Surveys, 1975-88. Home Economics Research Report No. 49. U.S. Department of Agriculture, Human Nutrition Information Service.

Subcommittee on Criteria for Dietary Evaluation (1986) Nutrient Adequacy: Assessment Using Food Consumption Surveys. National Academy Press, Washington, DC.

CONTINUING SURVEY OF FOOD INTAKE BY INDIVIDUALS (CSFII) METHODOLOGY DATA COLLECTION: *TRAINING AND MONITORING INTERVIEWERS*

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ABSTRACT

A variety of methods used to train and monitor the field interviewers contributed to the successful collection of dietary intakes for the CSFII 1994-96. Westat, Inc. Which conducted the survey under contract to the USDA, recruited and trained 82 interviewers and 5 supervisors in a 7-day in-person session in January, 1994. The data collection staff were recruited based on two principles. First, achieving the response rates required by the contract was dependent on the skills of interviewers experienced in gaining respondent cooperation and maintaining rapport over several interviews. Second, if the survey documents were standardized and the prospective interviewers were extensively trained on how to use the materials correctly, lay interviewers could collect high quality data. In particular, a concerted effort was made to standardize the Food Instruction Booklet (FIB), an interviewer tool consisting of detailed probes for the interviewers to conduct the Intake interview. Westat's basic approach to training was to use a variety of techniques to help the interviewers learn and to keep them actively involved in the training. Some of these techniques included a home study, a demonstration interview, interactive lectures, exercises, role plays, mock interviews, practice interviews with paid respondents, and a final review to answer questions and reiterate complex concepts. Monitoring the quality of the interviewers work is an on going primary responsibility for Westat, Inc. Extensive feedback was provided to interviewers during training the throughout the data collection period. Regional supervisors reviewed practice interviews, listened to taped interviews, conducted in-field observations of the interviewers at work, and performed validation procedures to confirm that interviews had been conducted. In addition, an extensive quality review was completed on the questionnaires when they were receipted in the home office and interviewers received feedback on the results of this review on a weekly basis.

Westat, Inc. serves as the contractor for the USDA Continuing Survey of Food Intakes by Individuals, 1994 - 96. As part of our contract we trained the interviewers to collect the dietary data and are continually monitoring the data collection effort. Two principles underscored the recruitment of data collection staff for the CSFII: lay interviewers rather than nutritionists or dietitians would be hired; and Westat's files of 4,000 supervisors and interviewers who work directly for Westat would serve as the primary recruiting resource.

There were also specific qualifications we were looking for. First, and foremost, we wanted interviewers with extensive interviewing experience, particularly experience on large, national surveys. In person interviewing is not for the timid. You never know what's going to happen when you knock on that door. For instance, a Los Angeles interviewer rang the doorbell, but got no response. Since it was a nice day, she thought the family might be in the back yard, but knew better than to charge back there. So, she cautiously walked down the side of the house calling "hello." She was pleasantly surprised when the "hello" was returned. She introduced herself as she walked around back. Imagine her surprise when she found herself talking to a parrot! And the adventures don't stop at the door. Two of our interviewers have had experiences with reptiles roaming around the floor and table as they completed the Intake.

A second important criterion was the ability to gain respondent cooperation and maintain rapport. In addition we looked for interviewers who had excellent reading and math skills, experience in buying, planning, and preparing food, and basic knowledge of food measurement and preparation. A nutrition background was not necessarily a criterion used to recruit interviewers. Rather, we believed that if the survey documents were standardized, and we extensively trained the interviewers on how to use the materials correctly, lay interviewers could collect high quality data just as they do in other surveys conducted by Westat and ARS. In particular, we made a concerted effort to standardize the Intake Questionnaires and Food Instruction Booklet.

Interviewer Qualifications

- Interviewing experience
- Skills to gain respondent cooperation
- Excellent reading and math skills
- Experience in buying, planning, and preparing food
- Basic knowledge of food measurement and preparation

Measures Taken to Collect High Quality Data

- Standardized all data collection documents
- Extensively trained on dietary data collection to ensure materials were used correctly

The Food Instruction Booklet, commonly known as the "FIB", is an interviewer tool consisting of detailed probes for the interviewers to use during the Intake interview. A version of the FIB has been used by USDA to collect data in individual intake surveys since the 1977-78 Nationwide Food Consumption Survey. Interviewers use the FIB to guide respondents in providing complete information about foods and quantities consumed.

The FIB is a unique and valuable tool in food consumption survey research because it provides interviewers with specific probes for reported foods. It is written to a level of specificity that is directly linked to food descriptions and quantities in the USDA food coding database. In addition, the FIB specifies exactly which probes should be asked for a particular food. The quality of the data collected by the interviewers can be closely monitored by comparing the data collected on the Intake Questionnaire, with the FIB. Specific feedback on the quality of the data they are collecting can be provided to the interviewers.

Several major revisions were made to the FIB for the CSFII 1994-96 to collect more complete and standardized data. The revisions included increasing the food specificity by expanding the number of food categories from 12 to 16 and making the document more user-friendly by adding a Table of Contents, that included examples of recording conventions, and a list of acceptable abbreviations. In addition, the layout was revised. Icons were included that served as a visual cue to interviewers to collect home recipes, sandwiches, salt, fat, and additions. These icons are reminders to the interviewers that more specific coding guidelines can be found in the General Instructions.

When possible the food probes were standardized across categories. The probe TYPE at the top of the page, and ADDITIONS at the bottom can be found in every food category where appropriate. The probes for *If Frozen, If Ready to Eat, If Commercially Canned,* and *If Home Recipe* are specific to the Spaghetti category shown in this slide as well as a few other food categories. Skip patterns were built into the format to move the interviewers through the FIB quickly. For example, in this category, if a respondent reported consuming a commercially-canned spaghetti product, the interviewer would go to "IF COMMERCIALLY CANNED" and ask the Brand and whether it came with Meat, and then skip to ADDITIONS.

Food Instruction Booklet (FIB)

- Specific probes for reported foods
- Directly linked to food descriptions and quantities in USDA food coding database
- Allows quality of data to be closely monitored

Interviewer Training

- 82 interviewers
- 7 day in-person training session
- Trainees divided into 5 small learning groups
- Spanish materials training for 10 bilingual interviewers

Supervisors who served as trainers were trained in an 8-day session held prior to interviewer training. During this trainer training, emphasis was placed on controlling the group since interviewers are notoriously extroverted and eager to jump ahead. Interviewer training was conducted in Dallas, Texas in January 1994. Eighty-two interviewers were trained in a 7 day in-person session. To facilitate the learning process, the interviewers were divided into 5 groups called "communities," averaging 16 interviewers each. At the conclusion of the 7-day session, 10 bilingual interviewers received an additional day of training on the Spanish language questionnaires and materials.

Training Approach

- Experienced trainers
- Trainee involvement and participation maximized
- Thoroughly scripted training materials
- Scripts built in complexity

Training Techniques

- Home study
- Demonstration interview
- Interactive lectures
- Mock interviews
- Role plays
- Paid respondents
- Food and volumetric displays
- Exercises
- Plenary review

Westat's basic approach to the training was to use experienced trainers who were skilled in presenting before a group. Trainee involvement and participation were maximized to provide ample opportunity for supervisory staff to observe and evaluate trainee performance.

An 1100 page training manual that contained scripted materials was developed to ensure standardization among trainers. The scripts were designed to provide situations that the interviewers were likely to encounter. As the training progressed the training scripts built in complexity.

Westat made every attempt to create an atmosphere in the training rooms that was conducive to learning -- friendly, open, and professional. There was an expectation that the trainees would be able to handle the task ahead, and that they possessed the skills necessary to complete a complex interview. We tried to convey the attitude that the survey was important and so was their role. The importance of collecting information correctly was emphasized.

A variety of techniques held the interviewers' attention and helped them to remember the lessons. These techniques included a home study, a demonstration interview, interactive lectures, mock interviews, role plays, practice interviews with paid respondents, food and volumetric displays, exercises, and a plenary review at the end of training.

Home Study

- Procedural manual, FIB, and exercises were mailed to interviewers prior to training
- Interviewers were required to complete exercises and bring them to training for supervisory review and feedback

Demonstration Interview

- One trainer played the part of the interviewer and the other the part of the respondent
- Trainers used all the tools needed to conduct an Intake interview

CSFII project specific training began with a home study packet sent to each trainee prior to training. The packet included the field procedures section of the interviewer manual, the FIB, and a set of exercises. The interviewers were required to read the material and complete the exercises, and then bring them to training for review by supervisory staff. Prior to the conclusion of training, the graded exercises were returned to the trainees and feedback was provided. At the beginning of Intake training, the measuring guides were handed out to the trainees. They were excited to get these because during the homestudy they were anxious about how they were going to collect the quantifying information. They were trained that the cups and spoons would be used for volume of foods; the ruler for length, width, and the height of foods; and the sticks for the thickness of meat poultry, and cheese. An interviewer reported that after laying out the measuring cups for a female respondent her husband came into the room and exclaimed, "these are the smallest cooking pots I've ever seen."

A demonstration interview was presented to introduce the interviewers to the correct way to administer an Intake. One trainer played the part of the interviewer, and another the part of the respondent. The trainer playing the part of the interviewer used all the tools needed to conduct the interview, including the measuring guides, the FIB, handcards, and "real" food products. The demonstration provided trainees with a general sense of the flow of the interview.

Another technique Westat employed was to present the information in an interactive lecture format, as simply and logically as possible. The lectures presented the basic concepts. A trainee would act the role of the interviewer while the trainer played the respondent. In this way the trainer would go through an interview, frequently stopping to emphasize an instruction, procedure, or question specification, and all the trainees would have a chance to participate at some point.

For example, the trainer stopped the scripted lecture to demonstrate the correct way to use the 2-cup measure. The 2-cup measure is used by the interviewer to measure an amount consumed from the respondent's own cup or bowl which is usually obtained from the kitchen cupboard. In this instance, the trainer explains that the trainee playing the part of the interviewer should have the respondent fill his cup with water to the level consumed. Now the trainer demonstrates that the interviewer should pour the water in the respondent's cup into the 2-cup measure and then documents in the Intake questionnaire the amount consumed.

Interactive Lectures	Mock Interviews
⊳ Presented basic concepts ⊳ Trainees acted the role of interviewer while trainer played the respondent ⊳ Trainer frequently stopped to emphasize instructions, procedures, or question specifications	⊳ More complex scripts ⊳ More hands-on practice using food labels, packages, and measuring guides ⊳ Trainers closely monitored interviewer performance

Written exercises were administered to reinforce complex concepts in the interactive lecture sessions. The exercises were used to practice the concepts and to give the trainees an opportunity to practice on their own. As an example, the procedure for collecting descriptive information about sandwiches is relatively complex and requires practice. A significant amount of time was devoted to training on this concept.

More complex scripts were written for mock interviews. A typical interviewing setting was created in the training room and the trainees were asked, in turn, to play the part of the interviewer. For the mock interviews the trainees were required to use measuring guides, food labels, and packages to conduct the interview. This allowed the trainers to closely monitor an interviewer's performance. As realistic as we try to make the mock interviews, there is no way we can anticipate what the interviewers will encounter. During the training, a variety of food items and different types of packages were arranged on a table at the front of the room.

They were used by the trainer throughout the training to provide the interviewers with a realistic experience of the process of asking respondents to show them the food products reported as consumed. For example, a respondent may report consuming fat-free peanuts, but when he provides the requested container, the interviewer determines from the package that he actually consumed low-fat peanuts.

Cups, glasses, and bowls were also displayed in the training room. This display served to remind the trainees that cups, glasses, and bowls come in many different sizes and when interviewing they must follow the FIB procedures to get accurate quantity information. A cup of coffee served in a cup may not be the same amount of coffee served in a mug. The trainees were required to use these utensils to collect volumetric data during training.

Scripted role plays were developed to give the trainees practice in completing an entire interview. The trainees were paired together by the field supervisors, who generally placed a strong interviewer with a weaker one. The weaker interviewer played the respondent in the first script. Westat's experience has shown that pairing in this way allows the less proficient interviewer to learn from the stronger one.

Using a script, one trainee played the part of the respondent, while the other played the part of the interviewer. When they reversed roles, one of the trainees became an actual respondent and provided her intake for the past 24 hours. This exercise allayed the trainees' fears that the respondent would not be able to recall all the food they had consumed the day before the interview. The training staff observed the interviews and corrected and answered questions as needed.

Role Plays	Paid Respondents
One trainee played the part of the respondent using a script and the other played the part of the interviewer Training staff observed and corrected as needed	"Live respondents" Unscripted Each interviewer conducted a complete interview

To culminate three days of Intake training, a paid respondent's practice session was conducted. This provided the trainees an opportunity to interview "live respondents" whose recall data was not scripted. Persons were recruited from the local population and paid a nominal incentive for participation. They were unaware of the nature of the interview when they were recruited.

The trainees were arranged at long tables in groups of four. Over a period of 4 hours, four live respondents were interviewed by the trainees in each group. Each trainee in the group conducted one interview while the other three trainees recorded the information. The "live respondents" interviewed by each group included two adults, one child between 6 and 11 years old, and a proxy for a child under 6 years old.

At the beginning of training the interviewers were concerned about the ability of children between 6 and 11 years to provide adequate dietary information. However, after this experience they were convinced that children would take this task very seriously and could recall their intakes in a thoughtful and accurate manner. This experience was invaluable because it was an unscripted, realistic situation and, by all accounts, was a very beneficial practice for the interviewers.

Finally, Westat conducted a plenary session on the last day of training. At this time all previously unanswered questions collected during the preceding days were addressed. All decisions made by ARS and/or Westat were presented to the interviewers, all remaining questions from the floor were answered, and any particularly complex concepts or procedures were reviewed. For example, we demonstrated how to collect information about sandwiches by putting together an actual sandwich in front of the whole group. We followed the FIB probes for sandwiches step-by-step starting with the bread. We added the spread, the meat, cheese, lettuce, and tomato. This brought the probes "to life" for the interviewers.

Once data collection was underway, monitoring the quality of the interviewers' work became a primary responsibility for Westat. Our experience has shown that ample feedback to the interviewers during training and as they begin interviewing helps the interviewers produce high quality data. In addition, monitoring and retraining, when necessary, throughout the data collection period reinforces concepts and procedures necessary to maintain the collection of high quality data.

Plenary Review

- Reviewed decisions made by ARS
- Answered remaining questions
- Provided a final review of particularly complex concepts or procedures.

Monitoring

- During training
- Prior to beginning the interviewing assignment
- During data collection

As mentioned earlier, during in-person training, the trainees completed exercises specific to each topic. The exercises were reviewed by the trainers and feedback was provided. In addition, feedback on the role plays and paid respondent practice was given to each trainee.

Immediately after training the interviewers were required to complete a scripted interview by telephone with their field supervisor, and complete two practice interviews with neighbors or family members prior to starting their interviewing assignment. The supervisors provided feedback to the interviewers and retraining, if necessary.

Monitoring During Training

- Exercises specific to each topic
- Feedback on role plays and paid respondent practice

Monitoring Prior to Beginning the Interviewing Assignment

- Mock scripted interviews
- Practice interviews

Westat has put in place a number of measures to monitor and retrain the interviewers during the data collection process. Prior to coding, the food coders perform a quality review of every Intake questionnaire received at Westat, and document errors and omissions. The field director reviews the Quality Review forms and forwards them to the field supervisors. This feedback is provided by the field supervisors during their weekly report calls with the interviewers.

Validation interviews are conducted to verify that an interview had been conducted at the assigned address according to survey procedures. Tape recorded interviews are listened to by the supervisors, the field director, and the staff nutritionist to monitor the quality of each interviewer’s work. Each interviewer is evaluated prior to forwarding the tapes to ARS. The evaluation focuses on ensuring the questions and food probes are asked as they were trained. Feedback and retraining, as needed, is provided to the interviewer.

In-person observations are conducted on an ongoing basis. Westat's field director, field supervisors, and ARS staff make in-person observations of interviewers at work. Observation forms are completed for each observation conducted and the results are shared with the interviewers. Training quizzes are developed and conducted periodically for continuing education. These quizzes are used to assess the interviewers' understanding of complex areas of the questionnaires that are sources of common interviewer errors. Training quiz topics specific to the Intake include recording sandwich information, quantifying foods with dimensions, and recording foods that are additions to foods with additions. A favorite question on the additions quiz is how do you record chocolate syrup added to milk which was then added to cereal? This is a favorite kid food! The supervisors provide retraining on the questions that the interviewers handle incorrectly in the quizzes.

Data Collection: Monitoring the Quality of Data Collected

- Quality review form is completed for each Intake
- Validation interview
- Taped interviews
- In-person observations
- Training quizzes

During Data Collection: Vehicles Used to Provide Feedback and Retrain

- Supervisors' weekly telephone report calls
- E-Mail for situations requiring immediate resolution
- Field staff memos
- Quarterly newsletters

Several vehicles are used to provide feedback and retraining. The primary vehicle is the supervisors' weekly telephone report calls to the interviewers. The interviewers have been provided with laptop computers loaded with the field management system software developed for CSFII by Westat. The system provides supervisors with productivity data which becomes the basis for the weekly call between the supervisor and interviewer. These weekly conferences also offer the supervisors an opportunity to provide feedback and retraining to the interviewers.

The computers have also been loaded with an E-Mail utility program. E-Mail is used for situations requiring immediate resolution. In addition, training quizzes are often administered via E-Mail. Periodic field staff memos are sent by U.S. mail or occasionally by E-Mail to inform or update interviewers on field procedures.

Westat also distributes a colorful, sometimes humorous newsletter "Food for Thought" which contains helpful advice, discusses common problems, and includes tips and interesting stories from the field. In addition, the ARS column of the newsletter which is titled "And Now a Word From Our Sponsor," keeps the interviewers informed on survey results.

Finally, Westat conducts an annual debriefing and refresher training to gain input on the interviewing experience from the interviewers and to retrain concepts as needed. In anticipation of the in-person debriefing, interviewers receive a questionnaire to capture their reactions to and experiences with a variety of survey materials and procedures. Included are questions about working with the FIB and measuring guides, obtaining label information, conducting interviews with child respondents, and related issues. All suggestions are taken into consideration for revising materials and procedures for the following survey year.

Annual Debriefing and Refresher Training

- Debriefing questionnaire
- In-person debriefing
- Refresher training

In conclusion, conducting the 24-hour recall Intake interview for CSFII 1994 - 96 is a very detailed and complicated process. A carefully constructed, well organized, and thorough training and monitoring program for the interviewers has played an essential part in the collection of high quality data.

CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) METHODOLOGY: TRANSLATING FOOD INTAKES INTO DATA

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ABSTRACT

The method used by the Agricultural Research Service to process nearly 11,000 24-hour dietary recalls collected in the first year of USDA's Continuing Survey of Food intakes by Individuals 1994-96 (CSFII) contributed to the release of data about eight months after final data receipt from the contractor. This method involved several new facets, one of which was the use of a computer-assisted food coding system, Survey net, that made the survey food coding data base, the recipe data base, and the survey nutrient data base accessible with a keystroke. Other important aspects included the electronic transmission of the data, the approach taken to code new foods and mixtures that were not in the data base, the use of coding guidelines, the capability to modify survey recipes, and the updating of the data bases in Survey Net. All of these procedures increased the flexibility of the food coding process and were also responsible for the efficient translation of descriptions of foods and quantities into data.

USDA's Continuing Survey of Food Intakes by Individuals (CSFII) measures the kinds and amounts of foods eaten by Americans. Data from this survey are used to address a variety of economic, nutrition, and food safety issues. Information about foods people eat is collected through a series of open-ended probes which ask for details about the foods, their preparation, their ingredients, and the amounts consumed. These details must then be translated into data that are structured and easily manipulated by computer programs to make them effective for research and analysis.

BACKGROUND

In the CSFII, the food-to-data translation process preserves survey respondents' descriptions of foods and measures as closely as possible using a hierarchical food coding scheme established and maintained by USDA for over 30 years. These codes are used to estimate gram weights of the food portions consumed, to calculate nutrient amounts contributed by each portion, and to classify foods into food groups.

Although the food-to-data translation process changed over the years to take advantage of new data processing technology, it remained a significant bottleneck until the current survey began in 1994. Between the previous survey, which ended in 1992, and the 1994-96 CSFII, USDA developed new coding and related procedures to increase the efficiency of food survey data processing. As a result of this effort the food-to-data translation for the 1994-96 CSFII was very successful, contributing to the release of the data in record time.

Several significant factors led to the success of the food coding process. One factor was the ability to search the survey food coding database quickly and easily for foods. Once a food description was located, information about the food--the recipe, the nutrients, weights and measures--was accessed instantaneously. Other factors included increased flexibility of the food coding system within a structure comparable to past surveys; the development of new and quicker procedures for handling "unknowns;" the weekly electronic data transmissions from the contractor; market checks conducted by field interviewers; and frequent food coding database updates. One aspect of the process which remained unchanged was USDA's use of a team approach to solve difficult coding issues and to decide when new foods were added to the database. This helped ensure consistency in the food coding database because decisions were made with a shared philosophy.

SURVEY NET

In 1990, USDA entered into a cooperative agreement with the University of Texas to explore and develop new procedures for coding and processing survey data. The University already had considerable experience using the survey food and nutrient databases, having begun to use them for their own research in 1986. Not only had they already prepared computer programs duplicating the recipe calculation methodology, but they also had developed routines for easily modifying ingredients within the survey recipes to provide nutrient calculations that were more precise for specific survey respondents. One of the most significant outcomes from this cooperative agreement was the development of Survey Net, a computer-assisted food coding and data management system, that incorporated features related to database searching capabilities, the handling of unknowns, and overall improvement of food coding and editing. For example, edit checks in Survey Net allowed many coding and reporting errors to be caught and corrected at the point of data entry. Survey Net operated on a multi-user computer network accessing a set of central databases. Survey Net was used by coders at Westat, Inc, the 1994-95 CSFII contractor, in Rockville, MD to enter food data, by supervisors to review and approve the entries, and by USDA to review the data and resolve any coding issues.

Survey Net used three complex databases--the food coding database, the recipe database, and the survey nutrient database. The food coding database contained food names and descriptions for over 7,000 food codes, as well as typical household food measures (such as cup, tablespoon, slice) and gram weights appropriate to those measures. The pre-defined recipe database contained ingredients and amounts for food mixtures for the purpose of calculating the nutritional content of foods. The USDA Nutrient Data Laboratory supplied the nutrient values for ingredients in foods and nutrient profiles for the survey codes were calculated from the individual ingredients in the recipes and their nutrient values. The Food Coding scheme used for CSFII evolved from a set of codes originally developed for a Nationwide Food Consumption Survey conducted in 1965 and used in several USDA surveys over the past three decades. Foods were categorized into 9 major food categories and over 200 subcategories. Each food has been assigned an 8-digit numeric code with the 1st digit representing one of the 9 major groups and the first 3 digits representing the subgroups. New foods that were reported in the survey were added within the structure of this coding scheme.

CODING FOODS

To code a food, all items that were possible matches with a sample person's food description were located and reviewed to select the closest match, or to determine that the food was missing from the database. The Food Search feature minimized the time required to locate and select food codes. A "search term" of either partial or complete words was entered and Survey Net displayed all the food descriptions in the food coding database that contain matching terms. Up to 10 different terms could be entered in any order. Single word searches, such as “milk,” were convenient when coders were not sure how a food was described in the database. Multiple search terms, such as “milk 2%,” were used to narrow the search eliminating descriptions that were not relevant. An average search, which involves searching over 70,000 words, took less than one second.

Many foods were consumed as mixtures of individual foods, and selecting codes for mixtures was especially problematic because of the many different variations of recipes and products. Since food mixtures in the food coding database have a pre-defined recipe in the recipe database, recipes were accessed to aid in making the closest selection during the food search. For example, if a respondent reported eating quick cooking cream of wheat made with 2% milk, the coder would first check the pre-defined recipe and find that the cereal was made with water and, therefore, was not a perfect match. However, recipes were modified to match more closely the food eaten by sample persons. In this case, the coder replaced the water with 2% milk. Modified recipes were numbered automatically by the program and saved in a central data file that was accessed by all coders. The modification feature was one of the most important new features included in Survey Net. It increased the flexibility of the existing food classification system, providing the ability to be more specific about the foods people consumed without increasing the size and maintenance requirements of the food coding database. It also provided a more accurate interpretation about the nutritional value of the foods consumed. For example, a cup of cream of wheat made with 2% milk contains more than twice the calories and more than thirteen times the fat than when made with water.

Another feature which enhanced the flexibility of the food code structure was the ability to link foods together which were eaten in combination, such as foods combined to make a unique sandwich. The number of types of combinations was increased since previous surveys. The "combination code" identified when specific foods were consumed together as one food item and indicated the type of combination, e.g. sandwich. The individual foods within the combination were coded with their own separate food codes and amounts. This feature has provided useful information for studying food habits.

UNKNOWNS

One of the most time consuming aspects of coding and editing food consumption data over the years has been dealing with "unknowns"--foods or measures which were new and did not exist in the database, or foods or measures that could not be matched exactly to the database. This occurred frequently because new foods are continually entering the market, new package sizes of existing foods are frequently introduced, and foods are always being combined in new and different ways. Even though extensive technical databases on foods and portion size weights was maintained, many items were still reported which could not be matched with existing entries.

The processing of food data in previous surveys required extensive record keeping of food coding questions and answers. Each description of an uncodable food was written up on a paper form, a photocopy was made of the respondent’s recorded intake page, and then both the form and the photocopy were sent to USDA. Processing of an intake stopped until an answer was received. Food coding specialists at USDA researched the food, made decisions on how it should be coded, and returned the answered form to the contractor. This process sometimes took several weeks. In the meantime, a new food on the market might be reported again several times before the answer was received by to the contractor. A special feature of Survey Net, the Unknown Foods File, finally eliminated this burdensome paper request trail. The Unknown Foods File was searched and updated by all coders. When a new or unusual food was encountered for the first time, a coder entered a description of the food in the Unknown Foods File. Each entry was automatically assigned a number which served temporarily as a food code. Until USDA described how an unknown was to be handled, subsequent encounters of the food were selected from the Unknown Foods File and the temporary food code placed in the output record.

The food intake data coded at Westat was transmitted electronically to USDA weekly. The weekly transmission was used to generate a list of the new items coders added to the Unknown Foods File. It included the household identification number and the interviewer’s initials who collected the information. This list was used to request market checks for additional information on certain unknowns. Interviewers who collected the information were asked to conduct the market checks. For the first year, about 185 market checks were requested from field interviewers who then purchased the food items and sent the labels to USDA within two weeks. Information on the label such as nutrient content or nutrient claims, the ingredient list, and the package and item weight assisted in decisions on handling unknowns. To resolve unknowns, USDA either used existing survey food codes by incorporating additional information into the food code's description, such as a brand name, or by adding new food codes to the food code database.

During the course of the 1994 survey, over 152,000 foods were coded and about 4,500 unknown foods were sent to USDA and resolved. There were two major categories of unknowns--food unknowns and amount unknowns. If the description provided by the sample person did not entirely match the survey food code description, if the sample person provided incomplete or conflicting information, or if a well-known brand was not listed in the food coding database, the food item was sent to USDA as an unknown. The expansion of the market place with new or modified foods since the previous survey, CSFII 1989-91, contributed a large number of unknowns. Some revisions to the wording of codes were required to accommodate computerized word searches for the food coding database. For example, search terms such as “diet” were added to sodas that were previously described as “sugar-free” and “coke” was added to “soft drink, cola type.” The number of unknowns in the next survey year, 1995, was 2891--one-third less than 1994. It is believed this decrease was primarily attributable to the updates to the database that clarified code descriptions and that added new market products introduced since the previous survey. Also, with a year's experience, Westat coders were more knowledgeable about the database and more skilled in conducting word searches for appropriate codes.

RESOLVING UNKNOWNS

A team approach was used to provide resolutions for unknown foods. Food coding specialists with a background in home economics or nutrition worked independently on different sets of unknowns. Various available resources were used when proposing coding options--label information from market checks, food encyclopedias, recipe books, manufacturers, restaurant and grocery chain managers, and routine consultation with the staff of the Nutrient Data Laboratory of USDA. After independently researching unknowns in about 30 intake questionnaires, three specialists met to determine the best solutions to the most difficult issues. Survey Net was used to search the databases, resolve unknowns and edit the intake records. Resolving problems with a team proved to be effective and interesting, but it was also an effort because teamwork required members:

- to listen to others
- to consider various opinions and to compromise
- to evaluate the pros and cons of proposed answers
- to use common sense
- to accept the decisions of the team
- to realize the best answer is the goal.

Individuals were rewarded with the personal satisfaction of resolving problems as a team, and the opportunity to learn about foods and food habits. Above all, however, the team approach ensured consistency in how coding problems were resolved and in which foods were added to the database. This consistency ensured that the survey data can be used for meaningful analytical research.

During team discussions certain questions, such as "Why was this food sent as an unknown?,” helped the team make decisions. If the food was in the food coding database but not selected, the team tried to determine if the coder misunderstood the database or perhaps needed additional guidance on appropriate search terms or survey code descriptions. In fact, comments entered by food coders in the notepad--a pop-up window in Survey Net--were the basis for many clarifications in the wording of survey codes. Other questions asked were: "Is this a new food and if so, is it produced by a manufacturer with a large distribution?" "How does the reported food compare to the food description of an existing survey food code?" "How much of the food was eaten by each household member?" "Was it a major part of the diet?" "Who reported it?" Small quantities, such as a tablespoon or so, consumed of an unknown were not considered as important as larger quantities and thus not as much time was spent on them. However, a food which was a major contributor to the days intake--such as infant formula fed to a baby--received serious consideration. Foods produced by a manufacturer with country-wide distribution were likely to be reported again and were incorporated in the database. Finally the following questions were asked--"Does our resolution retain the identity of the food, match the ingredients, and also have a reasonable nutrient match? What pieces of information will be lost or saved with each proposed answer?"

Unknowns were resolved in basically four ways:

1. With one existing survey code. This was the resolution for about 70 percent of the unknowns. In these cases information, such as brand name, was added to the food description in the food coding database.
2. With more than one existing survey code. In these cases the foods were tied together by a combination code to indicate that the food was eaten as a single item such as a salad, a sandwich, a mixture, an addition to a beverage or cereal, etc. About 18 percent of unknowns were handled in this manner.
3. With recipe modifications. About 7 percent of unknowns were resolved using recipe modifications.
4. With the creation of new codes for items that did not fit in the database. This occurred for 4 percent of the unknowns.

NEW CODES

New codes were created when: 1) no code existed for a food similar to the food reported; 2) sizable amounts of nutrients were present in the food or the food was modified to have reduced amounts of certain nutrients; 3) the food was likely to be reported again; or 4) the form or type of food was of interest to researchers. Among the nine major food groups, more codes were added to the grain products and mixtures group than to other food groups. Vegetables, meat mixtures and milk products followed grain products. A special effort was made to incorporate ethnic foods and those foods modified to be lower in fat, sodium, or sugar in the food coding database.

Good management of resources required a balance be maintained between the amount of employee time spent in efforts to resolve the unknown with the result of that effort. Sometimes, this meant that procedures changed. For example, at the beginning of the survey, the entire team of five members plus the supervisor met together for all resolution discussions, but this took too much time. Later, after team members were familiar with the problem-solving approach, discussions with two team members plus the supervisor were held. The supervisor attended all meetings and was responsible for providing a summary of the review to Westat as feedback to their coders.

UNKNOWN AMOUNTS

The quantification of amounts of foods eaten and matching those amounts to the database were also important. Portion size estimation guides--standard measuring cups, measuring spoons, a ruler, thickness sticks--were used by sample persons to estimate quantities of foods they ate. A one-pint measuring cup was used to actually measure the volume of soup and cereal bowls, juice and milk glasses, and coffee mugs used by the sample person. An advantage of conducting the interview in the kitchen was the proximity of eating utensils and food labels. There were about 32,000 gram weights in the database linked to measure descriptions (cup, slice, bar, small/medium/large item) associated with specific foods. These weights were based on information from manufacturers and food labels, reference books, contracts with food laboratories, food associations, calculations, similar foods, or actual weighings at ARS. Foods continued to come out in new sizes--bite-size cookies, snack size puddings, and king-size candy bars--that needed to be added to the database. Unknown weights were entered into Survey Net and transmitted to USDA where they were resolved along with the food unknowns.

These amount measures and weights worked well most of the time. However, sometimes a sample person did not recall the amount of a food eaten or the quantity given was incomplete or ambiguous. When this occurred, a measure called "Quantity Not Specified," or QNS, was used for the amount eaten. The development of the QNS measure, with a corresponding gram weight designation, was begun at USDA prior to the 1977-78 Nationwide Food Consumption Survey. In the process of establishing QNS measures and weights for typical foods, a team reviewed food service manuals, actual consumption data, marketing data, USDA references such as Handbook 8 and Handbook 456, dietary guidance recommendations and the size of foods in the market place. The goal in the survey was to use information provided by the sample person first and only use QNS as a last resort. Well-trained interviewers and conscientious sample persons have helped limit the use of QNS. In CSFII 1994, QNS measures were used for about 1.7% of all foods reported. The five foods in 1994 with the most instances of QNS were mayonnaise, mustard, coffee, frozen French fries, and mayo-type salad dressing. Three of these foods--mayonnaise, mustard, and mayo-type dressing (such as Miracle Whip) were spread on foods which make them difficult to quantify. Coffee may be consumed frequently throughout the day, perhaps making it difficult to recall the quantity for each occasion. Reported consumption of foods will be compared to QNS amounts and adjustments made to QNS values in the future, if necessary.

CONCLUSION

The translation of food intake information into data that can be used to address various economic, nutrition, and food safety issues is a critical part of food survey processing. Dedicated and hard-working staff at USDA and Westat, along with applications of new technology, improved the efficiency of this operation for the 1994-96 CSFII. A major component of this operation was Survey Net, a custom-built food coding and data management system. Survey Net features included access to centralized food databases, efficient search capabilities, recipe modifications, coding of foods eaten in combination, the ability for coders to record details about unknown foods and amounts quickly, and built-in editing routines. At USDA, the team approach to resolving food coding issues and maintaining food databases established over 30 years ago was retained to ensure consistency within CSFII and comparability to past surveys.

Paper P6-1	***Proximate Methods and Modes of Expression: Variability as a Harmonization Issue*** *Barbara Burlingame, New Zealand Institute for Crop & Food Research*

PROXIMATE METHODS AND MODES OF EXPRESSION: VARIABILITY AS A HARMONIZATION ISSUE

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ABSTRACT

Large numbers of methods of analysis and conventions for expressing food components have been developed for measuring and reporting ostensibly the same or similar nutritional entities. However, many of these methods are known to produce results that are not comparable. These incompatibilities frequently show up with some of the most commonly presented nutrients such as protein, fat, carbohydrate, fibre and energy. The factors contributing to the problem include non-prescription of methods, permitting use of different methods in different laboratories or from analyst to analyst within the same laboratory; different agencies within a country with different responsibilities prescribing different methods; and internationally, different labeling requirements with different methodological prescriptions. Two serious problems have been identified as resulting from the lack of standardization, or harmony or compatibility. First, it leads to expensive, time consuming and redundant analyses. And secondly, it leads to ambiguity and misinterpretation of nutritional information. A survey showing incompatibilities between proximate nutrient analyses and nutritional information requirements within countries and between countries was undertaken and the problems and potential problems are discussed. Adoption of INFOODS tagnames that define the nutrient entity, specify methods of analysis where different methods are known to produce different results, and incorporate the unit of measure, is identified as a useful step in addressing the problem of ambiguity, while high level and extensive international consultation is required to address the problem of harmonization and standardization as it relates to labeling of foods.

INTRODUCTION

Food composition is an area of research beholden to the inflexibilities and limitations of chemistry and the contingencies of biology. In an attempt to satisfy both, a large number of methods for food component analysis and expression have been proposed, adopted and used. They can represent rigorous or unapologetic chemical measurements <FATCE[1]>, chemical measurements with conversion factors to account for a biological or physiological context <PROCNT[2]>, physiological methods in animal models <PER[3]>, and calculations based on hope and optimism <CHOCDF[4]>. For some nutrient components, the different methods or expressions represent

[1]<FATCE>, Fat, total, by analyses using continuous extraction

[2]<PROCNT> Protein, total, calculated from total nitrogen

[3]<PER> Protein efficiency ratio

[4]<CHOCDF> Carbohydrate, total; calculated by difference

different fractions or aggregations of the nutrient, while the common terms may be identical. For example, there are five commonly used methods for measuring and/or expressing carbohydrate, each of which would be represented by a different "correct" value for the same food (Monro & Burlingame, 1996). These methods each have protagonists and antagonists in laboratories and in regulatory agencies around the world. It is not surprising, therefore, that disharmony and incompatibility exist. What may be surprising, however, is how frequently these incompatibilities show up. The most readily examined components are those most commonly analysed and presented on food labels and in food composition tables: protein, fat, carbohydrate, fibre and energy. In a single country, disharmony and incompatibility in measuring and/or expressing a food component can exist between analysts within a laboratory; between different laboratories undertaking nutrient analyses for the same purpose; and between agencies where one is responsible for setting nutrition labeling requirements and another is responsible for developing and maintaining the national food composition data base. Disharmony also exists between countries/regions, where there are different methods of analysis and presentation formats prescribed in food legislation for nutrition labeling.

Standardization of nutrient analysis methods for the purpose of harmonizing nutrition labeling and food composition data bases nationally should be a reasonable goal. And given the implications for regional and international food trade, and international research projects that depend on food composition data, harmonization beyond national borders should also be a reasonable goal. Acknowledging that few countries have achieved even a national goal of harmonization, compatibility or standardization it seems unlikely that international or regional goals can be achieved in the near future. A practical, immediate, realisable goal should therefore be to eliminate ambiguity and misinterpretation of food component information by adopting and using INFOODS tagnames (Klensin *et al*., 1989). Tagnames identify a food component unambiguously, and incorporate method of analysis/expression where different methods would give different numeric values, and include the unit of measure.

DISCUSSION

Incompatibilities within and between organizations, countries and regions

It is not uncommon for one organization in a country to have the responsibility for determining nutrition labeling requirements, and another to have the responsibility for that country's food composition programme, as shown in Table 1. The most familiar example is the United States, with the United States Department of Agriculture (USDA) having food composition data responsibilities and the US Food and Drug Administration (FDA) having most of the nutrition labeling responsibilities (Food and Drug Administration, 1993). The far right column of Table 1 shows that the incompatibility between these two agencies is with the food component "fat". The USDA determines fat by a solvent extraction and gravimetry procedure, while the FDA's NLEA requires fat to be expressed as the sum of the analysed individual fatty acids, calculated as triglyceride equivalents.

Up until July 1, 1996 in New Zealand, the Ministry of Health was responsible for operating the Food Standards Committee that drafts and gazettes food legislation. The New Zealand Institute for Crop & Food Research, a Crown Research Institute, is responsible for developing and maintaining the country's food composition data base and coordinating the nutrient analysis programme. Harmonizing nutrition labeling with nutrient analyses nationally is not difficult. New Zealand's nutrition labeling legislation, contained in the *Food Regulations 1984 and Amendments* (Department of Health, 1992), is reasonably flexible. With the exception of "special purpose" foods, and foods for which a claim is made, nutrition labeling is voluntary. There is only one prescriptive methodology, AOAC Prosky dietary fibre (Official Methods of Analysis, 1990). The far right column of Table 1 shows that this is the component for which there is incompatibility between food composition data base and food labeling. The routine method used for the Food Composition Database is Englyst soluble and insoluble non-starch polysaccharides (Englyst and

Hudson, 1987). No other methods of analysis are specified in New Zealand's food regulations. However, non-prescription of methods can be even more problematic because a range of "correct" results is possible, and the information is usually supplied without the understanding or documentation of method.

Table 1 shows that Australia is unusual among the countries listed, in that the same agency, the National Food Authority (NFA)[5], is responsible for both activities. NFA was created in 1991 for the purpose of consolidating these various food-related activities. Even so, there are still some areas of incompatibility between methods used in the food composition work and methods prescribed for nutritional labeling shown as carbohydrate and fibre in the far right column. For instance, crude fibre <FIBC> is a labeling requirement for breads, and Prosky AOAC fibre <FIBTG> is presented in the food tables/data files. The carbohydrate values in the food tables are “available” carbohydrate obtained by summation of sugars, starch, glycogen and other related compounds <CHOAVL> (NFA, Composition of Foods, Australia, vol 6., General Appendix 2) (note: in the tables the term used is “Carbohydrate, total”) and on food labels it is total carbohydrate obtained by difference (i.e., 100g minus the grams of water, protein, fat and ash) <CHOCDF>.

Table 1: Organizations with the major (but not exclusive) roles in food labeling and food composition data, and nutrient incompatibilities.

COUNTRY	ORGANISATION RESPONSIBLE FOR FOOD LABELLING	ORGANISATION RESPONSIBLE FOR FOOD COMP DBASE	NUTRIENT INCOMPATIBILITY
USA	FDA	USDA	Fat, Energy
UK	MAFF	Royal Society	Carbohydrate, Protein, Energy, Vit A
NZ	Ministry of Health	NZ Institute for Crop & Food Research	Fibre
Australia	National Food Authority	National Food Authority	Fibre

Another example of a country where food labeling and food composition data base development reside with different agencies is Canada where Agriculture and Agri-Food Canada has the responsibility for food labeling, and Health Canada has the responsibility for the national food composition database.

Regional and international organizations further compound the issue by their involvement in regulations. For example, the EC Directive and FAO's Codex Alimentarius both have labeling regulations and guidelines, as do many individual European countries.

[5] On 1 July 1996, the agency became known as The Australia New Zealand Food Authority.

Description and quantification of the differences in values with the different methods of analysis/expression

Some of the differences in nutrition information requirements are trivial, while others are significant. Some differences involve different calculations, while other involve different methods of analysis for reporting basically the same nutrient entity.

Units of presentation

Energy

The requirements can involve different factors in the simple calculations; for example energy in kilojoules in most countries, sometimes with kilocalories as an optional addition, versus kilocalories exclusively as in the USA. Many conventions are in use, most commonly by calculation using factors with energy-yielding components. Some conventions specify the same factor for each component, e.g., 4 X g total protein; while others use a range of different factors for each component.

Factors to calculate energy contributed by protein can range from a low of 1.82 for bran, to a standard value of 4 for all foods, to a high of 4.36 for eggs.

Factors to calculate energy contributed by fat can range from a low of 8.37 for most grains, to a standard value of 9 for all foods, to a high of 9.02 for eggs.

Factors to calculate energy contributed by carbohydrate can range from a low of 1.33 for chocolate, to a standard value of 3.75 for available carbohydrate in monosaccharide equivalents <CHOAVLM> and 4 for total carbohydrate <CHOCDF> for all foods, to a high of 4.12 for distilled spirits.

Protein

Protein is rarely analysed directly. The most common method for expressing protein is by direct analysis of nitrogen, and multiplication of this value with a selected nitrogen conversion factor. This is not straightforward. The nitrogen values used can be total nitrogen <NT>, amino nitrogen <NAM>, and protein nitrogen <NPRO>. The nitrogen conversion factor can be the standard conversion factor 6.25, or specific factors as used and/or recommended by FAO (1970), Jones (1941), and USDA (1994).

Protein calculated as nitrogen times the standard 6.25 is dictated by the EC Directive, whereas Codex Alimentarius prescribes calculation with at least one different reference nitrogen conversion factor, that is 5.7 for durum wheat semolina and durum wheat flour.

A typical food technologist or nutritionist could easily take basic laboratory data and satisfy all these different market requirements.

Fat

In the United States, since the enactment of the Nutrition Labeling and Education Act (NLEA) (Food and Drug Administration, 1993) the lack of harmonization, compatibility and standardization has presented some problem.

The most problematic of the nutrients is fat, as defined by the NLEA as triglyceride equivalents of fatty acids. The differences between values obtained by the NLEA methods and an extraction/gravimetric method can be significant for many reasons, including the presence of fatty acids from non-triglyceride lipids and the unavailability of standards for identifying/quantifying all known fatty acids.

The NLEA is often described as a non-tariff trade barrier, particularly when exporters calculate the cost of the nutrient analyses. In most commercial laboratories, the cost of a gravimetric fat analysis is about 25% of the cost of a comprehensive fatty acid analysis, which is needed for determining fat as the triglyceride equivalent of fatty acids. This cost, together with those for total nitrogen, individual mono- and disaccharides, starch, fibre, sodium, calcium, iron, vitamins A and C, and cholesterol, for the "short" form of the NLEA label, represents a substantial cost for each food analysed.

CONCLUSIONS

It is not the point of this paper to make recommendations regarding the “best” method of analysis, or the solution to standardizing the world’s nutrition information. Rather, the point is to demonstrate the need for eliminating ambiguity and striving for harmonization.

The potential for ambiguity resulting from different methods of analysis has been avoided in several food composition data bases by the use of INFOODS tagnames to identify the food components. These include the data bases in regional data centres of OCEANIAFOODS, ASEANFOODS, and LATINFOODS; and in many countries in these regions and beyond, including the United States with Standard Reference 11. This eliminates ambiguity in the identification of food components, within the country by providing appropriate documentation in the data base, and between countries when interchanging data.

A greater problem is harmonization of methods of analysis with a multiplicity of overseas labeling requirements for export products. This problem is compelling for food exporting countries like New Zealand when each food must comply with the labeling legislation in each of its export markets. Although straightforward analytically, it is burdensome and expensive to the food industries.

REFERENCES

EC Directive on Nutrition Labeling (1990). *Official Journal of the European Communities*. EEC 90/496, 40-44.

Englyst H.N., and Hudson G.J. Colorimetric method for routine measurement of dietary fibre as non-starch polysaccharides. A comparison with gas-liquid chromatography. *Food Chemistry* 24:63-76; 1987.

Food and Agriculture Organization (1970). Amino acid content of foods and biological data on proteins. Rome: FAO Nutritional Studies 24.

Food and Agriculture Organization of the United Nations and World Health Organization (1993). Codex Alimentarius General Requirements. Joint FAO/WHO Food Standards Programme Codex Alimentarius Commission. Supplement 1, Volume 1, 2nd edition. Rome.

Food and Drug Administration. Food labeling, Federal Register, 58; 1993.

Food Division, Agriculture and Agri-Foods Canada. Basic labeling requirements for prepackaged foods, May 1993.

Food Division, Consumer Products Branch, Consumer and Corporate Affairs Canada. Nutrition labeling handbook, September 1994.

INFOODS (1995). International Directory of Food Composition Tables. Boston and Palmerston North.

Jones, D.B.. (1941). Factors for converting percentages of nitrogen in foods and feeds into percentages of protein. Rev. U.S. Dept of Agric., Circ. 183, 22 pp.

Klensin, J.C., Feskanich, D., Lin, V., Truswell, A.S., Southgate, D.A.T. Identification of Food Components for Data Interchange. United Nations University, Tokyo, 1989.

Ministry of Agriculture, Fisheries and Food. (1994). Food Labeling (Amendment) Regulations. No. 804.

Monro, J.A.; Burlingame, B.A. (1996). Carbohydrates and related food components: INFOODS tagnames, meanings and uses. *Journal of Food Composition and Analysis*, **9**, 100-118.

National Food Authority/Commonwealth Department of Community Services and Health. *Composition of Foods, Australia. Volumes 1-7* (1988-1995).Canberra, AGPS.

New Zealand Department of Health. *Food Regulations 1984 and Amendments*. GP Publications Ltd, 1992.

New Zealand Institute for Crop & Food Research Limited. The New Zealand Food Composition Tables and Database. Palmerston North, 1995.

Official Methods of Analysis, 15th Edition. Method 985.29. Arlington, VA: AOAC International, 1990.

Sullivan, D.M. and Carpenter, D.E., (Eds.) Methods of analysis for nutrition labeling. Arlington, VA: AOAC International, 1993.

The Royal Society of Chemistry and Ministry of Agriculture, Fisheries and Food. Food labeling data for manufacturers, 1992.

U.S. Department of Agriculture. 1996. USDA Nutrient Data Base for Standard Reference, Release 11.

VARIABILITY OF MINERALS IN FOODS

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ABSTRACT

Dietary guidance to the public stresses foods or food groups as specific sources of minerals such as calcium in dairy products, iron in meats and legumes, and potassium in oranges and bananas. Dietary guidance also identifies foods that are low in some minerals (such as sodium, potassium, calcium, cooper, and iron) for patients with specific disease conditions. However, the levels of minerals and other substances in foods vary because of inherent (e.g., age and species of plants and animals), environmental (e.g., animal diets, climate, soil type), and processing (e.g., fortification, food additives, cooking method) factors. the distributions of minerals in foods are not generally Gausian, but vary based on unique features of both the is affected by levels of salt added during processing and may vary from brand to brand of t he same foods, while sodium in unprocessed milk, fruits, vegetables, nuts, and meats tends to be low and stable. Iodine in milk is affected by feed supplements of iodine, the use of iodophor sanitizing solutions by the dairy industry, and the use of the iodine-contained red food dye, erythrosine. Iron and zinc in breakfast cereals are greatly affected by levels of fortification. Levels of iron, copper, and zinc in some shellfish and in liver are affected by levels of these minerals in animal diets and by the age of the animals. Some acidic foods (like tomatoes and sauerkraut) may leach minerals from metal containers with prolonged contact. formulated products (entrees, desserts, condiments) vary in their ingredients from brand to brand, and thus have different mineral composition. although it is difficult to identify all the causes of mineral variation in finished food products, it is useful to have some measure of variation (such as standard deviation or coefficient of variation) with published mean values to determine the reliability of the data.

INTRODUCTION

When dietitians and nutritionists use food composition data to plan and evaluate diets or to assist patients and clients with modified diets, they usually search for mean values (values that represent a central tendency or typical concentration) of nutrients in foods. The presence of a measure of nutrient variability, such as a standard deviation (SD) or coefficient of variation (CV), is useful to help nutrition professionals assess the reliability of mean values and provide practical dietary advice and guidance. High variability of nutrients in foods may limit the use of mean values in certain situations.

Nutrient variability is of particular importance if it occurs in foods that are relied upon as the major sources of a nutrient (because of either high concentrations or frequent use) for a specific population. If mean nutrient values in food composition tables are unreliable because of high variation, dietary intakes of nutrients calculated from such values may be unreliable. Nutrient variability is also of concern for patients on restricted or modified diets who are trying to limit or increase their intake of a nutrient. For example, an individual may be consuming an abundance of foods thought to be Asodium free@ and indulging in one or two Alow sodium@ foods that are within their dietary limits. If the variability of sodium in foods is large and it tends to err on the high side, then the patient may be ingesting more sodium than dietary calculations (based on mean values) suggest.

Causes of Mineral Variation in Foods

The causes of mineral variation in foods include inherent, environmental, and processing factors. Inherent factors refer to age, maturity, genus, species, variety, and cultivar. Environmental factors include feed type and composition; soil and water composition; climate-related factors (rainfall, temperature, humidity, amount of sunlight); use of pesticides, and use of medications. Examples of processing factors include storage time and temperature; preservation methods (freezing, drying, canning); packing media; contact with containers (plastic, paperboard, glass, metal, wax); cooking methods (boiling, frying, roasting); substances added or removed; and use of food additives.

Secondary sources of variability such as the sampling design used to collect foods for analysis, sample preparation in the laboratory, analytical methods, and statistical treatment of the data (e.g., handling of outliers) affect the values reported for nutrients in foods, but do not affect the actual levels of nutrients in foods. These secondary factors may account for differences in results between laboratories when chemists analyze what appears to be the Asame@ product for minerals. Analytical variability is measurable, and, with the use of standard reference materials is controllable.

Although it is difficult to identify all the causes of mineral variation in finished food products, it is useful to have some measure of variation (such as SD or CV) with published mean values to determine the reliability of the data. Dietary guidance to the public stresses foods or food groups as specific sources of minerals such as calcium in dairy products, iron in meats and legumes, and potassium in oranges and bananas. Dietary guidance also indicates which foods are low in sodium for patients with hypertension, and for some disease conditions, patients are given advice about foods low in potassium, calcium, copper, and iron. This paper presents some information on the variability of minerals in core foods of the U.S. food supply (1-5).

METHODS AND MATERIALS

Between 1982 and 1991, there were 37 analysis of the levels of 11 minerals in 234 core foods of the U.S. food supply (1-3). Between 1991 and 1995, there were 13 individual measures of 10 minerals in 260 foods (4-5). These foods were collected by inspectors of the Food and Drug Administration District Offices, and they were analyzed by chemists at the Kansas City District Office Laboratory. The foods were clearly identified for collection purposes, but brand names for industry-prepared and restaurant-prepared foods were not specified. Thus, the results for industry and restaurant foods represent a mixture of different brand-name products. Analytical variation was minimized by the use of standard quality control measures (chemical standards, duplicate analysis, standard reference materials, fortified samples) and the consistent use of the same laboratory, sample preparations, analytical methods, chemists, and technicians. Information related to food collections, sample preparations, analytical methods, detection limits, and quality control are found in references 1 through 5.

RESULTS AND DISCUSSION

Space limitations prevent presentation of all the data and discussion of the many issues concerning mineral variability. This paper focuses on the variation of minerals in foods considered to be sources of the minerals (i.e., foods that provide at least 10% of the Daily Value (DV) per serving portion) and on the distributions of several minerals in selected foods. DVS are used for nutrition labeling and are the suggested daily intakes for nutrients based on an energy intake of 2,000 kilocalories per day.

Sources of Minerals

The number of foods providing at least 10% DV per serving portion, based on the data from 1982 to 1991 (1-3), are shown in Table 1. It appears that sodium, phosphorus, and iodine are more generally distributed in the core foods of the US food supply; that zinc, potassium, manganese, iron, and selenium are more moderately distributed; and that copper, magnesium, and calcium are less well distributed. Recommended intakes for nutrients that are more widely distributed tend to be easier to meet because there is a greater probability of including the sources in the diet. Results of dietary assessments show that some population subgroups do not meet daily requirements for calcium, magnesium, and copper, but requirements for phosphorus and sodium are almost always met. Even though iron appears to have a moderate distribution, it is still difficult for some groups to meet recommended dietary allowances because requirements are high relative to energy needs, e.g., women of child-bearing age have an iron requirement of 18 mg/day and an average caloric intake of only 1,500 to 2,000 kilocalories.

Table 1. Number of Foods Providing at Least 10% DV for 11 Minerals Per Serving Portion*

Mineral	Number of Foods	(Percent)	DV (mg)
Iodine	81	(35%)	0.150
Phosphorus	61	(26%)	1000
Sodium	58	(25%)	2400
Selenium	48	(21%)	0.070
Iron	43	(18%)	15
Manganese	40	(17%)	3.5
Potassium	31	(13%)	3500
Zinc	28	(12%)	15
Calcium	20	(9%)	1000
Magnesium	19	(8%)	400
Copper	16	(7%)	2

*Based on results of 36 analysis of 234 foods (1-3).

Coefficients of Variation (CVs)

The average and ranges of CVs for foods containing at least 10% DV per serving portion (in increasing order of average values) are shown in Table 2. Variability is important because several of these minerals are considered to be of public health concern. For example, sodium-restricted diets may be prescribed for hypertension or kidney disease; increased intakes of potassium from food sources are recommended with some diuretic medications. There is increasing concern about the ratio of calcium and phosphorus in the diet, and evidence that average intakes of iron, calcium, magnesium, zinc, and copper may be low for some segments of the population. In addition, certain disease states require dietary restriction of potassium, iron, or copper.

It is difficult to identify the specific causes of nutrient variability for prepared foods because the inherent, environmental, processing, cooking, and analytical variables are compounded. This is especially true for mixed dishes which contain varying levels of ingredients, each with its own causes of nutrient variability. As indicated in Table 2, levels of sodium were more variable than levels of phosphorus, potassium, or magnesium as indicated by the higher average CVs and wider ranges of CVs for sodium. Sodium variability in processed foods is due primarily to different levels of salt added by different manufacturers, while phosphorus, potassium, and magnesium variabilities are more related to inherent causes (e.g., genetics) and processing effects (e.g., use of food additives). Variability of some minerals (e.g., iron and zinc in breakfast cereals) may reflect different fortification levels. Selenium variability in plant foods is probably related to the selenium content of the soil in which the plants were grown. Some geographic areas are known to have high or low selenium content. Selenium variability in animal foods is related to the selenium content of the plants on which they feed. Iodine variability in foods is largely due to the presence of iodine-containing food additives (both direct and indirect). Because of their high variability, data on the iodine content of foods should be used with caution.

Table 2. Average and Ranges of CVS for Foods Containing at Least 10% DV Per Serving Portion*

Mineral	CV Mean	CV (Range)
Phosphorus	15%	(6-28%)
Potassium	16%	(7-27%)
Magnesium	17%	(6-37%)
Sodium	21%	(6-78%)
Calcium	22%	(13-36%)
Zinc	22%	(10-50%)
Copper	24%	(13-49%)
Iron	28%	(12-90%)
Manganese	28%	(11-66%)
Selenium	37%	(19-100%)
Iodine	158%	(35-416%)

*Based on 36 analysis of 234 foods (1-3).

Concentration Versus Variability

A few examples of mineral concentration versus variability are provided for sodium, calcium, and iron (1-3). Foods with the highest concentrations of sodium per serving portion and with the most variable concentrations of sodium among the 234 core foods are shown in Tables 3 and 4, respectively. The six foods with the highest concentrations of sodium (Table 3) provided from 36 to 68% DV of this mineral, and the CVs for these foods ranged from 10 to 27%, i.e., these high sources were relatively stable and reliable. The six foods with the most variable concentrations (and thus less reliable sources) of sodium contained 11 to 34% DV and had CVs ranging from 34 to 78%.

Table 3. Highest Sources of Sodium+

Food	Sodium (mg/serving)	CV(%)	%DV*
Fried chicken frozen dinner	1626	19	68
Chili con carne, canned	1112	10	46
Ham, cured	1088	13	45
Chicken pot pie, frozen	1058	15	44
Beef bouillon, canned	890	27	37
Chicken noodle soup, canned	853	22	36

+Based on analysis of 234 foods (1).
*DV = 2,400 mg.

The six foods with the highest concentrations of calcium per serving (Table 5) provided 28 to 34% DV and had CVs of 13 to 22%. These foods were dairy products or contained dairy products and appear to be stable and reliable sources of calcium. The six foods most variable in calcium content (Table 6) provided 11 to 23% DV and had CVs of 27 to 37%. These foods included spinach, collards, shrimp, and three foods containing some dairy products. The highest CV was only 37% which indicates that these sources of calcium are also relatively stable.

Table 4. Most Variable Sources of Sodium+

Food	Sodium(mg/serving)	CV(%)	%DV*
Italian salad dressing	344	78	14

Beef and vegetable stew, homemade	532	54	22
Whole wheat bread	300	52	13
Potatoes, scalloped	260	38	11
Spaghetti w/ meat sauce, homemade	397	38	17
Vegetable beef soup, canned	805	34	34

+Based on analysis of 234 foods (1).
*DV=2,400 mg.

Table 5. Highest Sources of Calcium+

Food	Calcium (mg/serving)	CV(%)	%DV*
Lowfat yogurt, plain	341	15	34
Milk shake, chocolate	303	13	30
Cheese pizza, frozen	285	21	29
Skim milk	279	17	28
Lowfat milk	279	22	28
Buttermilk	277	13	28

+Based on analysis of 234 foods (2).
*DV=1,000 mg.

Table 6. Most Variable Sources of Calcium+

Food	Calcium (mg/serving)	CV(%)	%DV*
Chicken noodle casserole, homemade	206	37	21
Spinach, canned	120	36	12
Tomato soup, canned	126	35	13
Shrimp, breaded, fried	109	33	11
Collards, boiled	116	32	12
Lasagna, homemade	234	27	23

+Based on analysis of 234 foods (2).
+DV=1,000 mg.

Tables 7 and 8 present the foods with the highest and most variable concentrations, respectively, of iron per serving. The percent DVs for the highest sources (Table 7) ranged from 25 to 107%, and the CVs for these foods ranged from 12 to 43%. The four highest sources were all breakfast cereals, and the variability of iron in these products is probably related to the presence of iron fortification and the levels of fortification. The other two high sources were beef/calf liver and chili con carne (which contains both meat and beans as sources of iron). The most variable sources of iron (Table 8) contained 11 to 24% DV and had CVs ranging from 44 to 90%. Three of these foods were breakfast cereals, and their iron variability was probably related to the presence and levels of iron fortification. Also included in this group with high variability were spinach, baked potato, and red beans.

Table 7. Highest Sources of Iron+

Food	Iron (mg/serving)	CV(%)	%DV*
Raisin bran cereal	19.20	43	107
Farina	10.51	41	58
Oat ring cereal	7.06	34	39
Fruit-flavored cereal	6.19	20	34
Beef/calf liver, fried	5.78	18	32

Chili con carne, canned	4.44	12	25

+Based on analysis of 234 foods (3).
*DV=18 mg.

Table 8. Most Variable Sources of Iron+

Food	Iron (mg/serving)	CV(%)	%DV*
Corn grits	2.90	90	16
Spinach, boiled	4.23	74	24
Granola w/ raisins	2.57	62	14
Potato, baked	1.90	50	11
Red beans, boiled	1.95	46	11
Oatmeal, cooked	2.25	44	13

+Based on analysis of 234 foods (3).
*DV=18 mg.

Distributions of Minerals

The distributions of minerals in foods are not generally Gausian (i.e., normal), but vary based both on unique features of the foods and on potential sources of minerals for each food. For example, sodium in processed foods is affected by levels of salt, soy sauce, garlic salt, and other sodium-containing additives added during processing and may vary from brand to brand of the same food, while sodium in unprocessed (and unsalted) foods such as milk, fruits, vegetables, nuts, and meats tends to be low and stable. Iodine in milk is affected by feed supplements of iodine fed to cattle (especially during the winter when cattle are not grazing outdoors) and the use of iodophor sanitizing solutions by the dairy industry. Previous work (6-7) has shown that the iodine content of whole milk varies from 2 to 94 µg per 100 grams. The iodine content of some foods may also be altered by the use of iodized salt as one of the ingredients. Iron and zinc in breakfast cereals are greatly affected by levels of fortification. Levels of iron, copper, and zinc in some shellfish and in liver are affected by levels of these minerals in the animal diets (or surrounding waters) and by the age of the animals. Some acidic foods (like tomatoes and sauerkraut) may leach minerals from metal containers with prolonged contact. Formulated products (entrees, desserts, condiments) vary in their ingredients from brand to brand, and thus have different mineral composition. Levels of phosphorus in processed foods are affected by the use of phosphate-containing food additives.

Several results from analysis completed in 1991-95 (4,5) are presented in Table 9 to illustrate the variability of minerals in several basic foods. Milk is a traditional, basic food which is considered a dependable and consistent source of calcium. Although the magnesium and zinc content of milk is stable, the calcium varies by fourfold. (Milk is not a source of iron or copper.)

Table 9. Mean and Range of Selected Minerals in Several Foods, 1991-95*

Food	Calcium Mean Range	Magnesium Mean Range	Iron Mean Range	Zinc Mean Range	Copper Mean Range
			(mg/100 g)		
Whole milk	95 26-116	10.1 6.9-11.6	0.01 0.00-0.07	0.36 0.25-0.41	.001 .000-.006
Beef/calf liver fried	5 4-6	23.1 20.8-25.1	6.19 4.55-7.98	5.45 3.35-6.30	10.56 4.77-20.8

Shrimp, boiled	122 34-219	43.8 16.7-88.0	1.79 0.18-5.19	1.62 0.72-3.46	.217 .090-.354
Spinach, fresh/ frozen, boiled	95 54-149	42.5 21.9-64.1	2.37 1.08-6.40	0.45 0.26-0.66	.080 .055-.164
Collards, fresh/ frozen, boiled	132 52-199	21.6 11.8-35.2	0.82 0.51-1.03	0.23 0.10-0.45	.060 .019-.188
Cheese pizza, regular crust, from pizza carry-out	224 174-303	27.9 23.5-31.4	2.34 1.66-3.01	1.71 1.50-1.97	.112 .092-.138
Beef chow mein, from Chinese carry-out	18 11-30	12.3 9.1-17.8	1.23 0.68-2.56	1.11 0.85-1.48	.054 .000-.079

*Based on 13 analysis (4,5).

Beef or calf liver is a highly nutritious food, although it is not commonly liked or consumed frequently. Liver is a storage organ with variable levels of minerals. It appears that calcium is not stored here (levels are low and stable). The magnesium concentration is stable, and the concentrations of iron, zinc, and copper are variable with twofold variations for iron and zinc and fourfold variation for copper.

Shrimp, a shellfish that accumulates some minerals, is a nutritious, although somewhat expensive, food that is liked and commonly consumed. Variations of six-fold for calcium, fivefold for magnesium, 29-fold for iron, fivefold for zinc, and fourfold for copper occur in this food.

Spinach and collards are both regarded as highly nutritious. Leaves are the metabolically active parts of plants which contain magnesium as part of the chlorophyll molecule and other minerals as enzyme activators. Spinach and collards both exhibit “natural” variability in mineral content. Spinach shows a threefold variation in calcium, magnesium, zinc, and copper and a six-fold variation in iron. Collards show a fourfold variation in calcium and zinc, three-fold variation in magnesium, twofold variation in iron, and tenfold variation in copper content.

The following are additional examples of mineral variation from the 1991-95 data (4,5). The iron content of raisin bran cereal ranged from 13.2 to 55.0 mg/100g due to different levels of fortification. This is a fourfold variation in a food regarded as an excellent source of iron. Fruit-flavored, sweetened cereal exhibited a threefold variation in iron content (8.00-24.1 mg/100 g) and a twofold variation in zinc (8.74-21.1 mg/100g) concentration, which are probably due to different levels of fortification.

The sodium content of fast-food french fries showed a tenfold variation in sodium content (67-640 mg/100 g) likely due to different restaurant practices in salting this product. The six-fold variation in the iron content of tomato juice (.19-1.18 mg/100 g) and twofold variation in the iron content of sauerkraut (.29-.71 mg/100 g) may illustrate potential leaching of minerals by acidic foods from metal containers or utensils during processing or packaging. The iron content of homemade cornbread varied from 0.16 to 3.60 mg/100 g illustrating that a mixed dish made repeatedly with the same recipe may differ in mineral content probably due to the different nutrient content of the ingredients.

The mineral content of cheese pizza from carry-out pizza restaurants showed stability, while the mineral content of carry-out beef chow mein from Chinese restaurants varied most likely due to different ratios of meat to other ingredients in the product obtained from different restaurants (Table 9).

CONCLUSIONS

Database compilers should consider the variability of minerals in foods before determining if means, medians, or modes are the most representative values for a database. Frequency distributions are useful for assessing the variability of nutrients in foods and may assist database compilers in identifying outliers and deriving representative values. Values with high variability should be used with caution when assessing nutrient intakes or providing dietary guidance. Reliance on foods as nutrient sources could be misleading if the nutrient levels are highly variable. Dietitians and nutritionists who use food composition data to assess individual diets or provide dietary guidance to patients should consider nutrient variability to effectively meet the objectives of their intended use of the data.

Database users who are unfamiliar with the variability of food composition data may express dismay when they discover the less than perfect presence (i.e., high variability and low reliability) of some minerals in some foods. Although analytical variation can and should be monitored, mineral variability due to inherent, environmental, or processing factors cannot be controlled, and needs to be measured and expressed (as SD or CV) with published food composition data. When high variability is discovered in food sources of minerals (e.g., those containing at least 10% DV of a mineral), caution in dietary guidance messages to the public may be warranted.

REFERENCES

1. Pennington JAT, SA Schoen, GD Salmon, B Young, RD Johnson, RW Marts. Composition of core foods of the U.S. food supply, 1982-1991. I. Sodium, phosphorus, and potassium. J Food Comp Anal 8:91-128, 1995.
2. Pennington JAT, SA Schoen, GD Salmon, B Young, RD Johnson, RW Marts. Composition of core foods of the U.S. food supply, 1982-1991. II. Calcium, magnesium, iron, and zinc. J Food Comp Anal 8:129-169, 1995.
3. Pennington JAT, SA Schoen, GD Salmon, B Young, RD Johnson, RW Marts. Composition of core foods of the U.S. food supply, 1982-1991. III. Copper, manganese, selenium, and iodine. J Food Comp Anal 8:171-217, 1995.
4. Pennington JAT, S Capar, S Schoen, C Edwards, D Kendall. Elements in total Diet Study foods, 1991-95: 1. Sodium, potassium, calcium, phosphorus, and magnesium. In preparation.
5. Pennington JAT, S Capar, S Schoen, C Edwards, D Kendall. lements in Total Diet Study Foods, 1991-95: 2. Iron, zinc, copper, manganese, and selenium. In preparation.
6. Pennington JAT. Iodine Concentrations in US milk - variation due to time, season, and region. J Dairy Sci 73(12):3421-3429, 1990.
7. Pennington JAT. A review of iodine toxicity reports. J Am Diet Assoc 90(11):1571-1581, 1990.

ANALYTICAL METHODS FOR TRANS FATTY ACID ANALYSIS

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ABSTRACT

The AOAC Technical Division on Reference Materials is in the process of developing a reference material for the analysis of trans fatty acids. If successful, these materials will become available through the AOAC. Two materials have been prepared, a non-hydrogenated soybean oil with approximately 3% trans fatty acids and a hydrogenated soybean oil with approximately 25% trans. In our effort to find the "true" value, these samples were sent to several experienced laboratories for analysis. Data will be presented showing the variability of the data generated by the IR method and the capillary GC method. Limitations of each method will be discussed. Industry activity in Response to Trans Fatty Acids Concerns. The vegetable oil industry is responding to the concern over trans fatty acids in the diet. They are developing new processing procedures to minimize the formation of trans fatty acids during processing. Current processing practices (specifically deodorization and hydrogenation) and their influence on trans fatty acid formation, will be presented. New processing procedures, aimed at the reduction of trans fatty acids in vegetable oils, will be also discussed.

AOAC Technical Division On Reference Materials
***Trans*-Fatty Acid Reference Material**
Sample Preparation

- Two Soybean Oil Samples Were Obtained Containing Approximately 5% and 30% Total Trans
- Samples Were Melted Under Nitrogen
- Mixed
- Packaged In Glass 7 ml Vials
- Stored In Freezer

AOAC Technical Division On Reference Materials
***Trans*-Fatty Acid Reference Material**
Methods Used For Analysis

- AOCS Cd 14c-94 GC Method
- AOCS Cd 14b-93 GC-IR Method
- AOCS Cd 14-61 IR Method

AOAC Technical Division On Reference Material
***Trans*-Fatty Acid Reference Material**
Distribution Of Material

- 15 Labs Volunteered To Do The Analysis by one Or More Of The Methods
- Each Were Asked To Analyze Each Sample In Duplicate On Three Different Days

AOAC Technical Division On Reference Material
***Trans*-Fatty Acid Reference Material**
Laboratory Response

- GC Method: 5
- GC-IR Method: 4
- IR Method: 5

Trans-Fatty Acid Reference Material
GC
Method AOCS Ce 1c-89
Margarine Oil

Method	Lab	N	Mean	Std. Dev.
GC	7	6	26.53	0.563
GC	4	6	24.37	0.258
GC	2	6	23.49	1.404
GC	5	6	25.12	0.180
GC	3	6	24.09	0.190
	All Labs	30	24.72	1.245

Trans-Fatty Acid Reference Material
GC-IR
AOCS Method Cd 14b-93
Margarine Oil

Method	Lab	N	Mean	Std. Dev.
GC-IR	4	6	33.75	0.561
GC-IR	5	6	23.23	0.142
GC-IR	6	6	29.07	0.312
GC-IR	1	6	25.90	0.141
	All Labs	24	27.99	4.014

Trans-Fatty Acid Reference Material
IR
AOCS Method Cd 14-61
Margarine Oil

Method	Lab	N	Mean	Std. Dev.
IR	4	6	32.53	0.427
IR	2	6	26.16	2.471
IR	5	6	22.33	0.143
IR	6	6	27.92	0.307
IR	1	6	26.02	0.117
	All Labs	30	26.99	3.532

Trans-Fatty Acid Reference Material
GC
GC Method AOCS Ce 1c-89
Salad Oil

Method	Lab	N	Mean	Std. Dev.
GC	7	6	3.59	0.045
GC	4	6	2.83	0.143
GC	2	6	2.28	0.169
GC	5	6	2.79	0.044
GC	3	6	3.65	0.087
	All Labs	30	3.03	0.538

Trans-Fatty Acid Reference Material
GC-IR
AOCS Method Cd 14b-93
Salad Oil

Method	Lab	N	Mean	Std. Dev.
GC-IR	4	6	2.81	0.158
GC-IR	5	6	2.85	0.056
GC-IR	6	6	3.55	0.055
GC-IR	3	6	4.82	0.087
	All Labs	24	3.51	0.834

Trans-Fatty Acid Reference Material
IR
AOCS Method Cd 14-61
Salad Oil

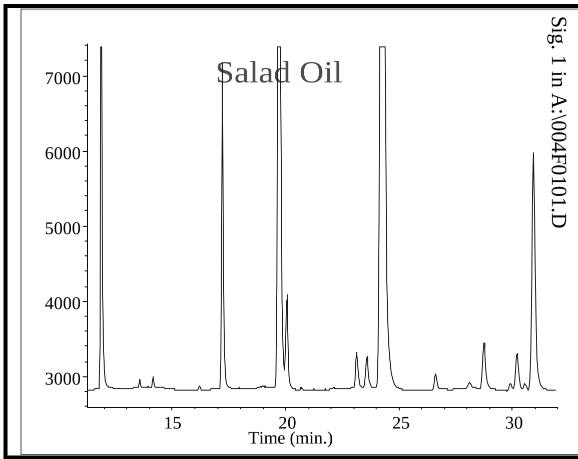
Method	Lab	N	Mean	Std. Dev.
IR	4	6	0.57	0.052
IR	2	6	6.34	0.524
IR	5	6	2.41	0.056
IR	1	6	4.23	0.103
	All Labs	24	3.39	2.200

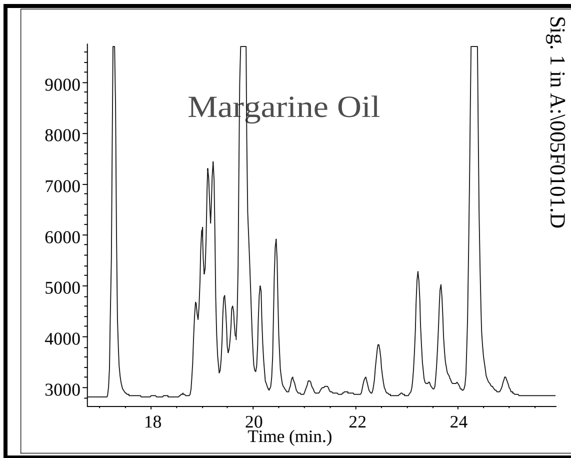
Trans-Fatty Acid Reference Material Total Trans Between Lab Variation Margarine Oil

Method	N	Mean	Std. Dev.
GC	30	24.72	1.245
GC-IR	24	27.99	4.014
IR	30	26.99	3.532

Trans-Fatty Acid Reference Material Total Trans Between Lab Variation Salad Oil

Method	N	Mean	Std. Dev.
GC	30	3.03	0.538
GC-IR	24	3.51	0.834
IR	30	3.39	2.200





GC Method Advantages / Disadvantages

- Advantages
  - Most oil refineries have GC's
  - Simple sample preparation
  - Capable of measuring individual fatty acids
  - Useful for a wide range of sample types
- Disadvantages
  - Difficult interpretation of data
  - Long analysis time

GC-IR Method Advantages / Disadvantages

- This method is only intended for the determination of trans-octadecenoates

GC-IR Method Advantages / Disadvantages

- Advantages
  - Fast
  - Simple sample preparation
- Disadvantages
  - Uses carbon disulfide
  - Data reduction difficult
  - Not applicable to samples with < 5% total *trans*

Project Status

- GC method appears to be the method of choice
- Resolution factor of 1 for *trans*-13 and oleic will be a recommended change in method
- A recognized expert, Dr. Ratnayake, Health Canada has re-analyzed the samples
- An expert review committee of six is reviewing the data and will comment on where we should go from here

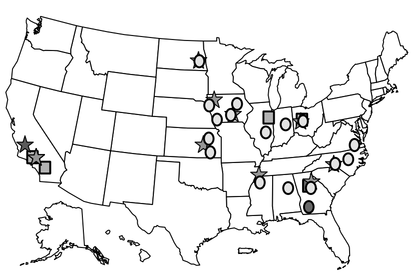
Why Use Reference Materials ?

- Get everyone on the same page
- Help everyone understand the variability of methods used
- Use with SPC techniques (pre-control) to control the capability of methods

Cargill Worldwide Oilseeds Processing

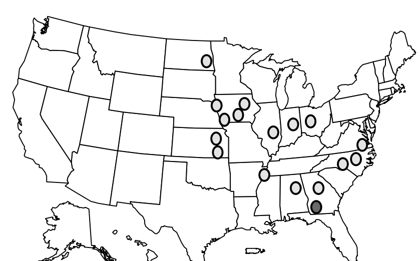
▼United States
▼Canada
▼Venezuela
▼Brazil
▼Argentina
▼United Kingdom
▼France
▼Netherlands
▼Belgium
▼Spain
▼Australia
▼Malaysia
▼Phillipines
▼China

U.S. Oilseeds Processing - Physical Assets



Crushing Facility
Refining Facility
Packaging Facility

U.S. Oilseeds Processing - Crushing Facilities

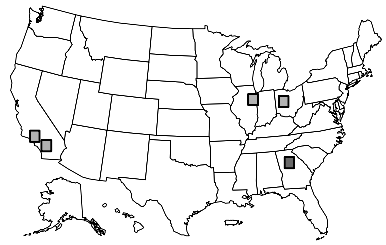


Bloomington, IL
Cedar Rapids ,IA
Dawson, GA
Des Moines, IA
Fayetteville, NC
Gainesville, GA
Guntersville, AL
Iowa Falls, IA
Kansas City, KS
Lafeyette, IN
Memphis, TN
Norfolk, VA
Raleigh, NC
Sidney, OH
Sioux City, IA
West Fargo, ND
Wichita, KS

U.S. Oilseeds Processing - Refining Facilities

Des Moines, IA	Gainesville, GA	Sioux City, IA
Fayetteville, NC	Memphis, TN	West Fargo, ND
Fullerton, CA	Sidney, OH	Wichita, KS
		Vernon, CA

U.S. Oilseeds Processing - Packaging Facilities



Chicago, Il	Gainesville, GA	Sidney, OH
Fullerton, CA	Vernon, CA	

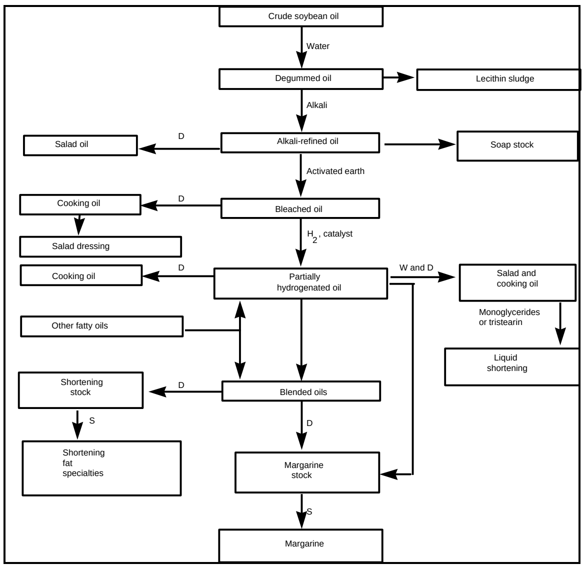
Raw Materials Processed

Protein

- Canola
- Corn
- Peanut
- Soybean
- Sunflower
- Specialty Crops
  - canola
  - soybean
  - sunflower

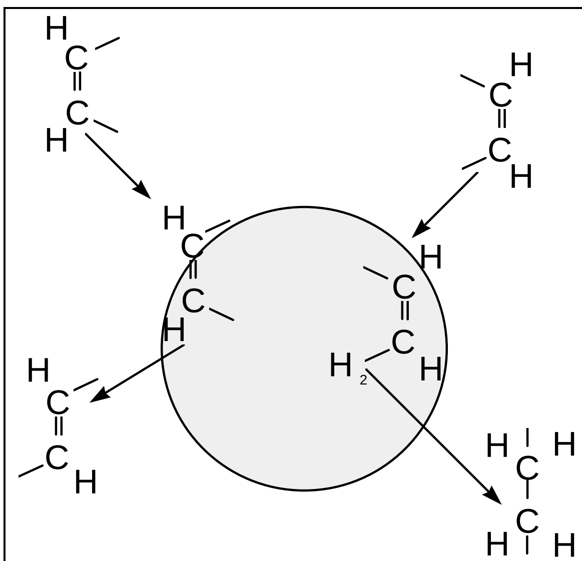
Oil

- Corn
- Cottonseed
- Palm
- Peanut
- Soybean
- Sunflower
- Specialty Oils
  - canola
  - sunflower
- Tallow



Hydrogenation

- In the presence of a catalyst, hydrogen gas is added to the double bonds of fatty acids
- Changes the melting behavior of oils, converting oils to semisolids
- Reduces the iodine value
- Improves oxidative stability
- Isomeric (*trans*) unsaturated fatty acids formed



Industry Activity
Development of Low Trans Products

- Optimization of current processes
  - Time exposed to high temperature
  - Lower temperature during hydrogenation
  - Hydrogen pressure
  - Catalyst recycling
- Development of new processes
  - Time
  - Temperature
  - Precious metal catalysts

Deodorization

- High temperature, high vacuum, steam distillation
- Can produce isomeration, both positional and geometric
- Removes
  - Flavors and odors
  - Free fatty acids
  - Sterols
  - Hydrocarbons
  - Pigments

Deodorization

- Minimization of isomerization by optimizing
  - Temperature
  - Time
  - Vacuum
  - Stripping steam rate

Other Industry Activities
Production of Healthy Fats and Oils

- Plant breeding
  - High Oleic Sunflower
  - High Oleic Soy
  - Canola with unique properties
- Interesterification
  - Moving fatty acids to different positions in the triglycerides in the fat
    - Random - chemical catalysis
    - Selective - enzyme catalyzed
  - Changes the melting properties of fats and oils
  - Example: Interesterification of high melting fats with oils to produce products with a variety of melting properties

FOOD COMPOSITION DATA: MAKING USE OF VARIABILITY

Sevenhuysen GP[1], Holcikova K[2], Holden J[3], and Kutka J[2].
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ABSTRACT

The mean value is the most common way to report the amount of a component in a food. In most databases the mean value is intended to reflect the average composition of similar food samples from a specified geographical area. However, the amounts of a food component in any one food may not be distributed normally, which can preclude the use of the mean, standard deviation and standard error. Though median values may better predict the content of other samples, such values can not be summed to calculate the content of a mixture of foods, or perform other linear operations. An alternative technique of presenting food composition data using percentile distributions is described, suitable for use with very small sample sizes. The technique allows users to determine the probability that a combination of food items contains levels of components recommended for nutrient intake or required for food product labeling. In addition, the technique can assist users to describe more precisely which characteristics of food items increase variability, such as growing conditions, storage or processing steps. Data from Eastern Europe and from The Carotenoid Project, USDA, is used to demonstrate the technique that provides probabilities of food component levels. The practical process of generating databank values, examples of data presentation and their use in food product development and dietetic practice are included.

PRESENTING FOOD COMPOSITION DATA

Problem

The amount of a nutrient or component in a food is most commonly expressed as the mean of several analytical estimates derived from different samples of the food. Standard deviations are used to show the extent to which actual food contents may vary from the mean. However, the calculation of standard deviations requires that the analytical values from a sample of food items are normally distributed. Since analytical values are frequently not normally distributed, standard deviations are often incorrect estimates of the probability with which given food component amounts occur.

Alternative measures of variability such as percentile values can represent variability in non-normal distributions of data. The 50th percentile, or median value, is interpreted as the food component amount that the next food sample will contain with a 50% probability. However, percentile values obtained from several foods can not be added or averaged to find the percentiles for the recipe or daily intake the foods represent. As well, the majority of food composition data involves small sample sizes, e.g. 3 or 6 data values, for each food and nutrient combination, which prevents the use of traditional percentile calculations.

New technique

Create a percentile distribution for a food. Instead of single percentile values, group them according to the extent of variation due to the analytical technique used to generate the data. For example, the frequencies for each group of 4 percentiles can be used. If the technique is less precise, the frequencies of adjoining percentile groups would increase to show the increased probability. Create a percentile distribution for a mixture of foods by adding the nutrient amount values from different foods that are associated with the same percentile.

Create a point-to-point curve by connecting the frequency values of each bin, including all the ones that show zero frequencies. Divide the area under the curve in 100 equal parts by using vertical lines that intersect the horizontal scale and the curve. Record the value associated with areas of probability desired: 50%, 5%, 10%, 90% and 95%.

Application

The technique provides information about the likelihood that the amount of a nutrient or component in a food meets a given standard, because of the use of non-normal distributions and the use of percentiles. As a result, it is possible to quantify the chance that an individual's intake fails to meet the physiological requirement; or, to formulate a food product in order to be certain of minimum or maximum amounts of certain food components.

Paper P6-5	***Capstone Presentation*** *Jean H. Hankin, Cancer Research Institute of Hawaii* *University of Hawaii*

TWENTY-FIRST NATIONAL NUTRIENT DATABANK CONFERENCE CAPSTONE PRESENTATION

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ABSTRACT

As one of the leading authorities on the development of ethnic databases, Dr. Hankin will summarize the two and a half-day discussions and present a new challenge for the year. Dr. Hankin has been a presenter at previous conferences, but never the capstone presenter. Her challenge is to deliver the final message to the attendees and based on her previous presentations at this conference, she is the perfect choice. Her wit, wisdom, and personal presentation style will surely motivate the attendees to new adventures and will set the foundation for the 1997 National Nutrient Databank Conference program.

In summary, Dr. Hankin compiled the most important points gleaned from the papers presented and they have been transcribed as follows:

Regarding new strategies and directions for food databases, Rhona Applebaum stressed that we need a uniform federal policy that includes non-nutrient data. There are 2 types of databases, commodity and recipe which need a flexible structure that involves industry participation. We need unified labeling which may involve label reformulation or new items. There is need for a central repository for collecting, organizing and distributing data. Finally, one key point is that there is a need for more funding for food composition research.

Dr. Christopher Beecher spoke on NUTRALERT: a database for non-nutrient components in plants. This is a premier natural products database containing 120,000 books and articles, 43,000 plants and animal species, and 103,000 chemical compounds. There are 3 databases: active plants, active compounds, and plants with active compounds. Essentially this is a database from the literature with very little data on analyses. He stressed the importance of flavonoids, isoflavonoids, saponins, and carotenoids. Additionally, he stressed the need for funding for developing analytical methods and for performing needed analyses of foods.
In food design: trends and changes, Dr. Samuel Godber discussed the development of new products, which is essential for companies, but a costly and lengthy process. In 1995, 17,000 new products were developed, of which only 15% were successful. New products developed included baked products, beverages and side dishes with the focus on taste, designer foods, and health claims. Top trends in marketing include "fresh is best, energy enhancing foods, a eat where you are society, upgrading the American palate—e.g., Cajun foods, save planet earth, fitness and nutrition.

Dr. Martina McGloughlin spoke on new products in the food and agricultural biotechnology pipeline. Part of her message is that biotechnology is not new!!!! Prehistoric farmers improved plant lines and animal breeding through altering their genomes. We use microorganisms in the production of bread, beer, wine and cheese. Currently genetic engineering is conducted through application of recombinant DNA methods, as examples: tomatoes with improved ripening and shelf life, squash resistant against viruses, herbicide-tolerant crops, insect-resistant potatoes. Genetic engineering is complex and it takes precision to manipulate living things---it may now be predictable, precise and controlled. Thus, this will contribute to safer, more nutritional and economic food supply

Regarding analytical methods to obtain high quality laboratory data, Carol Davis stressed that methods be validated before they are applied and urged the importance of accuracy, precision and reproducibility.

Dr. Gary Beecher, in his presentation on measurement of new health-related food components, indicated that the traditional nutrients were important, but don't account for all epidemiological observations. There are additional components with biological activity. New components associated with health include carotenoids, isoflavones, lignins, isothiocyanates, allium, and saponins. There is now additional need for analytical methods and databases for these.

Karen Andrews' paper on dietary fiber in the national nutrient database included the definition of fiber as plant polysaccharides and lignin which are resistant to hydrolysis by human digestive enzymes. The goal of the Nutrient Data Laboratory was presented in two phases: Phase 1: individual carbohydrate components of 50 foods: sugars, total, soluble and insoluble fiber and Phase 2: 500 priority foods -- contribute 80% of key fiber components of public health significance

The update panel including presentations by government agencies is traditionally a highlight of the National Nutrient Databank Conference. This is a once a year opportunity to assemble those individuals who produce and/or use the nutrient data generated nationally to inform the users of the status of work being conducted in their departments.

- Joanne Holden of the Nutrient Data Laboratory mentioned that USDA Standard Reference Database, Release 11, would appear with a new structure. The primary dataset for 1995 CSFII contained 2500 foods and 30 components for use with the USDA recipe file. The National Nutrient Database for Child Nutrition Programs (Release 2) occurred in Fall 1995. And finally that there will be a database redesign in 1997.
- Jean Pennington presented an update of the FDA Total Diet Study indicating that the last analysis for 260 foods analyzed for pesticides, residues, industrial chemicals, radionuclides, toxic minerals and 2 vitamins published in 1991 was ongoing. A revised list of 305 foods will be implemented within next year.
- FDA labeling issues was presented by Tom O'Brien. FDA is planning to publish a proposal to amend the serving size rule; to complete the 1995 Food Label and Package Survey; to publish final rules for voluntary labeling of 60 raw fruits, vegetables, and fish; and has approved 44 databases for labeling.
- Gary Beecher of the Food Composition laboratory indicated that analytical methods were being developed for isoflavonoids, dietary fiber, folates, vitamin E, niacin, and carotenoids. There is a push for improvement of data quality and reducing costs of analysis.
- INFOODS update was presented by Barbara Burlingame who focused on the mission as one of an international network of food data systems. Its aims are to bring together, evaluate and document all available food composition data--national, regional and international levels. There are currently in existence 8 regional data centers and 3 in organizational stages. Workshops are designed to assist regions in maintaining national identity. INFOODS participates in developing standards to increase a country's authority and recognition.

Friday's program began with reports from National Surveys. Alanna Moshfegh described changes in food intakes -- 1977-1994. Grain mixtures were up 40%, in milk consumption there was an increase in low fat and skim milks, meat consumption saw a rise in mixtures of meats with other foods, consumption of eggs decreased by 37%, an increase in 3% for vegetables and 20% for fruits was also noted, as well as an astounding more than 100% rise in non-citrus juices for adults and an increase of >304% in children. Total fat calories were 33% (40% in 1978) but only 1/3 of males and females were consuming <30% fat calories. The survey also indicated that 50% of individuals ate away from home at least once a day and that 30% of males and 45% of females rarely or never do vigorous exercise!!!!

The NHANES III 1996 update was presented by Bethene Ervin who indicated that current research is devoted to underreporting, use of multiple 24-hour recalls, and comparison of in-person with telephone recalls. Interim files for phase I were released in September 1995, with complete NHANES III data files and survey manuals released in 1996. Planning for NHANES IV includes pilot testing 1996-1998, initiation in mid-1998. The sample size planned is 40,000 > 6 MONTHS OF AGE. Included are a 3-hour mobile exam and a one hour home interview. Twenty-four hour recalls will be conducted with 10% selected for a second recall. NHANES IV will include determination of heights, weights, skinfold measurements, as well as nutritional biochemical and hematologic tests. Vitamin and mineral supplement use will be determined by interview. A physical exam will be included with the manual for this having been developed by Kuczmarski.

Danielle Brule discussed the Canadian Food Consumption Surveys. In 1995 the Canadian Heart Health Initiative was begun as a partnership model with the provinces. A coalition of federal, provincial health representatives formed the partnership to obtain nutritional data at national and provincial levels. They developed protocol and diet assessment instruments - sociodemographic data, physical activity, knowledge and attitudes data. The survey was begun with adults and later included 6 to 17 year olds.

Plenary Session 4 concerned food supplements. NHANES III obtained data on prevalence of use and assessed contribution of supplements to total nutrient intakes and nutritional status. Types of supplements being used included: single, multiple vitamins, multivitamin-minerals; formula diets, sports drinks; herbs, plants, etc.; and amino acids, lipotropics and fish oils. This session also described what was termed a “certainty index.” This index includes: 1) matches for specific brand name products; 2) products in which the name is partially complete or misspelled; 3) nutrients known but not amounts; 4) only general product class identified; 5) unidentified, but believed to be a supplement; and 6) unidentified -- unknown product. There was some discussion on construction of a dietary supplement database with efforts provided by FDA, NCHS, USDA to collect dietary supplement data. It was noted that the Continuing Survey of Food Intakes by Individuals asks five questions regarding supplement use: how often supplements are taken; type taken; single supplements used; use of fish oil supplements; and use of fiber supplements. In 1994, 40% of those in the survey took multivitamins, 25 % used a multivitamin/mineral combination, 64% took vitamin C, 40% took vitamin E and 30% took a calcium supplement.

The papers presented this year are indicative of the expansive area nutrient databases and their use in national surveys are expected to cover. We heard everything from non-nutrients to supplements and focused on the broad spectrum of national data to the narrow area of Cajuns in Louisiana. Certainly we have seen that there has always been an adventure of some sort for nutrient database use. Moreover, it appears that nutrient databases, surveys utilizing nutrient databases, and developers of those nutrient databases will be faced with new challenges as new adventures ahead are sure to open up avenues not before seen.

GUIDELINES FOR OBTAINING HIGH QUALITY LABORATORY DATA

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ABSTRACT

Accurate and reliable food composition data are essential for food intake assessment, food manufacturing, labeling, regulation and trade. High quality analytical laboratories are key to generating high quality food composition data. The criteria for selection of a laboratory should be based on analytical performance, validation of method, and on-going quality control programs. This information is invaluable in the resolution of data that disagree. Performance can be monitored by requesting the analysis of in-house and/or standard reference materials with known concentrations. Laboratory in-house quality assurance programs provide the foundation for the ongoing generation of reliable data and can help laboratories to achieve accurate and precise values for ‘‘unknown” analytical samples of foods. Customers/database developers must request quality assurance data to be assured that the laboratory is continually producing high quality food composition data. In our experience over the last decade, attention to the details of these criteria has resulted in the generation of the known best data analytical laboratories are capable of producing.

MEASUREMENT OF "NEW" HEALTH-RELATED FOOD COMPONENTS

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ABSTRACT

Results from epidemiological studies continue to validate the importance of fruits, vegetables and fiber containing foods in the diet as effective means of reducing the risk of several debilitating diseases. The elucidation of the health promotion-role of the many biologically active components in plant foods requires databases of values and analytical techniques to generate data. Many compounds in plant-based foods have biological activities which are consistent with the promotion of health. Unfortunately, robust analytical methodologies have been developed for only a few families of these compounds. Examples include carotenoids, flavonoids, isofavones, lignans, phytosterols and tocotrienols. The analyses of these components requires a chromatographic separation step, gas liquid or high performance liquid chromatography, followed by quantitative detection with systems ranging from ultraviolet detectors to mass spectrometers. While a lot of attention has focused on 'new' health-related components in foods, some of the 'old' nutrients also have received analytical attention. These include measurement of all of the forms of tocopherol, improved extraction of folates and identification of a reduced form of vitamin K in hydrogenated foods. Examples of recent advances in the measurement of nutrients and health-related food components will be discussed.

Paper transcribed from tape:

First of all, I thank the program chairs of the Nutrient Data Bank Conference for inviting me to discuss this topic. I am so happy that Chris, Dr. Christopher Beecher, made the presentation that he did this morning because he really set the stage for what I'm going to talk about this afternoon in terms of several families of components that are present in foods and that have biological activity. Let me try to set the stage for you in terms of why we are interested in a number of components of foods that are "non-nutrients." I don't like that term. I hope that sooner or later we will come up with a term that is more definitive of these components and non-nutrients. For the time being, at least, I'll talk about them in terms of food components. Other people may talk about them in terms of non-nutrients. But, nevertheless, we're talking about the same thing.

The point that I want to make in terms of setting the stage for you is that because of the wealth of epidemiological data that we now have available relative to the intakes of specific foods and the incidence of certain debilitating diseases, the general overall and overwhelming observations that we can make from these data are that fruits, vegetables, and fiber containing foods are associated with a decreased disease risk or a decreased incidence of disease. If you look, then, at the traditional nutrients, that is those nutrients for which there are either RDA's or for which there are estimated safe ranges of daily dietary intake, which I call traditional nutrients, these nutrients are important but they do not account for all of the epidemiological observations that have been made relative to the association of food intake with disease risk and disease incidence.

We also know from the plant physiology and from the studies that Chris talked about this morning, that there are many, many additional components in foods that have wide ranging biological activity. From plant physiology, we know that plant materials develop these secondary metabolites simply as a defense mechanism to protect the plant from disease, fungi, and a number of other things. Remember now, there are very few plants that can swat a fly or swat an insect like we can or like other mammals can. So they have to develop other defense systems. It is not surprising that some of these same chemicals that the plant has developed for its defense might also be important in terms of biological systems in mammalian systems.

Biological activities that we hear about in great detail today include antioxidant activity which stimulates detoxifying enzymes. These are the Phase Two P450 enzyme series as well as other enzyme systems in the body. Some of these components have hormone-like activities or are metabolized in the GI tract into compounds that have hormone-like activities. Some of these compounds stimulate cell gap junction communication which is important in controlling the development and the expansiveness of each individual cell within the body or within an organ. And then there are a whole host of other biologic activities that I won't take time to discuss today. This sets the stage for our interest and where we are in the whole field of nutrition and human biochemistry and physiology relative to what's in the foods in the food systems that we have today.

Then there are a whole laundry list of components many of which we have heard about already today. I'm sure you've heard and seen at least some of these some place in the literature, some place in the popular press as being important relative to biological activity and also being part of specific food and the food supply in general. What I'd like to do then is rearrange this laundry list of food components and put them together chemically and to some extent with biological activity and discuss where we are and what we understand about the biological activity. This then leads us to where we are in terms of analytic methodology, and where we are in terms of having access to comprehensive data relative to the composition and to the levels of these components in foods.

I'd like to start out with the carotenoids. As you know, we have been working on carotenoids in the food composition lab for a number of years. In general, and for many years, the sole activity that was attributed to the carotenoids has been anti-oxidant activity. Remember that a handful of the carotenoids also have Vitamin A activity, that is they are converted to retinol and other Vitamin A active components by the mammalian system. That's a given for some of these carotenoids. All of the carotenoids have some anti-oxidant activity as far as we can tell at this point.

Lycopene, the carotenoid that provides the red color in tomatoes appears to be the most active in terms of anti-oxidant activity. These studies have been done by Helmut Seese and his colleagues in Dusseldorf in *in-vitro* systems. Fred Khachik in our group has observed the oxidation products of both lutein and lycopene in the plasma of human beings. This varies with the nutritional state of the human beings as well as the levels of carotenoids that are fed to those subjects. Fairly recently there has been the observation that the intakes of lutein and zeaxanthin appear to be associated with a reduction in the risk of adult macro-degeneration, AMD. This is work by Joanne Sutton out of Boston. It's interesting that from what we can tell at this point there is very little zeaxanthin provided in the food supply, but there is a considerable amount of lutein. All of the green foods have a substantial amount of lutein in them. There are also physiological studies from the University of Miami that suggest that there is a considerable amount of metabolism of lutein to zeaxanthin in the retina and also in the macula of the eye. It would appear that this is one of the first evidence that there is conversation of one carotenoid to another in the human body. I'll talk a little bit about where we stand with zeaxanthin in just a minute.

Finally, I don't think any of us have avoided the observance in the popular press that beta carotene supplements, pure supplements, appear to increase the risk of certain cancers in certain sub-populations, that is those populations that are smokers or that have recently smoked and also those people that have been subjected to environmental conditions such as high asbestos areas and those sorts of things. Beta carotene has not been the silver bullet that many people have thought that it would be. The status now with the database is: we've developed analytic methods. All of you know that we put out the database in 1993 for 5 carotenoids. Clive West and Eric Portly at Wageningen Agricultural University in the Netherlands have published a book on the beta carotene content and a few other carotenoids where the carotenoid data are available for the rest of the world. That book was published in 1995 or 1996. I can get you the reference if you're interested in it. We are currently in the process of updating the database.

Chris Spangler in our laboratory is busy running carotenoid analysis on foods. This is a joint project that has been funded by the National Cancer Institute as well as our own group at the USDA. It's a joint study with the Nutrition Coordinating Center at the University of Minnesota and with Marilyn Buzzard while she was still at NCC; and since she has left NCC and is now at the Medical College of Virginia, we are collaborating with her there. We are updating the database with values from around the world. We are incorporating the West-Portly data into the database and also adding new data that have been published since that database was put out. We expect this database should be available late '97 or early '98, the updated version. That gives you some idea of what to expect for carotenoids.

Chris mentioned flavonoids and talked a little bit about food flavonoids. This family of compounds has certainly got a lot of press lately. Probably the work of Hertog et al. in the Netherlands through epidemiological work and also through analysis and development of a database on food flavonoids shows at least some of these compounds with a reduced risk of cardiovascular disease. This is the famous Zutphen study. The flavonoids are a very large family of compounds in the order of somewhere between 3 to 5 thousand compounds in the plant kingdom. Fortunately, we don't have to deal with quite that many in the foods that we commonly consume. Probably something on the order of 20 specific molecular entities are in the foods that we commonly consume. The work in the Netherlands was really eye-opening in terms of bringing us up to speed or at least getting us to think about the importance of these compounds.

If we look in the literature, there has been some considerable work in the Orient looking at green tea and reduced instance of cancer and reduced risk of cancer. As we look at the green teas in particular, one of the major components in the tea are the flavonoids so we're fairly certain that there is some association here between the flavonoids and the reduced incidence of cancer.

There is the whole issue of the French paradox. That is why do people that drink substantial amounts of red wine especially with meals and have fairly high saturated fat intake have a fairly low incidence of cardiovascular disease. The red wines contain a considerable level of flavonoids as well as other phenolic compounds. The important factor has been between these particular phenolic compounds as being the effectors of the reduced incidence of cardiovascular disease in this particular sub-population. One of the important biological activities that this family of compounds excels in is their antioxidant activity. Again, these are *in-vitro* systems that have been used to measure this antioxidant activity. The antioxidant activity varies from what is equal to Vitamin E antioxidant activity up to 5 times the levels of Vitamin E, so they have a tremendous amount of anti-oxidant activity. And assuming that, that antioxidant activity is one of the important biological activities for this family of compounds.

Where do we stand relative to the analytical status? Michael Hertog and his colleagues developed at the analytic methods for measuring 5 flavonoids, three of which are the most common flavonoids in the food supply. That is quercetin, myricetin, and kaempferol. They also as part of that analytical system are also able to measure lutein and anhydrolutein. Those are the flavonoids that are common in such things as onions, kale, and other commonly consumed fruits and vegetables. Bill Bronner in our lab who has been working on methodology development for flavonoids also and published a paper a couple of years ago on the development of methods for extracting and measuring the flavonoids in citrus, grapefruit and oranges. We are currently working on the methods for measuring the flavonoids in tea, that is the family of flavonoids called the catechins. We should have that methodology ready to go fairly soon. There is very little information in the literature on the quantification, the national level of flavonoids in US foods. Hertog and his colleagues have published data on the flavonoid content, that is the levels of 5 flavonoids on the food that are commonly consumed in the Netherlands. Those data have been published in the Journal of Agricultural and Food Chemistry. But there is little other analytical data that had been published using modern techniques. We're in the process right now of analyzing foods, using the techniques that we've developed in the laboratory, and this summer we will set up the techniques that Hertog and this colleagues developed and will measure the flavonoid levels of specific foods. This is part of an NIH grant as well as with funding from our own organization we will try to develop some sort of rudimentary database on about the same schedule as updating the carotenoid database and provide it to use in your studies to assess the impact of specific flavonoids on the particular biologic endpoints that you're looking at.

Another family of compounds or groups of compounds with similar biologic activity are what I call the food estrogens. The biology of these have either directly or can be converted to compounds to that have estrogenic activity. There are 2 families of compounds that are involved here. First, the isoflavonoids which are closely related to the flavonoids and are at present in legumes but primarily in the soy-based foods that human beings eat. Then there is the other family of compounds called the lignins, which are present in high fiber foods such as foods that are made from flax and rye, to ascertain extent wheat containing foods, and then to an even more limited extent, fruits and vegetables. As I indicated, the biologic activity is estrogenic-like activity. Most of this estrogenic activity is developed in the GI tract of the human being, that is these compounds are metabolized by the microflora to produce the compounds that have estrogenic activity. In addition, these compounds do have antioxidant activity at least as measured by *in vitro* systems.

Dr. Pat Murphy, who has presented a paper at this meeting in the past, is the guru of isoflavonoid analysis in the world. She's been quietly working on it at Iowa State since the early 80's as part of plant breeding and soybean breeding to develop strains that are high in these compounds and has gotten little publicity until the human biological activity has become important.. Others working to measure these compounds are located at the Cancer Center of Hawaii and the University of Alabama at Birmingham. Relative to lignins, which are the estrogenic precursors, researchers at the University of Helsinki have just published a paper in Analytical Biochemistry describing developed methods for measuring the two lignins that are precursors to estrogenic compounds.

There are a whole family of lignins in foods we think are important biologically. Dr. Betty Li and I in our laboratory are currently recruiting a post-doc to work in this specific field. Relative to the amount of lignins from a food that have mammalian derived estrogenic activity, Lillian Thompson at the University of Toronto has developed methods for measuring those. So, relative to the database status, again we have a joint project with Pat Murphy at Iowa State to develop data to provide a database. That's really all there is at this point relative to lignins in terms of data that has been published or has been collated.

I'd like to turn next to the sulfur compounds. Again, Chris touched on this this morning with just a couple of examples. I've categorized all the sulfur compounds together because I think that their biological activity, at least from what we understand, is very similar in that their biological activity appears to reduce cancer risk, probably through the induction of detoxifying enzymes. These sulfur-containing molecules appear to turn on these enzymes. Many of these come from cruciferous vegetables. Researchers at Johns Hopkins have done quite a bit of work with sulfur compounds from broccoli and it's reasonable to expect other cruciferous vegetables contain this family of compounds. Concerning analytical status, rugged analytical methodology needs to be developed and a database as well since there is none. Again, this is down on the priority list for our laboratory. I cant assure you when we will get to it, but it certainly is coming up fairly soon on the priority list.

Chris also mentioned the saponins family of compounds. These compounds have been shown to reduce plasma cholesterol and also appear to reduce risk of cancer. The mechanism appears to be through binding of dietary cholesterol, bile acids and lipids, probably because these compounds have a structure that is very similar to cholesterol. The structure of saponins is about the same shape and dimension as cholesterol and that appears to be the reason it is active in terms of binding cholesterol. These compounds are present in legumes and some spices. We need to develop methods and there are no databases, at least as we understand the databases that have data for this particular group of food components.

Phytosterols are compounds that are closely related to cholesterol also. We don't know whether these compounds are absorbed like cholesterol. There is a guess-timate that the daily intake of these compounds if one is eating substantial amounts of fruits and vegetables could be as much as 250 mg a day. Rudimentary analytical methods for phytosterols were developed in our laboratory back in the '80s. Katherine Phillips, and Kent Stewart while he was still at VPI, worked on the project, modifying these methods and they have now been developed to a robust level and are ready to go in terms of measuring these compounds in foods and other materials. We have no database at this point.

Let me make some comments relative to the old nutrients. I don't think that we can forget that we have extensive data on traditional nutrients for which there are RDA values. Let me just highlight some points on what is happening with some methodologies for this particular family of nutrients. For vitamin E, the tocopherols, we can now separate and measure all four forms of vitamin E. This has happened in the last couple of years. Along the same lines and using some of the same techniques, in fact some of the same analyses, we can measure all four forms of a family of compounds that are closely related to vitamin E, that is the tocotrienols. These are the compounds that are present in such things as rice bran oil and other isolated oils that may impact reduction of cholesterol and risk of cardiovascular disease. Since we can now measure these, it's simply a matter of getting to the point of developing databases that have the details for the various forms.

Folic acid continues to be a challenging nutrient. As you all know, FDA has approved fortification of flours with folic acid. That has challenged us now to be able to develop an analytical method that is rugged and routine for the measurement of this component in specific foods. I feel that all of the things are in place to be able to do that; it is simply a matter of getting around to doing it and putting it all together. There have also been advances made by the Finns in the total extraction of the indigenous folates in vegetables. This is also a very difficult area that is going to require some time before we can get a methodology put together for it.

And finally, some recent work at the USDA Human Nutrition Center at Tufts has resulted in the finding of a reduced form of vitamin K in the margarines that have been subjected to hydrogenation. We don't know what the biological activity of that particular compound is, but it's present in fairly high levels. As much as 50% of the total vitamin K in these margarines has been observed to be reduced as part of the hydrogenation process. These are some new developments for what I call "old" nutrients.

So, in summary, fruits, vegetables, and fiber-containing foods are obviously associated with health. The traditional nutrients don't account for all of the decreased disease risk that has been observed with these particular foods. There are many components in plant foods with biological activities that support health. And, yes, I think we have to remember that if we overdose on either a food or one of these components, it is quite likely that it is going to become toxic. We always need to remember that particular component of this area of biological research. And, finally, I've discussed with you the measurement systems and the database development and the state of those activities for a number of these particular components.

Thank you very much for your attention.

Paper C1-3	***Dietary Fiber in the National Nutrient Databank: Data and Methods*** *Karen Andrews, USDA/ARS/NDL*

DIETARY FIBER IN THE NATIONAL NUTRIENT DATABANK: DATA AND METHODS

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ABSTRACT

The dietary intake of total dietary fiber for adults is 13.2 g/day according to the USDA 1989-1991 Continuing Survey of Food Intakes by Individuals (CSFII). Forty-three percent of the dietary fiber intake comes from grains and predominantly grain mixtures while 27.5% comes from vegetables; 10.1% comes from fruits and 7.2% comes from legumes, nuts and seeds. The dietary fiber data used in the USDA's surveys are generated by the method, AOAC 985.29, an enzymatic-gravimetric method of analysis. Data from contracted analyses, other government agencies, industry, and the scientific literature are reviewed and incorporated when appropriate. New methods of analysis for dietary fiber and related carbohydrate fractions are also evaluated. As clinical and epidemiological research continues to document the positive health effects of foods high in dietary fiber and dietary fiber components, the Nutrient Data Laboratory is making plans to expand its carbohydrate database. The long range goal of the Nutrient Data Laboratory is to compile quality data on individual carbohydrate components and report total carbohydrate by direct analysis. The dietary fiber components that have been identified as immediate priorities are total dietary fiber, soluble dietary fiber and insoluble dietary fiber. The Key Foods (Key Foods include approximately 500 foods which, either by themselves or as part of food mixtures, contribute 80% of the "key" nutrients of public health significance to the U.S. diet) have been identified as priority foods for the analysis of these dietary fiber components.

Introduction

As clinical and epidemiological research continues to document the positive health effects of foods high in dietary fiber and dietary fiber components, the Nutrient Data Laboratory (NDL) is making plans to expand the carbohydrate fractions published in USDA food composition databases. The carbohydrate data published in USDA databases is obtained from USDA contracted analyses, the scientific literature, the food industry and other government agencies. At the 1993 National Nutrient Databank Conference, the paper, “Carbohydrate Data - Present and Future Needs” (1) discussed the replacement of all crude fiber and neutral detergent fiber values with total dietary fiber (TDF) in the National Nutrient Databank for Standard Reference Release 10. (2) At that time, the TDF data used in the USDA database were generated by one method, AOAC 985.29, an enzymatic-gravimetric method of analysis. (3) This paper includes an update on approved TDF methodologies, a discussion of the status of soluble and insoluble dietary fiber data and the current status of fiber data in USDA databases.

Mean Intake of Dietary Fiber

According to the 1989-91 USDA Continuing Survey of Intakes by Individuals (CSFII) (4), women in this country consume an average of 12.3 g of TDF per day and men consume an average of 16.7 g of TDF per day. Although men consumed more fiber than women per day, women showed a slightly higher rate of dietary fiber consumption per 1000 kcal. (8.2 g/1000 kcal vs 7.7 g/1000 kcal). Forty-three percent of the dietary fiber intake was from grains and predominantly grain mixtures while 27.5% was from vegetables; 10.1% from fruits and 7.2% from legumes, nuts and seeds.

The results from this and other comparable surveys were discussed at a recent workshop at the 1996 Vahouny Fiber Symposium. (5) In order to encourage consumers to increase their consumption of high fiber foods, workshop members proposed that a formal recommendation be made to the National Research Council to establish an RDA (Recommended Daily Allowance) for dietary fiber based on the National Cancer Institute guidelines of 20-35 grams of fiber per day. The members of this workshop also specifically recommended that an RDA not be established for soluble and insoluble fiber because they felt that there is not enough evidence that measurements using current analytical methods can predict physiologic response.

Dietary Fiber Definition

The most accurate definition of dietary fiber is still being debated among researchers in this field. Since the 1970s, the definition that has been generally accepted defines dietary fiber as the remnants of plant residues (polysaccharides and lignin) which are resistant to hydrolysis by human digestive enzymes. (6) In a recent international survey (7), a majority of dietary fiber researchers agreed on the following points:

- The term “dietary fiber” should be preserved.
- The definition of dietary fiber should be based on chemical and physiological perspectives.
- Oligosaccharides that are resistant to human alimentary enzymes should be included in the dietary fiber definition.
- Having a common definition of dietary fiber is important to advance analytical methods.
- Enzymatic-gravimetric methods of analysis are most appropriate for nutrition labeling and quality control research purposes.
- Enzymatic-chemical methods of analysis are most appropriate for nutrition researchers for whom a detailed listing of dietary fiber components is beneficial.

AOAC- Approved Methods for the Analysis of Total Dietary Fiber

As recently as 1992, the only dietary fiber methods approved by AOAC (Association of Analytical Chemists) INTERNATIONAL were two very similar enzymatic-gravimetric methods. There are now five methods that have been approved by AOAC for the analysis of total dietary fiber in foods (3). Table 1 lists the five methods for total dietary fiber and two methods for soluble and insoluble dietary fiber analysis. The original enzymatic-gravimetric method, No. 985.29, was approved first action in 1985 and is known as the “Prosky” method. The additional methods listed below this method are revisions which optimize soluble and insoluble analysis. Method No. 991.43 is similar to the Prosky method, but uses a MES-tris buffer instead of a phosphate buffer to adjust pH. Both of these methods have been recommended by the Food and Drug Administration for compliance with food labeling regulations and have been approved by AOAC for the analysis of soluble and insoluble dietary fiber.

The last three methods in Table 1, numbers 992.16, 993.21 and 994.13, have been approved by AOAC in the last four years. The first of these methods is an enzymatic-gravimetric method that was developed in Canada and is known as the “Mongeau” method. This method determines total fiber by summing the results of a soluble fiber analysis with an insoluble (neutral detergent fiber) analysis.

The second method, Total Dietary Fiber in Foods and Food Products with less than or equal to 2% starch, is a simplification of the Prosky method and is referred to as a non-enzymatic gravimetric method. The starch hydrolysis step is removed from this method which is only applicable for foods that are very low in starch, such as most fruits and vegetables. This method only determines total dietary fiber content.

The last method listed in Table 1, known as the "Uppsala" or "Theander" method, is a chemical method for determining total dietary fiber in foods. As in most of the other methods, free sugars, starch, protein and fat are removed from the sample. Soluble and insoluble fractions are separated. Instead of weighing dried residues, as in the gravimetric methods, the fractions are hydrolyzed with sulfuric acid and the individual neutral sugars are analyzed by high-performance liquid or gas chromatography. Pectin is measured colorimetrically and lignins are measured gravimetrically.

Table 1. AOAC - Approved Methods for the Analysis of Dietary Fiber

Method No.	Method Title	First Action/ Final Action	Description
985.29	Total Dietary Fiber in Foods. Enzymatic-Gravimetric Method	1985/ 1986	Known as "Prosky" method. **Approved for labeling**.
991.42	Insoluble Dietary Fiber in Foods and Food Products. Enzymatic-Gravimetric Method (Phosphate Buffer)	1991/ 1994	Revised Prosky method for measuring insoluble fiber. Applicable for vegetables, fruit, and cereal grains. **Approved for labeling**.
993.19	Soluble Dietary Fiber in Food and Food Products. Enzymatic-Gravimetric Method (Phosphate Buffer)	1993	Revised Prosky method for measuring soluble fiber.
991.43	Total, Soluble and Insoluble Dietary Fiber in Foods. Enzymatic-Gravimetric Method (MES-Tris Buffer)	1991/ 1994	Improved Prosky method, buffer change improved precision. Applicable to processed foods, grain and cereal products, fruits and vegetables. **Approved for labeling**.
992.16	Total Dietary Fiber. Enzymatic-Gravimetric Method	1992	Known as "Mongeau" method. Applicable for cereals, beans, vegetables and fruits.
993.21	Total Dietary Fiber in Food and Food Products With $\leq$2% Starch. Non-Enzymatic-Gravimetric Method	1993	Enzyme step removed for low starch foods, applicable to determination of $\geq$10% total dietary fiber in foods with $\leq$2% starch (dwb).
994.13	Total Dietary Fiber (Determined as neutral sugar residues, uronic acid residues, Klason lignin). Gas Chromatographic-Colorometric-Gravimetric Method	1994	Known as "Uppsala" or "Theander" method, Very different from the other methods--a chemical method.

It is interesting to note that two of these last three methods have been approved by AOAC only for TDF analysis, even though the separation of soluble and insoluble portions is an integral part of the methods. The total dietary fiber value for the Mongeau method (992.16) is actually determined as a sum of soluble and insoluble determinations. As mentioned earlier, the Uppsala method (994.13) separates soluble and insoluble fractions before generating values for the individual chemical components.

Several studies have addressed the differences in results using these methods. Asp and coworkers (8) have reported as much or more variability between laboratories for each method than variability between the methods (The Englyst method for non-starch polysaccharides was included in their study). Other studies show relatively linear correlations between methods, but these are usually food type dependent. For example, when comparing the enzymatic gravimetric (phosphate buffer) and the Mongeau methods, TDF values for fruits and vegetables are very similar. (9) However, TDF values for dried, cooked legumes are much higher using the phosphate buffer method because of the significant amount of resistant starch in these foods. (10) For fruits, the TDF values obtained using the Uppsala method are consistently lower than values obtained using the Enzymatic gravimetric (phosphate buffer) method. (11)

Dietary Fiber and other Carbohydrate Data in the National Nutrient Databank

A long range goal of the Nutrient Data Laboratory is to compile high quality data on individual carbohydrate components and to report carbohydrate by direct analysis. Immediate nutrient priorities are soluble and insoluble dietary fiber . Immediate food priorities are high consumption and high fiber foods on NDL's Key Foods list. (12) Key Foods are defined as those foods which, either by themselves or in mixtures, cumulatively contribute 80% of the intake of a key nutrient of public health significance to the US diet. When the foods in the 1995 Key Foods list were ranked by fiber content and total grams consumed, 72% of the dietary fiber consumed in this country came from only 100 foods.

In order to begin the process of compiling soluble and insoluble dietary fiber data and other priority nutrients such as starch and individual sugars, a three-part project was begun in 1993. Over 50 Key Foods were selected for analysis. Sampling plans were determined for each food based on 1988 sales (Nielsen Scantrack) data (13) and consultations with food specialists. Top name brands or varieties of foods were purchased from two major grocery chains and composited for each food. An overview of the sampling plan used for each food group is listed in Table 2.

In the first year of this project, the foods were purchased and prepared for analysis. They were analyzed for moisture, soluble and insoluble dietary fiber and individual sugars. In the second year, the foods were analyzed for individual sugars and total dietary fiber using different methods. They were also analyzed for starch content. These two phases of this project are now complete. Some of the carbohydrate data are discussed in detail in the poster, "Carbohydrate Data for Selected Foods in USDA's National Nutrient Database", (14) presented at this conference.

The third phase of this project will determine the rest of the proximate components (protein, ash and fat). The calculated carbohydrate by difference value will then be compared to carbohydrate determined directly using several methods.

Release 11 of Standard Reference

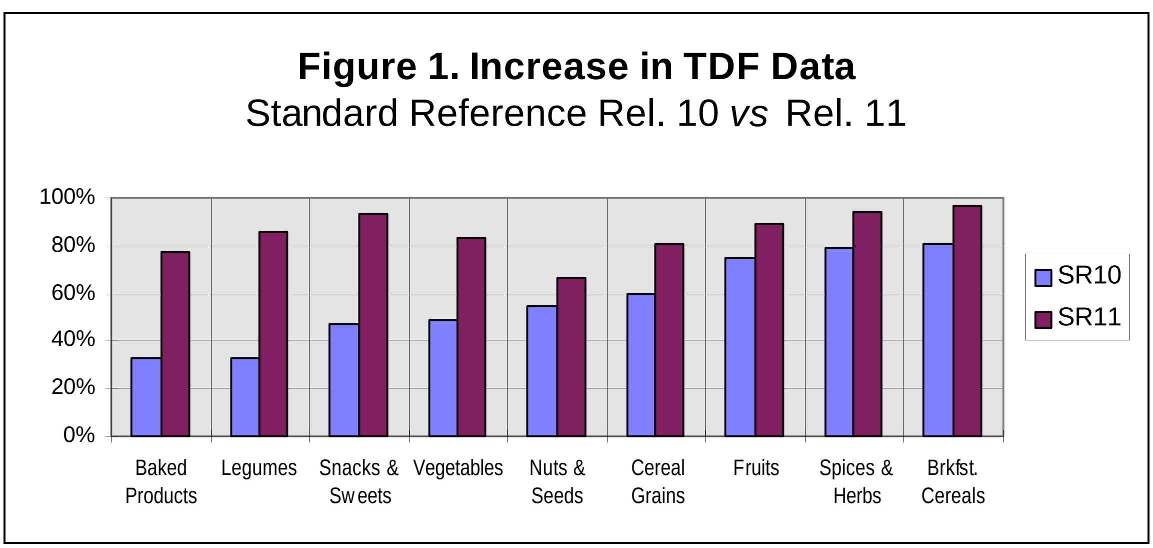
In September, 1996, the Nutrient Data Laboratory will be releasing Standard Reference Release 11, (15) which will be available from our bulletin board and via the Internet. An on-line search program will be offered which will allow unique data queries. The TDF values in Standard Reference, which have been updated and expanded in all of the food group categories, will be included. Soluble and insoluble fiber data will be available at a later date.

Table 2. Sampling Plan Summary

Food Category	No. of Foods[1]	General Sampling Plan (each food)
Baked Products	14	Top 1 or 2 name brands purchased from 2 major grocery chains and composited
Cereal Grains and Pasta[2]	10	Top 2 or 3 brands (sometimes included a store brand) composited
Legumes, canned	8	
Fruits and Fruit Juices	19	Same variety (when possible) purchased from 2 major grocery chains and composited
Vegetables, raw and cooked	16	
Snacks and Sweets[2]	7	Top 2 brands composited
Vegetables, frozen	2	

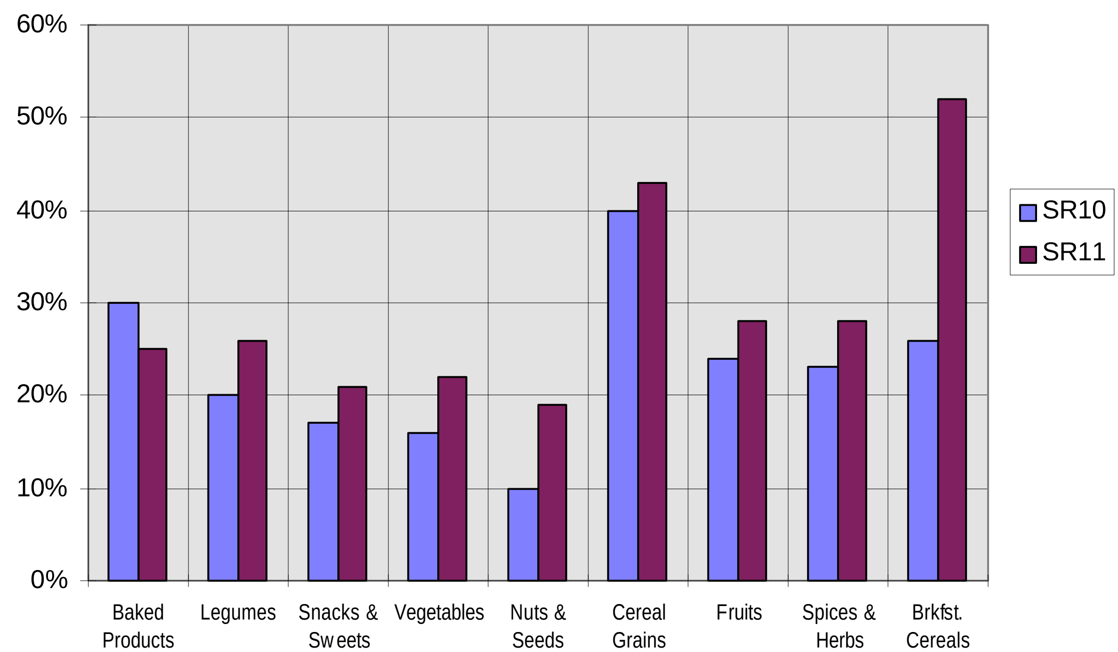
[1]No.of foods = n.
[2]In a few cases, the top brand had such a high market share, that this brand was purchased from 2 major grocery chains and composited.

Figures 1 and 2 are graphical representations of the status of the TDF data in Standard Reference Release 11 as compared to Standard Reference Release 10. TDF values were first published in Standard Reference with Release 10 in July, 1993. In Figure 1, the percentages of foods with dietary fiber values are compared by food group. In Release 10, these values ranged from 34% in Baked Products to 80% in Breakfast Cereals. The percentage of TDF data in Release 11 will increase for all food groups, ranging from 68% in Nuts and Seeds to 97% in Breakfast Cereals.



In Figure 2, the percentage of analytical TDF values is compared. The percentage of analytical TDF values increased in all food groups except baked products, where some TDF values determined by recipe using newer formulations replaced analytical values with counts of 1 or 2. For the other food groups, the analytical percentages in Release 10 ranged from 10% in Nuts and Seeds to 44% in Cereal Grains and Pasta. In Release 11, the analytical percentages will increase from 20% in Nuts and Seeds to 53% in Breakfast Cereals.

Figure 2. Increase in Analytical TDF %
Standard Reference Rel. 10 *vs* Rel. 11



Conclusion

The carbohydrate content of foods is an increasingly important area of food composition research. A number of new methods for determining dietary fiber in foods have been approved by AOAC in the last four years. The Nutrient Data Laboratory has begun to fund contracts for the gravimetric analysis of soluble and insoluble dietary fiber and the analysis of individual sugars and starch in Key Foods. This is the first step toward determining total carbohydrate directly by summing carbohydrate fractions instead of determining carbohydrate by difference in USDA food composition databases.

References:

1. Andrews, K.W. and Pehrsson, P.R. 1993. Carbohydrate Data -- Present and Future Needs. Proceedings of the 18th National Nutrient Databank Conference. Baton Rouge, LA. pp. 164-172.
2. U.S. Department of Agriculture, Agricultural Research Service. 1993. USDA Nutrient Data Base for Standard Reference, Rel.#10. Springfield, VA; National Technical Information Service. Accession No. PB93-502771. Computer Diskette.
3. Official Methods of Analysis. 1995. 16th edition. AOAC International, Gaithersburg, MD.
4. Continuing Survey of Food Intakes by Individuals (CSFII), 1989-1991. U.S. Department of

Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center, Food Surveys Research Group, Riverdale, MD.
5. Bonfield, C.and Kritchevsky, D., eds. Dietary Fiber in Health and Disease. Plenum Press, Inc. NY, NY (in press). Proceedings of the Fifth Vahouny Symposium, Washington, D.C., March 26-29, 1996.
6. Trowell, et. al. 1976. Dietary fiber redefined. Lancet 1: 976.
7. Lee, S.C. and Prosky, L. 1995. International Survey on Dietary Fiber: Definition, Analysis, and Reference Materials. J. AOAC Intl. 70: 22-36.
8. Asp, N.G. 1995. Dietary fiber analysis -- an overview. Eur. J. Clin. Nutr. 49 (suppl. 3): s42-s47.
9. Mongeau R. and Brassard, R. 1989. A Comparison of Three Methods for Analyzing Dietary Fiber in 38 Foods. J. Food Comp. Anal. 2: 189-199.
10. Mongeau R. and Brassard, R. 1994. Comparison and Assessment of the Difference in Total Dietary Fiber in Cooked Dried Legumes as Determined by Five Methods. J. AOAC Intl. 77(5): 1197-1201.
11. Marlett, J. A. And Vollendorf, N.W. 1994. Dietary fiber and composition of different forms of fruits. Food Chem. 51: 39-44.
12. Haytowitz, D.H. et al. 1996. Key Foods: Setting Priorities for Nutrient Analyses. J. Food Comp. Anal. (in press).
13. Nielsen Scantrack® , Nielsen Company, Northbrook, IL.
14. Andrews, K.W. and Pehrsson, P.R. 1996. Poster presentation at 21st National Nutrient Databank Conference. Baton Rouge, LA.
15. U.S. Department of Agriculture, Agricultural Research Service. 1996. USDA Nutrient Database for Standard Reference, Release 11. Nutrient Data Laboratory Home Page, http://www.nal.usda.gov/fnic/foodcomp

USDA NUTRIENT DATABASE FOR STANDARD REFERENCE, RELEASE 11

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ABSTRACT

USDA has been producing electronic forms of Agriculture Handbook No. 8—the USDA Nutrient Database for Standard Reference (SR)—for almost 20 years. Previously the database was only useable on a large mainframe computer; advances in hardware and software have made it possible to do most work with the database on a personal computer. Relational Database Management Systems designed for the personal computer have brought procedures such as specialized queries, data searches, and report generation which once required customized programs, to the desktop and the user. To meet the needs of its users, the Nutrient Data Laboratory has developed a new format for the SR database, using a relational structure. The various files that make up the new SR database and their relationships are described. New data fields have been added to provide more information on the data reported. The layout of these and existing fields will also be described. The structure of the SR database is not the only thing that has changed--many data have been revised and new items have been added. Extensive data on beef and lamb cuts trimmed to 1/8" external fat have been added to the database as have selected new data on ethnic foods. Updated values on breakfast cereals and canned vegetables, are also included in the revised SR database. Data on vitamin E and total dietary fiber have been revised and expanded.

Introduction

The USDA Nutrient Database for Standard Reference (SR) is the major source of food composition data in the United States and provides the foundation for most public and private sector databases. As food composition data are updated, new versions of the database are released. This version, the USDA Nutrient Database for Standard Reference, Release 11 (SR11) contains data on approximately 5600 food items for over 70 nutrients. It replaces the previous release (SR10) issued in July 1993 and adds food composition data for several hundred new items. A number of other items have been updated and new information on all foods such as type of data and INFOODS tagnames (2) have been added. Although most foods, with the exception of breakfast cereals and infant formulas, have generic descriptions, there has been an expansion of data for brand name products. A relational structure was adopted for this release. Where once there was only a nutrient file and a coding manual, there are now several principal files and a number of support files linked by key fields in each file. SR11 includes all the food composition data published in the 21 sections and four supplements of Agriculture Handbook No. 8 (AH-8) (3-27) and supersedes it. In the future, it will be superseded by subsequent releases.

Changes and Updates

Along with changes in structure, there are also changes in the data. New items have been added and old items have been updated. Among these are vitamin E values, which are now all reported in milligrams of a-tocopherol equivalents. New values have been provided for a number of breakfast cereals and those products which are no longer marketed have been removed. Updated data on brand name candies are also available. In the past few years the canned vegetable packers and soup manufacturer’s have reformulated their products to lower the sodium

content. The values for sodium in these products have been updated to reflect this change. When the section on baby foods
was first published, no data on infant formulas were included. These also have been added to SR11. New data on beef T-bone and porterhouse steaks have been added. Market basket studies show that the average fat-trim on beef and lamb cuts is now 1/8". In consideration of this change in the market, new beef and lamb cuts trimmed to 1/8" external fat have been added to SR11. In addition, selected items from a contract sponsored by the Nutrient Data Laboratory (NDL) on ethnic foods have also been included. More will be added in the interim release.

SR11 has been made available on the Nutrient Data Laboratory Home Page and Bulletin Board in a variety of formats. Two relational files are available in both ASCII and DBF. An abbreviated file, containing fewer nutrients, is also available in both ASCII and DBF. The data have also been converted to the International Food Distributors Association's (IFDA) Product Data Exchange Format, Version 3.0. (1) which was developed to facilitate the exchange of product information, including nutrient data, between food manufacturers, suppliers and their various clients throughout the food chain. The relational file formats allow users to import and query the data, using a database management software package.

Planning is underway to produce a CD-ROM containing the above mentioned SR11 files. Because of time constraints, the CD-ROM will be available with the first interim release. This interim release will add items, for which data were received too late, to be included with the intial release of SR11. It is anticipated that interim releases will follow about 6 months after the primary release.

An online program is also available on our home page which permits users to look up the nutrient content of any food in the database. The user enters a food name or portion of the name, and is then given a list of items which contain the entered term. After selecting the food item to be displayed the user is given a list of household weights available for that food. The user can select to report the data on the 100-gram basis and up to three household weights, or if the 100-gram option is not selected, up to 5 household weights. The user then gets a report, suitable for printing, of the nutrients in that food calculated to the household weights selected.

The Nutrient Data Laboratories home page has been moved to a web site managed by the National Agricultural Library. The new URL is:

http://www.nal.usda.gov/fnic/foodcomp

Quality Control

A number of tests were conducted to insure data integrity: 1) review of all foods in the nutrient file to determine if there were corresponding records in the description file? 2) summing the proximates to verify that they add up to 100? 3) checking the energy value to see that it is less than the sum of protein and carbohydrate value times four and the fat value times nine? 4) summing the mineral values to verify that it is less than the ash value? 5) checking to see if the vitamin A value reported in RE is less than that reported in IU? 6) summing the total saturated, total monounsaturated and total polyunsaturated fatty acids to verify that it is less than the total fat value? 7) summing of the individual fatty acids to verify that it less than the total fat value? 8) summing the individual saturated fatty acids to verify that it is less than the value for total saturated fatty acids? 9) summing the individual monounsaturated fatty acids to verify that it is less than the value for total monounsaturated fatty acids? and 10) summing the individual polyunsaturated fatty acids to verify that it is less than the value for total polyunsaturated fatty acids? Reports listing any exceptions were reviewed by food specialists and either explained or corrected.

Explanation of File Formats

The database is comprised of several separate files. There are three principal files: Food Description File (Table 1), Nutrient Data File (Table 2), and Gram Weight File (Table 5). There are four support files: Nutrient Definition File (Table 4), Measure Description File (Table 6), Source Codes File (Table 7) and Food Group Description File (Table 9). A diagram showing the relationship between these files is given in Figure 1.

Figure 1 - Relationships between Principal Files and Support Files

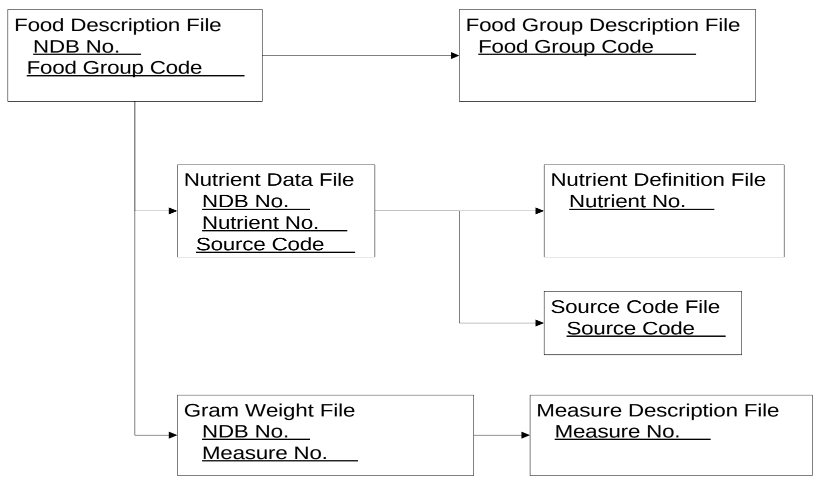

Table 1 - Food Description File: (File Name = FOOD_DES)

The Food Description File contains both a long and short description for 5,635 food items along with the scientific name, refuse, and the factors used for calculating protein, calories and fatty acids if applicable.

- Links to the Food Group Description File by the FdGp_Cd field.
- Links to the Nutrient Data File by the NDB_No field
- Links to the Gram Weight File by the NDB_No field

Table 1 - Food Description File: (File Name = FOOD_DES)

Field Name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Data Bank number which uniquely identifies a food item
FdGp_Cd	A 4	N	4-digit code indicating food group to which a food item belongs.
Desc	A 200	N	200 character description of food item
Shrt_Desc	A 60	N	60 character abbreviated description of food item. Generated from the 200 character description using abbreviations in the Appendix. If short description was longer than 60 characters, the food specialist made additional abbreviations.
Ref_desc	A 45	Y	Description of inedible parts of a food item, such as, seeds or bone.
Refuse	N 2.0	Y	The percent refuse
SciName	A 60	Y	The scientific name of the food item. Given the first time the food appears in the file, if applicable.
N_Factor	N 4.2	Y	Factor for converting nitrogen to protein
Pro_Factor	N 4.2	Y	Factor for calculating calories from protein.
Fat_Factor	N 4.2	Y	Factor for calculating calories from fat.
CHO_Factor	N 4.2	Y	Factor for calculating calories from carbohydrate.
Blank_1			Field reserved for future use
Blank_2			Field reserved for future use
Blank_3			Field reserved for future use
Blank_4			Field reserved for future use

Table 2 - Nutrient Data File: (File Name = NUT_DATA)

The Nutrient Data File contains the nutrient values and information about them including, sample count and standard error for analytical values and a source code indicating the type of data.

- Links to the Food Description File by NDB_No
- Links to the Nutrient Definition File by Nutr_No
- Links to the Source Codes File by Src_Cd
- Links to the Gram Weight File by NDB No.

Table 2 - Nutrient Data File: (File Name = NUT_DATA)

Field Name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Data Bank number.
Nutr_No	A 3*	N	3-digit unique identifier code for a nutrient
Nutr_Val	N 10.3	N	Amount in 100 grams, edible portion. (The number of decimal places displayed does not always reflect the accuracy of the data)
Sample_Ct	N 5.0	N	Number of samples, 0 if nutrient value was not analytical
Std_Error	N 8.3	Y	Standard error of the mean. Null if could not be calculated
Src_Cd	A 2	N	Code indicating type of data
Blank_1			Field reserved for future use
Blank_2			Field reserved for future use
Blank_3			Field reserved for future use

Table 3 - Nutrients included in the Nutrient Data File

Proximates	Other Food Components	Vitamins
Protein	Amino Acids	Ascorbic acid
Fat	Caffeine	Thiamin
Carbohydrate	Theobromine	Riboflavin
Moisture	Alcohol	Niacin
Ash		Pantothenic acid
Total Dietary Fiber		Vitamin B_6
Energy		Folate
	Minerals	Vitamin B_{12}
Lipids	Calcium	Vitamin A
Cholesterol	Iron	(IU and RE)
Total Saturated Fatty Acids	Magnesium	Vitamin E (a-TE)
Total Monounsaturated Fatty Acids	Phosphorus	
Total Polyunsaturated Fatty Acids	Potassium	
Individual Fatty Acids	Sodium	
Phytosterols	Zinc	
	Copper	
	Manganese	

Table 4 - Nutrient Definition File (File Name = NUTR_DEF)

The Nutrient Definition File is the support file to the Nutrient Data File. It identifies the 3 digit nutrient number code with the unit of measure, INFOODS tagname, description, and the IFDA field number.

- Links to Nutrient Data File by Nutr_No

Table 4 - Nutrient Definition File (File Name = NUTR_DEF)

Field Name	Type	Blank	Description
Nutr_No	A 3*	N	3-digit unique identifier code for a nutrient
Units	A 6	N	Units of measure - mg, g, mcg, etc.
Tagname	A 20	N	INFOODS Tagnames. A unique abbreviation for a food component developed by INFOODS to aid in the interchange of data.
NutrDesc	A 60	N	The name of the food component
IFDA_No	A 3	N	Number assigned by IFDA to each nutrient. Used to cross-reference data in the IFDA data exchange format.
Blank_1			Field reserved for future use

Table 5 - Gram Weight File: (File Name = WEIGHT)

The Gram Weight File contains the gram weight for household measures for a food item with the measure number that links it to the description of the measure.

- Links to Food Description File by NDB_No
- Links to the Measure Description File by Msre_No
- Links to Nutrient Data File by NDB_No

Table 5 - Gram Weight File: (File Name = WEIGHT)

Field Name	Type	Blank	Description
NDB_No	A 5*	N	5-digit Nutrient Data Bank No.
Msre_No	A 5*	N	A unique code in the Measure Description File referencing the description
Gm_wt	N 9.2	N	The weight of the food item
Blank_1			Field reserved for future use

Table 6 - Measure Description File: (File Name = MEASURE)

The Measure Description File is the support file for the Gram Weight File. It contains the 5 digit measure number and measure description.

- Links to the Gram Weight File by Msre_No

Table 6 - Measure Description File: (File Name = MEASURE)

Field Name	Type	Blank	Description
Msre_No	A 5*	N	5 digit code denoting the measure
Msre_Desc	A 120	N	The description of the measure, i.e. "cup", "cup, chopped", "tomato", "tbsp", etc.
Blank_1			Field reserved for future use

The Gram Weight and Measure Description files together allow expansion of the number and types of household weights beyond the two previously published in AH-8 or earlier releases of the database as shown in Figure 2. Using these two files one can calculate the nutrient profile of a food for the specified measures and generate reports with the measure description as headings.

Figure 2 - Example showing relationships between Gram Weight and Measure Description files for NDB No. 11252, Lettuce, Iceberg, raw.

Gram Weight File

NDB No.	Measure ID	Weight
11252	10160	55
11252	61018	755
11252	61025	15
11252	61116	20

Measure Description File

Measure ID	Measure Description
10160	1 cup, shredded or chopped
61018	1 large head
61025	1 large leaf
61116	1 leaf

Table 7 - Source Code File: (File Name = SOURCE)

- Links to the Nutrient Data File by Src_Cd

Table 7 - Source Code File: (File Name = SOURCE)

Field Name	Type	Blank	Description
Src_Cd	A 2*	N	2 digit code
SrcCd_Desc	A 60	N	Description of source code that identifies the type of nutrient data.

The Source Code File contains codes to give the user an indication of the type of data in the Nutrient Data File. In previous versions of the SR there was not a separate field to indicate the type of data in the file. The standard error field was used for this purpose. If there was a positive value in the standard error field, the nutrient value was based on analytical data. If the value with no standard error was published in the printed sections of Handbook 8, a -1 was placed in this field. If a value was missing from the printed Handbook section, but was imputed for SR, then a -4 was placed in the standard error field. For breakfast cereals, where values for added nutrients were based on the label declaration from the manufacturer, a code of -5 was placed in the field.

In converting to the new format, a value of -1 in the standard error field was converted to a 1 and moved to the new source code field. The standard error field was then blank if an actual value was not reported. The -4 was converted to 4 and the -5 was converted to 5. To improve the usability of the database, food specialists in NDL have filled in nutrient values for many proximate components, total dietary fiber, vitamin and mineral values. Values for other nutrients, such as alcohol and vitamin E, were filled in because the food items are part of the database that is used for the USDA Continuing Survey of Food Intakes by Individuals (CSFII) (28).

We have added additional source codes to be more specific about the type of data used for processed and brand name products in SR11. At this time, previous versions of SR were not reviewed to revise source codes. Therefore the new source codes that have been added are used only for items that are new or were revised for SR11. As existing items are revised, source codes will be updated.

The few exceptions are:

- Carbohydrate values of zero in all animal products were given the source code of 7 which indicates an assumed zero.
- Carbohydrate values which are calculated by difference were given a source code of 4.
- Energy values which were calculated by Atwater factors were given a source code of 4.
- Cholesterol and vitamin B_{12} values of zero in plant products were given a source code of 7.
- Vitamin C and total dietary fiber values of zero in animal products were given a source code of 7.

Table 8 - Source Code List

Code	Description
1	The value is analytical or derived from analytical.
4	The value is imputed.
5	The value upon which a manufacturer based their label claim for added nutrients (Used primarily for Breakfast Cereals and Infant Formulas)
7	The value is an assumed zero. The nutrient is not expected to be present because biologically it could not be present, such as dietary fiber in animal products, or the nutrient is expected to be present in only insignificant amounts, such as vitamin C in meat products.
8	The value is calculated from the nutrient label by NDL.
9	The value is calculated by the manufacturer, not adjusted or rounded for NLEA compliance.
12	The value is analytical, supplied by the manufacturer with partial documentation.

Table 9 - Food Group Description File: (File Name = FD_GROUP)

- Links to the Food Description File by FdGp_Cd

Table 9 - Food Group Description File: (File Name = FD_GROUP)

Field Name	Type	Blank	Description
FdGp_Cd	A 4*	N	Four digit code identifying a food group. Currently only the first 2 digits are assigned. In the future the last 2 digits may be utilized.
FdGp_Desc	A 60	N	The name of the food group

Abbreviated File

This file is an adaptation of the Abbreviated File included with earlier releases and is provided as a convenience for users of that file. It does not contain the full complement of nutrients as the relational files described above. It contains NDB No., the short description, 32 nutrients, and two household measures. Because of the restructuring of the SR files, some changes were made to this file as well: 1) The 20-character name is replaced with the 60-character short description; 2) the nutrients magnesium, zinc, copper, manganese, vitamin B_6, pantothenic acid, folate, vitamin B_{12} , and vitamin E as mg a-tocopherol equivalents have been added; and 3) only the first two weights and their description for each NDB No. in the gram weight file are included, which may not be the same two weights as in previous releases of this file. To obtain additional information this file can be linked to the other files listed above by the NDB No.

Table 10 - Layout of Abbreviated File

Field Name	Type	Description
NDB No.	A 5*	5-digit Nutrient Data Bank number.
Shrt_Desc	A 60	60 Character abbreviated description of food item. The 200 character description and other descriptive information can be obtained by linking to the Food Description File.
Water	N 10.3	Water in grams per 100 g
Energ_Kcal	N 10.3	Food Energy in kilocalories per 100 g
Protein	N 10.3	Protein in grams per 100 g
Tot_Lipid	N 10.3	Total lipid (fat) in grams per 100 g
Carbohydrt	N 10.3	Carbohydrate, by difference in grams per 100 g
Fiber_TD	N 10.3	Total dietary fiber in grams per 100 g
Ash	N 10.3	Ash in grams per 100 g
Calcium	N 10.3	Calcium in milligrams per 100 g
Phosphorus	N 10.3	Phosphorus in milligrams per 100 g
Iron	N 10.3	Iron in milligrams per 100 g
Sodium	N 10.3	Sodium in milligrams per 100 g
Potassium	N 10.3	Potassium in milligrams per 100 g
Magnesium	N 10.3	Magnesium in milligrams per 100 g
Zinc	N 10.3	Zinc in milligrams per 100 g
Copper	N 10.3	Copper in milligrams per 100 g
Manganese	N 10.3	Manganese in milligrams per 100 g
Vit_A	N 10.3	Vitamin A in IU per 100 g
Vit_E	N 10.3	Vitamin E in mg a-tocopherol equivalents
Thiamin	N 10.3	Thiamin in milligrams per 100 g
Riboflavin	N 10.3	Riboflavin in milligrams per 100 g
Niacin	N 10.3	Niacin in milligrams per 100 g
Panto_acid	N 10.3	Pantothenic acid in milligrams per 100 g
Vit_B6	N 10.3	Vitamin B_6 in milligrams per 100 g
Folate	N 10.3	Folate in micrograms per 100 g

Table 10 - Layout of Abbreviated File (continued)

Field Name	Type	Description
Vit_B12	N 10.3	Vitamin B_{12} in micrograms per 100 g
Vit_C	N 10.3	Vitamin C in milligrams per 100 g
FA_Sat	N 10.3	Saturated fatty acid in grams per 100 g
FA_Mono	N 10.3	Monounsaturated fatty acids in grams per 100 g
FA_Poly	N 10.3	Polyunsaturated fatty acids in grams per 100 g
Cholestrl	N 10.3	Cholesterol in milligrams per 100 g
GmWt_1	N 9.2	The first household weight for this item from the Gram Weight File. For the complete list and description of the measure, link to that file.
GmWt_Desc1	A 120	Description of household weight number 1
GmWt_2	N 9.2	The second household weight for this item from the Gram Weight File. For the complete list and description of the measure, link to that file.
GmWt_Desc2	A 120	Description of household weight number 2
Refuse_Pct	N 2.0	The percent refuse. For description of refuse, link to the Food Description File

References

1. International Food Distributors Association. 1995. IFDA Product Data Exchange Format, Version 3.0. Washington, D.C.
2. Klensin, J.C., D. Feskanich, V. Lin, A.S. Truswell, and D.A.T. Southgate. 1989. Identification of Food Components for INFOODS Data Interchange. United Nations University. Tokyo. 106 pp.
3. U.S. Department of Agriculture, Agricultural Research Service. 1976. Composition of Foods: Dairy and Egg Products; Raw, Processed, Prepared. Agric. Handb. No. 8-1, 144 pp.
4. U.S. Department of Agriculture, Agricultural Research Service. 1977. Composition of Foods: Spices and Herbs; Raw, Processed, Prepared. Agric. Handb No. 8-2, 51 pp.
5. U.S. Department of Agriculture, Agricultural Research Service. 1978. Composition of Food: Baby Foods; Raw, Processed, Prepared. Agric. Handb. No. 8-3, 231 pp
6. U.S. Department of Agriculture, Agricultural Research Service. 1979. Composition of Foods: Fats and Oils; Raw, Processed, Prepared. Agric. Handb. No. 8-4, 142 pp.
7. U.S. Department of Agriculture, Agricultural Research Service. 1979. Composition of Foods: Poultry Products; Raw, Processed, Prepared. Agric. Handb. No. 8-5, 330 pp.
8. U.S. Department of Agriculture, Agricultural Research Service. 1980. Composition of Foods: Soups, Sauces, and Gravies; Raw, Processed, Prepared. Agric. Handb. No. 8-6, 228 pp.
9. U.S. Department of Agriculture, Agricultural Research Service. 1980. Composition of Foods: Sausages and Luncheon Meats; Raw, Processed, Prepared. Agric. Handb. No. 8-7, 92 pp.

10. U.S. Department of Agriculture, Agricultural Research Service. 1982. Composition of

Foods: Breakfast Cereals; Raw, Processed, Prepared. Agric. Handb. No. 8-8, 160 pp.
11. U.S. Department of Agriculture, Agricultural Research Service. 1982. Composition of Foods: Fruits and Fruit Juices; Raw, Processed, Prepared. Agric. Handb. No. 8- 9, 283 pp.
12. U.S. Department of Agriculture, Agricultural Research Service. 1992. Composition of Foods: Pork Products; Raw, Processed, Prepared. Agric. Handb. No. 8-10, 223 pp.
13. U.S. Department of Agriculture, Agricultural Research Service. 1984. Composition of Foods: Vegetables and Vegetable Products; Raw, Processed, Prepared. Agric. Handb. No. 8-11, 502 pp.
14. U.S. Department of Agriculture, Agricultural Research Service. 1984. Composition of Foods: Nut and Seed Products; Raw, Processed, Prepared. Agric. Handb. No. 8-12, 137 pp.
15. U.S. Department of Agriculture, Agricultural Research Service, 1990. Composition of Foods: Beef Products; Raw, Processed, Prepared. Agric. Handb. No. 8-13, 412 pp.
16. U.S. Department of Agriculture, Agricultural Research Service, 1986. Composition of Foods: Beverages; Raw, Processed, Prepared. Agric. Handb. No. 8-14, 173 pp.
17. U.S. Department of Agriculture, Agricultural Research Service, 1987. Composition of Foods: Finfish and Shellfish Products; Raw, Processed, Prepared. Agric. Handb. No. 8-15, 192 pp.
18. U.S. Department of Agriculture, Agricultural Research Service, 1986. Composition of Foods: Legumes and Legume Products; Raw, Processed, Prepared. Agric. Handb. No. 8-16, 156 pp.
19. U.S. Department of Agriculture, Agricultural Research Service, 1989. Composition of Foods: Lamb, Veal, and Game Products; Raw, Processed, Prepared. Agric. Handb. No. 8-17, 251 pp.
20. U.S. Department of Agriculture, Agricultural Research Service, 1992. Composition of Foods: Baked Products; Raw, Processed, Prepared. Agric. Handb. No. 8-18, 467 pp.
21. U.S. Department of Agriculture, Agricultural Research Service, 1991. Composition of Foods: Snacks and Sweets; Raw, Processed, Prepared. Agric Handb. No. 8-19, 341 pp.
22. U.S. Department of Agriculture, Agricultural Research Service, 1989. Composition of Foods: Cereal Grains and Pasta; Raw, Processed, Prepared. Agric. Handb. No. 8-20, 137 pp.
23. U.S. Department of Agriculture, Agricultural Research Service, 1988. Composition of Foods: Fast Foods; Raw, Processed, Prepared. Agric. Handb. No. 8-21, 194 pp.

U.S. Department of Agriculture, Agricultural Research Service, Composition of Foods. Raw, Processed, Prepared Agric. Handb. No. 8.
24. 1989 Supplement, 1990. 96 pp.
25. 1990 Supplement, 1991. 114 pp.
26. 1991 Supplement, 1992. 85 pp.
27. 1992 Supplement, 1993. 144 pp.

28. U.S. Department of Agriculture. 1995. CSFII/DHKS Data Set, Documentation and Technical Support Files: The 1994 Continuing Survey of Food Intakes by Individuals and the 1994 Diet Health and Knowledge Survey. National Tech. Info. Service. Springfield, VA. CD-ROM: Accession No. PB95-501010.

UNITED STATES AND AUSTRALIA: SHARING NATIONAL NUTRITION SURVEY METHODOLOGY

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ABSTRACT

SURVEY NET is the computer assisted food coding system developed jointly by United States Department of Agriculture's Agricultural Research Service (USDA-ARS) and the University of Texas-Houston School of Public Health (UTSPH) to code, store, retrieve, review and analyze data from the 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII). The methodologies used in the 1994 CSFII and the format of the food coding and nutrient data bases, which are the driving force of SURVEY NET, make it a suitable program for dietary surveys in other countries. In 1993, Australia recognized the potential use of SURVEY NET in their National Nutrition Survey and obtained permission to receive and adapt it for Australian use. Australia also received the CSFII interviewing and coding manuals. With the help of the UTSPH, Australia adapted SURVEY NET for Australian use and developed the Australian Food and Nutrient Data Base according to the U.S. file formats. In both countries, SURVEY NET, a multi-level system operating from a network, captures detailed information about foods, brand names, recipes, unknown foods, and portion sizes; utilizes the nutrient retention factor recipe methodology; and emphasizes quality control. Inherent differences between countries had to be considered in adapting SURVEY NET: different foods and preparation methods; Imperial system versus the metric system for units of measure; and different consumption styles between countries. The adapted version, referred to as ANSURS, was used in the 1995 National Nutrition Survey in Australia. This collaboration between USDA-ARS and the Commonwealth of Australia benefits both countries by allowing comparability of national food consumption data and survey methodology and by providing a basis for future research between countries.

AMERICANS' SALT USE IN FOOD PREPARATION--1994 CSFII & DHKS

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ABSTRACT

The Continuing Survey of Food Intakes by Individuals (CSFII) 1994-96 survey methodology allows for the collection and coding of information about the use of salt during cooking or preparation for selected Survey Nutrient Data Base foods. There are 3,129 foods within 5 broad food groups--meats, grains, vegetables, eggs and legumes-- which have a flag to indicate that salt is considered an optional ingredient in the CSFII recipes data base. For these foods, information is coded as to whether salt was used (yes) or not used (no) during preparation. This information is later used during the nutritional analysis of the data. If a respondent does not know, or no answer is provided, the analysis program defaults to "yes." In the 1994 CSFII, among the 5,589 respondents with 10,900 24-hour dietary recalls, 89 percent answered either "yes" or "no" for at least one of the foods which includes salt as an optional ingredient. Of these respondents, males and females reported similar usage of salt in food preparation with 75 percent of males and 72 percent of females consuming at least one food to which salt was added in preparation. A subset of the respondents of the CSFII also participated in the Diet Health and Knowledge Survey (DHKS) and answered questions on their knowledge and attitudes about salt or sodium. Seventy-four percent of persons who indicated they thought their diet was too high in sodium consumed at least one food with salt added in preparation, compared to 67 percent of those who thought their diet contained about the right amount. Sixty-eight percent of persons who felt it was somewhat or very important to use salt in moderation consumed at least one food with salt added in preparation, compared to 70 percent who thought it was of limited importance. These data indicate that collecting information on salt use in food preparation not only improves specificity of reports and potentially improves estimates of sodium intake, but also the information has potential for being used with DHKS data to study behavior associated with certain beliefs about salt or sodium.

Paper C2-4	***Assessment of Fish Consumption among Sportfishers on the St. Lawrence River in the Montreal Region: Reliability/Calibration Study*** *Bryna Shatenstein, Sante Publique-Unite Sante Environmentale, Montreal, Quebec, CANADA*

ASSESSMENT OF FISH CONSUMPTION AMONG SPORT-FISHERS ON THE ST. LAWRENCE RIVER IN THE MONTREAL REGION: RELIABILITY/CALIBRATION STUDY

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ABSTRACT

Fish are a source of both environmental contaminants and the cardioprotective omega-3 fattyacids. Two hundred Montreal-area fishers are being studied in different seasons to assess the health impact of sportfish consumption; interviews and collection of blood, hair and urine are used to quantify their exposure to toxic and beneficial substances. The reliability and accuracy of study instruments are being evaluated in a sub-sample of high-level fish consumers in both winter and summer fishing seasons. An 87-item questionnaire ("Time 1") administered face-to-face by dietitians provided data on fishing habits and fish consumption. The calibration process required completion of a non-consecutive seven-day food record, covering a four-week period. The first day of the food record was done with the fishers as a 24-hour recall; they were then monitored by telephone. SOEHNLE™ electronic scales were loaned for portion size estimation. Participants also kept a "fish consumption calendar", to assess the accuracy of concurrent questionnaire data. Fishers were interviewed again at the end of the calibration period, using a shortened version of the initial questionnaire ("Time 2"), and provided a second blood sample. The food records were analysed using the NUTRIENT ANALYSIS PROGRAM, based on the 1991 Canadian Nutrient File, including omega-3 fatty acid values. Once the complete calibration sample of 29 high level fishers is assembled, comparative results will be presented on retrospective fish consumption data at Times 1 and 2; the prospective measures (food record and calendar) will be correlated with the retrospective data obtained at Time 2; and plasma fatty acids and mercury at Times 1 vs. 2, correlated with the prospective data on fish consumed during the calibration period. It is expected that accurate food consumption data could ultimately serve as a surrogate for the invasive collection of biological specimens, permitting easier detection of potentially-hazardous fish consumption levels in population-based studies.

Paper C2-5	***Improvement in Matching Energy Expenditure to Food Intake in a Metabolic Chamber Utilizing Prior Measurements of Free-Living Activity*** *Heli Roy, Pennington Biomedical Research Center, LSU, Baton Rouge, LA*

IMPROVEMENTS IN MATCHING ENERGY EXPENDITURE TO FOOD INTAKE IN A METABOLIC CHAMBER UTILIZING PRIOR MEASUREMENTS OF FREE LIVING ACTIVITY

Heli Roy, PhD and Jennifer Lovejoy, PhD
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ABSTRACT

Introduction: In most feeding studies food intake is matched closely to energy expenditure (EE) to maintain weight. This is done by adjusting intake as needed in the first few days or weeks of eating. In feeding studies involving the use of a metabolic chamber to measure 24-hour EE, there is often an imbalance of EE compared to energy intake during the measurement days due to a reduced level of activity in the confined space of the metabolic chamber. In many studies, EE in the metabolic chamber is reduced 10-20% from normal free-living level resulting in surplus energy balance. Substrate oxidation then adjusts as during overfeeding (preferential carbohydrate oxidation and suppression of fat oxidation) and is not reflective of true substrate oxidation. Therefore, we have devised a method that allows us to closely match individual EE to energy intake during metabolic chamber days to get correct substrate oxidation levels.

Methodology: Eleven females served as experimental subjects, (age [Mean±SE] 25±1.0 yrs, weight 73.8±0.8 kg) and 17 males (age 24.2±1.2 yrs, weight 76.2±2.8 kg) as control subjects. Resting metabolic rate (RMR) was measured for 1 hour in the fasting state after the subjects rested for 30 minutes. The experimental subjects were required to wear a Caltrac activity monitor for three consecutive days including one weekend day. The value was averaged over the three days to get an estimate of average free-living EE. EE in the metabolic chamber was estimated based on individuals' weight and free-living EE. Exercise requirements in the metabolic chamber were then individually determined for each subject by using treadmill speed, body weight, and energy difference to match free-living to metabolic chamber conditions. In contrast, the control subjects simply walked 90 minutes a day on the treadmill during their metabolic chamber stays.

Results and conclusions: Energy balance in the chamber for the control subjects was significantly positive (423±76 kcal) while the experimental subjects were in near-neutral energy balance (79±19 kcal). Using the Caltrac to individually determine exercise requirements resulted in 81% improvement in energy balance for the experimental subjects. This improvement in energy balance should result in accurate substrate oxidation rates during the metabolic chamber measurement days.

Paper C3-1	***Taking a "Data Tour" with FIAS: How to Examine CSFII Survey Data with a Nutrient Analysis Program*** *Deirdre Douglass, University of Texas Food Intake Analysis System*

TAKING A "DATA TOUR" WITH FIAS: HOW TO EXAMINE SURVEY DATA WITH A NUTRIENT ANALYSIS PROGRAM

Deirdre Douglass, MS, RD, LD, University of Texas School of Public Health

ABSTRACT

The U.S. Department of Agriculture Agricultural Research Service CD-ROM with the 1994 CSFII and DHKS data contains information about the food intake of individuals and the food coding data base. We will explore the food data on the CD-ROM and show the logical link between the data on the CD-ROM and the data in the Food Intake Analysis System (FIAS). We will explain some of the data values and show examples from the CD-ROM and from FIAS.

Paper C3-2	***How Restaurants Will Handle Mandatory Labeling in 1997*** *Nancy Belleque, ESHA*

HOW RESTAURANTS WILL HANDLE MANDATORY LABELING IN 1997

Nancy Belleque and Monica Cape-Lindelin, ESHA Research.

ABSTRACT

Mandatory labeling of restaurant foods/menus goes into effect in 1997. Restaurant owners, chefs, cooks, and menu writers will be affected. They will be required to report the nutritional content of the foods they serve. ESHA's Computer Chef software was designed to meet these needs. Database of over 6,000 foods selected specifically for restaurants and chefs, students, and other dietary professionals. Computer Chef helps all food service folks create healthy, good tasting recipes and allows users to create a variety of reports, including recipe cards, table tents for nutrition information, consumer menus, labels, and in-house notes.

Paper C3-3	***Supporting Research with a Dietary Assessment Service and a Nutrient Data Clearing House*** *Laura Winter Falk and John Alexander, CBORD*

SUPPORTING RESEARCH WITH A DIETARY ASSESSMENT SERVICE AND A NUTRIENT DATA CLEARING HOUSE

Laura Winter Falk, MS, RD and John Alexander, The CBORD Group, Inc.

ABSTRACT

*This past year The CBORD Group has expanded their research support to provide dietary assessment services in a number of exciting studies, including Dean Ornish*s Multicenter Lifestyle Heart Trial. In the area of nutrient databases, CBORD has been awarded a USDA Small Business Innovation Research (SBIR) grant to prototype a methodology for the creation, on-going maintenance, and distribution of a functional nutrient database to satisfy the multifaceted needs of researchers, dietitians, and the food industry. The plan is overseen by an interdisciplinary advisory committee to assure that the goals and priorities address its intended audiences.*

Paper C3-4	***Re-engineering Research Software: A Modern Face for an Old Standby*** *Lori Beth Dixon, Nutrition Coordinating Center, University of Minnesota*

RE-ENGINEERING RESEARCH SOFTWARE: A MODERN FACE FOR AN OLD STANDBY

Lori Beth Dixon, PhD, Assistant Director of Client Services, NCC

ABSTRACT

Currently, exciting times are upon the Nutrition Coordinating Center (NCC) at the University of Minnesota. As many researchers know, NCC developed a microcomputer-based diet assessment / nutrient calculation software tool, the Minnesota Nutrition Data System (NDS), in 1988. Since 1988, versions of this software have been used to collect 24-hour dietary recall or record data from participants of many national research studies including the National Health and Nutrition Examination Survey (NHANES III). The most current release of NDS, version 2.9, is linked to an extensive food database that contains over 19,000 North American foods including approximately 8,000 brand name products, many ethnic and regional foods, dietary supplements, and medications containing caffeine and sodium. It also allows for the calculation of up to 95 nutrients including energy, the proximate nutrients (protein, fat, carbohydrate, and alcohol, plus water and ash), animal and vegetable protein plus 18 amino acids, 23 individual fatty acids, cholesterol, starch, six simple sugars, total dietary fiber and three fiber fractions, nine minerals, 17 vitamins, caffeine, saccharin, aspartame, and oxalic acid. Now we are in the process of developing a NEW software system to include many of the renowned features of the current NDS (e.g., the multiple pass data collection including a quick list, food entry, and recall review, the incorporation of standardized prompts, questions regarding the amount and type of fat used in recipes and food preparation), as well as several new features that have been highly requested by our users. Examples of new features include the ability to analyze dietary data in terms of food groups, the addition of user foods and user recipes to the database, and options to customize data collection procedures (e.g., the choice to inactivate the quick list if dietary records are being collected rather than 24-hour recalls, the choice to inactivate questions that prompt for sodium preparation during an interview). Moreover, the new software will incorporate our newly redesigned food and nutrient database to provide friendlier access to desired food and nutrient calculations. In addition,, our current NDS is a DOS-based system for PCs. The new software will be a WINDOWS-based system compatible with Microsoft Windows products (e.g., Windows 95). The switch to WINDOWS-based technology will allow enhanced editing functions, use of multiple open windows, use of a mouse in addition to activated keys, access to on-line help information, and enhanced project and record management capabilities. The target date of our new software is summer of 1997.

EMPOWERING YOUR DATABANK: A FOOD CLASSIFICATION SYSTEM AND ITS APPLICATIONS

Linda Nowbar, MBA, RD, First DataBank, The Hearst Corporation

ABSTRACT

The need for fast, accurate, and reliable information has become one of the major driving forces of our present-day society. This constant desire for useful data combined with great advancements in technology have prompted many organizations to look for more powerful means of collecting, analyzing, and distributing data than those that have existed in the past. The development of a new food classification system is proving to be an effective way of empowering databases and their users to compete in this information-based world. The food classification system developed at First DataBank organizes foods based on comprehensive descriptions that reveal not only the general food group associated with a given product but also detailed information about the processing and preparation of the food both prior to and after consumer acquisition. Classification of foods in this fashion has allowed for extremely powerful search capabilities which include the ability to find similar or related foods with a single query, the ability to search for foods with similar processing or preparation methods, and the ability to perform extremely specific queries focusing on a set of particular food group and processing factors. This new classification system has also provided for a easy and consistent method of assigning foods to an exchange group in the Diabetic Exchange System and to a food group in the Food Guide Pyramid model. This assignment in conjunction with a set of predetermined decision rules allows for the quick and accurate calculation of the exchange values and pyramid servings represented by a particular food in each of these systems. It is hoped that these developments in database technology and food classification will help to quickly provide dietitians, food manufacturers, and nutrition researchers with the types of information they need to operate efficiently and effectively now and in the future.

Paper C4-1	***Nutrient Data Laboratory (USDA/ARS)*** *Joanne Holden, Research Leader*

NUTRIENT DATA LABORATORY (USDA/ARS)

Joanne Holden, MS, Research Leader, USDA/ARS/NDL, Riverdale, MD

ABSTRACT

1) USDA Nutrient Database for Standard Reference. The USDA Nutrient Database for Standard Reference (SR), Release 11 will be available in August, 1996. The database will adopt a relational structure and will be released as ASCII delimited files. In addition to the ASCII delimited files, the CD-ROM release will add files in DBF and the IFDA Data Exchange format. 2) Primary Data Set. During 1995-1996 the Nutrient Data Laboratory (NDL) completed the 1995 Primary Data Set, a nutrient database for approximately 2,500 foods and 30 components, to be used with the USDA recipe file to create the USDA Survey Nutrient Database for the 1995 Continuing Survey of Food Intakes by Individuals. 3) Child Nutrition Program. The National Nutrient Database for Child Nutrition Programs (Release 2) was made available in Fall 1995 in collaboration with the Food Surveys Research Group, ARS and the USDA Food and Consumer Services. 4) Databank Redesign. During 1997, the Nutrient Data Laboratory will begin a major revision of the National Nutrient Databank System. 5) NDL Home Page. The NDL Home Page has moved to a USDA server at the National Agricultural Library. The bulletins and data have been rearranged so that they are linked together. More detailed information can be found in the Update Sheet included in the participant's conference materials.

Paper C4-2	***Food and Drug Administration-Total Diet Study*** *Jean Pennington, NIDDK (formerly with the FDA)*

UPDATE OF THE TOTAL DIET STUDY

Jean A. T. Pennington, Ph.D., R.D., DNRC, NIDDK, NIH

ABSTRACT

The Total Diet Study is conducted yearly by the Food and Drug Administration to monitor the safety and nutritional quality of the U.S. food supply. The current program (which was implemented in 1991 and is based on the 1987-88 USDA NFCS) includes the collection and analysis of 260 foods, four times per year and the estimation of daily intakes of contaminants and nutrients for 14 age-sex groups. The foods are collected from cities within four geographic areas of the U.S. and are analyzed for pesticide residues, industrial chemicals, radionuclides, toxic minerals, and nutrients (10 minerals and two vitamins). The mineral and vitamin data from 1991-95 are currently being evaluated and summarized. The 1982-91 data on the composition of 234 foods for 11 nutritional minerals (Na, K, P, Ca, Mg, Fe, Zn, Cu, Mn, Se, I) were published in the Journal of Food Composition and Analysis (8:91-217, 1995). Two papers on the daily intakes of these minerals for 8 age-sex group and the contributions of food groups to mineral intakes are in press in the International Journal of Vitamin and Nutrition Research. The food list of the Total Diet Study foods was revised based on information from the 1989-91 CSFII. This revised food list contains 305 foods. Preparation instructions were developed for these foods, and recipes were formulated for "homemade" products. The revised Total Diet Study will be implemented within the next year.

Paper C4-3	Food and Drug Administration-Labeling
	Tom O’Brien, FDA Consumer Scientist

FOOD AND DRUG ADMINISTRATION - LABELING

Tom O'Brien, FDA/CFSAN

ABSTRACT

This update will cover a number of issues. The FDA plans to publish a proposal to amend the serving size rule, referring to serving sizes as part of the nutrition label. The FDA is in the final stages of completing the 1995 Food Label and Package Survey (FLAPS). There are also plans to publish a final rule for voluntary labeling of raw fruits, vegetables, and fish. The Policy for Database Review for Voluntary and Mandatory Nutrition Labeling will be discussed and will describe the current manual detailing guidelines to follow, number of samples for analysis, data sources, analytical methodology, electronic submission of data, historical data, and database review process. More detailed information can be found in the Update Sheet included in the participant’s conference materials.

Paper C4-4	Food Composition Laboratory (USDA/ARS)
	Gary Beecher, Research Leader

FOOD COMPOSITION LABORATORY (USDA)

Gary R. Beecher, Food Composition Laboratory, BHNRC, ARS, USDA. Beltsville, MD 20705

ABSTRACT

The mission of the Food Composition Laboratory is to identify critical nutrient needs for U.S. Consumers. The laboratory takes a leadership role in the development, validation and communication of analytical technology for the measurement of important nutrients and other health-related components in foods. The research activities of the laboratory are an integral part of the National Nutrition Monitoring and Related Research program of the federal government. The analytical technology currently being developed by scientists and staff falls under one of the following broad areas: 1) analytical methods development, 2) improvement of data quality, and 3) reduction of analysis cost. Typical projects and examples of recent accomplishments will be discussed.

Paper C4-5	***INFOODS*** *Barbara Burlingame, Nutrition Programme Leader,* *New Zealand Institute for Crop and Food Research*

UPDATE ON INFOODS, WITH RELEVANCE TO NORTH AMERICA

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ABSTRACT

The International Network of Food Data Systems (INFOODS) was established to provide leadership for the development of international standards and guidelines for generating, compiling, and reporting food composition data. Since its creation in 1983, eight Regional Data Centres have been established, and three more are in early organisational stages. In this update, some of the recent and relevant Regional Data Centre activities will be reviewed, including the workshop for the creation of the first ASEANFOODS Food Composition Data Base and Tables, the LATINFOODS Meeting and Training Workshop, and the organisational meetings of MASIAFOODS, GULFOODS and SAARCFOODS. The progress on establishing the North American Regional Data Centre will be discussed. The summaries of the reports of two international committees – Data Quality, and Food Nomenclature and Terminology – will be presented.

REGIONAL DATA CENTER ACTIVITIES

FROM LATE 1995

The first organisational meeting of **MASIAFOODS**, for the countries of middle Asia, was held in Beijing from 12-14 October 1995, under the joint sponsorship of UNU and FAO. There were twenty four participants from China, Korea, Hong Kong, Taiwan and the sponsoring agencies. The purpose of the meeting was to organise the people and agencies involved in food composition activities in the countries of Middle Asia, and to formalise their participation in the INFOODS Network. The defined objectives were all achieved and activities have begun.

LATINFOODS conducted a three-week long Spanish-language workshop in Santiago in October 1995, attended by more than 30 people from 11 Latin American countries. The workshop was supported by mainly by FAO, but with UNU supporting the INFOODS coordinator conducting one week of classes. The content of the workshop included training in the areas of laboratory-based data generation, computer-based data compilation, and multimedia approaches to data dissemination, and is modelled on the 1994 workshop in Wageningen. Follow-up activities were planned, including the preparation of the LATINFOODS Food Composition Tables and data files.

The first meeting of **GULFOODS** was held on 21-23 November 1995, in United Arab Emirates. under the joint sponsorship of FAO and UNU. It was attended by 27 participants, speakers and observers, with six Gulf States represented. The purpose of the meeting was to assess the status of food composition data in the countries of the Arab Gulf, establish a basis for collaboration in food composition projects, and to develop a structure for the cooperation of countries of the region with the global UNU/FAO International Network of Food Data System (INFOODS). It was agreed that the meeting for **MEFOODS** (Middle Eastern countries aside from the Gulf States) would be held in late 1996 or early 1997.

The establishment of **CARICOMFOODS** has been agreed as of December 1995, and will operate from the Caribbean Food and Nutrition Institute (CFNI) in Kingston, Jamaica. INFOODS supplied computer hardware. This group will participate in the next NORAMFOODS meeting, scheduled for September 1996.

The workshop for the Creation of the first **ASEANFOODS** Food Composition Tables/Database was held in March 1996. This workshop was undertaken to create the first regional food composition table using INFOODS recommendations and intra-regional standardisation/harmonisation.. This workshop achieved its goal of developing the regional food composition database. This regional database will serve needs of ASEANFOODS member countries and others in the nearby regions where food composition data are lacking. It will also further strengthen the activities and collaboration among the ASEANFOODS member countries, between the regional network centre and INFOODS.

The first meeting of **SAARCFOODS**, for the countries of South Asia, will be held in August 1996 in Peshawar, Pakistan. Participant from Pakistan, India, Sri Lanka, Nepal, Bangladesh, Bhutan, and the Maldives will deliver presentations on the present state of food composition data generation, compilation and dissemination in their countries. Regional harmonisation issues will be identified, and working groups will be established to solve these problems. Issues of resource availability, equipment needs and training requirements will also be discussed, and proposals prepared to address these points.

NORAMFOODS -- INFOODS North American Regional Data Center

The North American regional network, **NORAMFOODS**, will hold their second meeting in Riverdale, Maryland, in September 1996. UNU will support the participation of members from Mexico and Jamaica and FAO will support a resource person from Rome. The organisational makeup will involve the countries of USA, Canada, and Mexico, with Caribbean participation.
The main purposes of the meeting are to formalized the tentative structure for the INFOODS North American regional data center proposed at the first meeting held in February 1995. The expectation is that NORAMFOODS would continue to be made up of representatives of Canada, Mexico, and the United States. In addition the Mexican National Food Composition Data Center (MEXFOODS) would coordinate a network for the Spanish and French speaking countries of the Caribbean to be known as MEXCARIBEFOODS. The English speaking countries of the Caribbean will be covered by a regional data center in Jamaica to be known as CARICOMFOODS. Representatives of MEXCARIBEFOODS and CARICOMFOODS will be represented at the meeting and will be invited to participate in future NORAMFOODS meetings.

In addition the expectation of the second meeting is to established working groups to deal with international and regional standardization and harmonisation issues including: recipe standardization; component tagname usage; food terminology and nomenclature; analytical methods and quality control; data quality identification; statistical issues; and collaboration on an industrial ingredients data base. MEXFOODS and NORAMFOODS are already using INFOODS tagnames which will facilitate data interchange within the INFOODS system.

Data quality committee meeting

A two-day international meeting on data quality took place under the auspices of INFOODS, at US Dept of Agriculture offices, in June 1995, and a follow-up meeting is scheduled to take place immediately after the FoodComp ‘96 course in Wageningen, The Netherlands. Participants were from the USA, Thailand, Chile, Zimbabwe and INFOODS. Some of the issues examined included the need for data quality indicators in a food composition data system; their applications in retrospective data evaluation, and production and evaluation of new data; their advantages/uses; the different types of component values in a food composition data base to which they could be applied; the baseline data quality parameters for analytical data and derived data; and how data quality should be represented in a food composition data system. Work undertaken in 1996 included a survey in one country where data quality/source information is currently supplied to users, to determine how widely the information is used and how it is applied. This information will be used in formulation of guidelines for the international community.

Food nomenclature and terminology meeting

An IUNS/UNU/INFOODS working group convened to determine the tasks for an expert committee on food nomenclature and terminology. This one-day meeting was hosted by the US Dept of Agriculture at their offices in June 1995, with participants from the USA, Thailand, Chile, Zimbabwe and INFOODS. The first item addressed was the affirmation of the need to re-convene an international committee pertaining to food terminology, nomenclature, and descriptors. The tasks for this committee, as recommended by this working group, are as follows: review systems currently in use to determine the feasibility of linking them; determine if it is possible for a single food description language or a set of minimum criteria to be adopted among various countries; assume responsibility for the compilation of an electronic international food description dictionary/thesaurus/concordance, possibly including food images; describe and contrast the various systems for users, perhaps on the Internet, to see where the systems are complementary and where are they in conflict; and prepare an update, as a continuation of the development of the INFOODS system, previously published in the Journal of Food Composition and Analysis. The follow-up meeting is also scheduled to take place in Wageningen in late October 1996, and that committee will address the above-mentioned topics.

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Paper C5-1	***The UK Approach to Determining Nutrient Composition of Meat*** *Susan Church, Ministry of Agriculture, Fisheries and Food, London, UK*

THE UK APPROACH TO DETERMINING NUTRIENT COMPOSITION OF MEAT

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ABSTRACT

A major study of the composition of carcase meat in the UK was undertaken in the early 1970s. Since then, changes in breed of animals and in husbandry techniques have led to leaner animals, while changes in butchering techniques and in cooking procedures may have resulted in other variations in composition. In addition, there have been improvements in the methods for determining many nutrients. The Ministry of Agriculture, Fisheries and Food therefore designed and commissioned a programme to determine the nutrient composition of retail cuts of carcase meats in the UK. The aim was to provide up-to-date nutritional information on a much wider range of cuts, both raw and cooked, by newer as well as more traditional cooking methods. This presentation will outline the approach taken to ensure that the available resources were effectively used to obtain representative data on the composition of meat. The design of the analytical studies will be described together with the interpolation of analytical data to provide a full set of nutrient values. Finally, some of the changes in composition between the 1970s and the 1990s will be highlighted.

ANALYTICAL METHODS FOR THE ANALYSIS OF *MYOCASTER COYPUS* (NUTRIA)

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ABSTRACT

Nutria is an animal which belongs to the same order as the squirrel and is herbivorous in its feeding habits. Compared with domestic animals, they are sanitary in their feeding and living habits. The nutria is utilized as food not only in South America, its native home, but also in European and Asiatic countries. Nutria have devoured large areas of marshlands in South Louisiana leading to Coastal erosion. In investigating ways to reduce the nutria population, wildlife officials are exploring the use of nutria as an inexpensive alternative meat source for human consumption. T he present investigation was designed to determine the nutritional content of nutria and compare the results with other meat sources. A total of 63 nutria were captured, placed in individual holding cages and transported for processing. Nutria were weighted, sacrificed, sexed and tagged. The carcass was deboned and the resulting meat was weighed, packed in labeled ziplock bags, and delivered to the Food Analysis Laboratory. Samples were arranged into four groups based on age and sex (>4000 grams as “adult”, <4000 grams as “young”). A total of 14 composites representing 42 animals were made. The eat samples were homogenized, aliquoted, and frozen at -20° C. To analyze the samples the following methods were used: fat (AOAC 945.167A), protein(AOAC 992.15), ash (AOAC 920.153,900.02, 923.03), moisture (AOAC 985.14), fatty acids (AOCS Ce 1b-89), cholesterol (Thompson et al, 1993), vitamin A (Panfili, et al, 1994), vitamin C (Tulley, 1993), sodium and iron (AOAC 990.08). Data describing the contents per group will be presented.

Paper C5-3	***Comparison of the Nutritional Value of Mycocaster Coypus (Nutria) with Other Food Sources Utilizing the MENu Database*** *Richard Tulley, Pennington Biomedical Research Center, LSU*

COMPARISON OF THE NUTRITIONAL VALUE OF *MYOCASTER COYPUS* (NUTRIA) WITH OTHER FOOD SOURCES UTILIZING THE MENu DATABASE

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ABSTRACT

With the widespread availability of common meat sources, nutria have not been well utilized. Recently, there has been renewed interest in Louisiana because of the detriment nutria poses to the environment and also because of its potential to provide the public with an inexpensive alternative meat source. The nutritional quality of nutria meat has been previously unreported. Therefore, the purpose of this study was to determine the nutritional content of nutria meat and compare it to other meat sources. A total of 63 nutria, captured in the wild, were analyzed for total fat, protein, ash, moisture, fatty acids, cholesterol, iron, sodium, vitamin A, and vitamin C. Most notable are the analyses for cholesterol, total fat, and protein. The data show that fat is lower than in chicken, ground beef, squirrel, deer, rabbit, port and turkey. Of the sources tested, only cod has lower levels of fat. protein content compares favorably with all the meats compared in the MENu database. it is concluded that nutria is a meat source of excellent nutritional value, high in protein and low in fat and cholesterol. The future acceptance of nutria as a major meat source remains to be determined. There may be more interest in nutria in international datasets due to the fact that its consumption has been noted in tropical areas in regions other than North America.

Paper C5-4	***Lower Mississippi Delta Nutrition Intervention Research Initiative*** *Frankie Schwenk, USDA/ARS* *David Harsha, Pennington Biomedical Research Center, LSU* *Bernestine McGee, Southern University, Baton Rouge, LA* *Margaret Bogle, Arkansas Children's Hospital, Little Rock, AR* *Sungchan Kim, University of Arkansas, Pine Bluff, AR* *Carol Connell, University of Southern Mississippi, Hattiesburg, MS* *Ed Parmer, Alcorn A & M, Alcorn, MS*

LOWER MISSISSIPPI DELTA NUTRITION INTERVENTION RESEARCH INITIATIVE

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ABSTRACT

The initiative is a research effort to design, carry out and evaluate nutrition interventions directed at improving the health and well-being of the people residing in the Lower Delta region of Arkansas, Louisiana, and Mississippi. The Consortium is composed of the Agricultural Research Service, US Department of Agriculture; Alcorn State University, Lorman, MS; Arkansas Children's Hospital Research Institute, Little Rock, AR; Pennington Biomedical Research Center, Baton Rouge, LA; Southern University, Baton Rouge, LA; University of Arkansas at Pine Bluff, Pine Bluff, AR; University of Southern Mississippi, Hattiesburg, MS. This consortium met for the first time at a visioning conference in April, 1995. During the past year, some consortium members have added to their faculty and built their capacity to conduct nutrition intervention research. An organization structure has been developed. Three conferences, with well-known leaders in the field, have been conducted. Existing data have been collected, analyzed, and are being published in a monograph. Currently, plans are being made for community assessments.

USDA NUTRIENT DATA BASE FOR STANDARD REFERENCE, RELEASE 11 - DEMONSTRATION OF NEW FILE FORMATS

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ABSTRACT

To take advantage of various improvements in computer hardware and software, NDL has undertaken a major revision of the USDA Nutrient Database for Standard Reference (SR). Previously the data base was only useable on a large mainframe computer, but advances in hardware and software have made it possible to do most work with the database on a personal computer. To meet the needs of its users, the Nutrient Data Laboratory has developed a new format for the SR data base, using a relational structure. Using Relational Database Management Systems designed for the personal computer it is now possible to conduct specialized queries and data searches to generate other reports. This demonstration will show the user how the data is organized into data and support files. The three data files are: 1) Description, which contains long and short descriptions, scientific names, and factors, 2) Nutrient Data, and 3) weights--this revision permits the file to contain many more household weights than previous releases. The four support files are: 1) Food groups, 2) Nutrient definitions, 3) Source codes, and 4) Measure descriptions. The fields in each of these files and how they can be linked together to produce various queries and reports will be shown.

COMPARISON OF AVAILABLE NUTRIENT DATA ON SELECTED CD-ROM COOKBOOKS

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ABSTRACT

With the current demand by the public for nutrition information and the availability of multimedia computers, CD-ROM cookbooks have the potential to provide more information to diverse segments of the population. The type of information provided by CD-ROM cookbooks has not yet been identified. One of the primary goals of this research was to determine the extent to which nutrient analysis could be performed on recipes either added by the user, or modified in some way from the original recipe. During Fall 1995 a survey of computer stores in the Wilmington, DE area was undertaken to determine the number of CD-ROM cookbooks available for purchase by the general public. A total of 11 were available at that time. A copy of each program was purchased, and used for this analysis. All programs required an IBM-compatible computer with Windows 3.1 or higher, and a CD-ROM disc drive. Programs were loaded on a multimedia laptop computer. The first step in this analysis was to run each program and determine the number of general features each one offered. The second step was to examine the type of nutrition information available through each program. The majority of the programs advertised that nutrition information was a feature offered by that program. Final research results revealed that 8 of 11 (73%) programs offered nutrient composition information on recipes included in the program. None of the eleven programs examined offered the consumer the opportunity to change or modify a recipe and then calculate a revised nutrient analysis on that recipe. While nutrient analysis information was available in 8 of 11 (73%) programs, in no instance was an interactive nutrient database available for use by the program user. Based on this analysis, it would appear that the CD-ROM cookbooks are not incorporating all of the interactive capabilities available in multimedia technology at the present time. There is a need for cookbooks of this type to provide calculation of nutrient values after addition or modification of a recipe.

CSFII/DHKS 1994 CD-ROM - ACCESSING THE SURVEY MICRODATA

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ABSTRACT

A CD-ROM containing microdata from the 1994 Continuing Survey of Food Intakes by Individuals and its follow-up Diet and Health Knowledge Survey will be demonstrated. The microdata include information on food and nutrient intakes by 5,589 individuals of all ages and on dietary knowledge and attitudes of 1,879 individuals 20 years of age and older. The data were collected between January 1994 and February 1995. Food intakes were collected by in-person interviews on 2 nonconsecutive days using a 24-hour recall. In addition to the microdata, the CD-ROM includes full documentation on the survey, survey instruments, programming examples for data analysis, and SETS. SETS, Statistical Export and Tabulation System, is a search and retrieval software which allows the user to browse the documentation and data files as well as create data subsets. The survey data files are also available in a separate directory on this CD-ROM for users who wish to use them outside the SETS environment. Also available on the CD-ROM are directories containing the Technical Support Files used to code food data collected in the CSFII and calculate the nutrient values.

CSFII/DHKS 1994 CD-ROM -- ACCESSING THE TECHNICAL SUPPORT FILES

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ABSTRACT

An extensive technical support system is maintained by USDA for coding foods reported in the Continuing Survey of Food Intakes by Individuals (CSFII) and for nutritional analysis of the data. These files are organized into three relational data bases--the survey food coding, nutrient, and recipe data bases. The 1994 versions are included in ASCII format on the CD-ROM containing the 1994 CSFII data, to serve as documentation for the technical Information used to process the survey. The files may be downloaded for use with the 1994 CSFII data, or they may be used for separate research projects. Their format facilitates import into a data base management system. The food coding data base includes over 7,200 food items and over 32,000 weights associated with various food/measure combinations. Thirty food components for each of the 7,200 foods are included in the nutrient data base. The recipe data base identifies ingredients used to represent the nutrient content of mixtures. It includes recipe modifications that were used when sample persons provided detailed information about foods that differed from the survey recipes. The recipe data base also includes information linking the survey nutrient data base values to the USDA Nutrient Data Base for Standard Reference.

POSTER 1- CATEGORY:DATABASES IN EPIDEMIOLOGICAL STUDIES

FOLATE FORTIFICATION OF BREAD AND GRAINS: INTAKE OF THE ELDERLY IS AFFECTED BY FOOD SOURCES OF FOLATE. **K.M. Koehler, S.L. Pareo-Tubbeh, L.J. Romero, R.N. Baumgartner, P.J. Garry, Univ. of New Mexico School of Medicine, Albuquerque, NM.**

Folate fortification of breads & grains will be implemented to prevent neural tube birth defects. This could be a risk for the elderly by masking possible vitamin B-12 deficiency or a benefit by improving folate status & preventing elevated serum homocysteine, a vascular disease risk factor. The purpose of this study was 1) to examine folate food sources in the elderly, 2) to project the effect of fortification on mean folate intake. Subjects were 118 men & 190 women, volunteers, age 65-94y. A food frequency, the Health Habits & History Questionnaire (HHHQ), was interviewer administered and analyzed using VEGADJ & FRUITADJ options for each food item, mean folate intake was computed and items were ranked as folate sources. Effects of proposed regulations were estimated by increasing folate levels per 100g of bread & grains in the ranked folate sources. Mean folate intake from food was 299.6+5.8 (µg/d(SEM). Foods providing 60% of folate were orange juice 15%, bran cereal 10%, highly-fortified cereal 8%, other cereal 7%, salad 6%, dark bread 5%, beans 3%, broccoli 3%, white bread 2.3%. Folate contributions of food groups were: breakfast cereals 26%, vegetables 23%, fruits 21%, refined breads & cereals 6.7%. Mean folate intake would increase 16.5% with fortification of white bread/grains. For NHANES II adults, age 19-74, white bread ranked higher and breakfast cereals lower as folate sources. Mean intake would increase 28.3% from fortification of breads/grains. A fortification policy can have different effects in population groups with different food sources. Supported by NIH AG-02049, AG-11049

POSTER 2- CATEGORY:DATABASES IN EPIDEMIOLOGICAL STUDIES

ASSESSMENT OF FISH CONSUMPTION AMONG ASIAN-ORIGIN SPORTFISHERS ON THE ST. LAWRENCE RIVER IN THE MONTREAL REGION. **T. Kosatsky, B. Shatenstein, N. Kishchuk, M. Tapia, J-P Weber, S. Lussier-Cacan, Y. Marchand. Montreal Regional Public Health Board. Environmental Health Unit. Montreal, Quebec CANADA.**

Freshwater sportfish consumption may contribute both to dietary benefit and hazardous chemical exposure. As recent Asian immigrants may consume relatively high levels of whole fresh and dried fish, a pilot study was conducted in a small sample of Montreal's Vietnamese and Bangladeshi immigrant sportfishers. Preparatory steps were undertaken to render existing questionnaires (developed for a concurrent risk-benefit sportfishers assessment study) culturally-relevant, and to prepare for the analysis of foods not found in the 1991 Canadian Nutrient File (CNF). A research dietitian worked with a resource person from each community on grocery and restaurant field studies of group-specific food purchasing and consumption habits, to provide data on food - especially fish - preferences and preparation practices. Such information was used to derive fish species lists for a "Brief Fish Frequency Questionnaire", incorporated into the main study instrument, and contributed to administration and interpretation of the two 24-hour recalls. Community resource people were on hand during interviews to help with possible language difficulties. Participants were loaned POLAROID™ cameras, and instructed to photograph all foods and beverages consumed on the days preceding interview and food recall visits. British and Asian nutrient databanks provided ancillary culture-specific food composition data, often obtained from researchers on the Internet. Recently published Chinese and Bangladeshi tables were a valuable source of food and nutrient data, added as required to the "user file" utility, an adjunct to the CNF database in the *NUTRIENT ANALYSIS PROGRAM*. Finally, a series of 26 fish models was designed to represent fish fillets and steaks sold in Montreal fish markets. Equations based on published fish density factors permitted calculation of the portion weight subsequently entered for nutrient analysis. Results indicate that these fishers maintain their cultural dietary habits, and that their fishing habits, fish preparation and consumption practices differ both from the general population of Montreal-area sportfishers, and from one another.

POSTER 3- CATEGORY:DATABASES IN EPIDEMIOLOGICAL STUDIES

ESTIMATED VITAMIN B-12 VALUES FOR FOODS ON A FOOD FREQUENCY, THE HEALTH HABITS AND HISTORY QUESTIONNAIRE. **Shirley L. Pareo-Tubbeh, M.S., Richard N. Baumgartner, Ph.D., Linda J. Romero, M.D., Philip J. Garry Ph.D., Kathleen M. Koehler, Ph. D., Clinical Nutrition Program, University of New Mexico School of Medicine, Albuquerque, NM.**

Assessment of vitamin B-12 intake is important in the elderly in light of malabsorption of vitamin B-12 due to atrophic gastritis and pernicious anemia. Food frequency questionnaires are valuable for assessing usual dietary intake with little respondent burden. A well-known food frequency, the Health Habits and History Questionnaire (HHHQ), does not provide vitamin B-12 values. The objectives of this study were 1. to estimate vitamin B-12 values for foods on the HHHQ and 2. to look at the performance of the estimated vitamin B-12 values. Vitamin B-12 content for each food in the HHHQ database was estimated from USDA databases. Weighted averages were taken when more than a single food was combined on the HHHQ. Food frequencies and 3-day diet records were collected from 297 elderly volunteers age 65-95 participating in the New Mexico Aging Process Study. The food frequencies were interviewer-administered and analyzed using version 3.7 HHHQ software; the 3-day diet records were analyzed using version 2.3 of the Food Intake Analysis System (FIAS). Each food from the HHHQ was ranked as a source of vitamin B-12. Top sources of vitamin B-12 were liver (19.8%), 2% milk (9.0%), skim milk (8.6%), and highly-fortified cereals (8.4%) of total vitamin B-12 intake. Mean intake from the HHHQ was 4.43 + 2.49 µg (SD) and from diet records was 5.21 + 6.21 µg (SD), not significantly different by paired t-test (Wilcoxon signed rank test), p=0.88. Vitamin B-12 intake from the HHHQ and from diet records were correlated significantly, Spearman's r=0.34 (p<0.00001). Our estimated values for vitamin B-12 on the HHHQ gave reasonable results for food sources and comparison with diet records. These estimates of vitamin B-12 intake will be useful in research on nutrition and aging. (NIH AG-02049 and AG-10149)

POSTER 4- CATEGORY: NUTRIENT VARIABILITY

FAT AND FATTY ACID CONTENT OF SELECTED FOODS CONTAINING *TRANS*-FATTY ACIDS. **J. Exler, L. Lemar and J. Smith Nutrient Data Lab., ARS, USDA, Riverdale, MD 20737.**

Selected foods were analyzed for fat and fatty acid content under contract with the Nutrient Data Laboratory. Samples were analyzed by capillary gas-liquid chromatography; the studies were monitored for quality control. Files containing the following information have been released on the Nutrient Data Laboratory Bulletin Board and the Internet: data sources, descriptions of 214 food items, listings of added fat as ingredients declared on the food labels, and nutrient values for total fat, individual fatty acids (including *trans*-fatty acids), other fatty acids not listed individually, and fatty acid classes. Comparisons of data for different brands of the same food, for the same food and brand analyzed by different labs or for the same lab at different times, and for similar products with different ingredients show data variability. Some suggestions for possible aggregation of the data and for its use in assessing the dietary intake of *trans*-fatty acids will be made.

POSTER 5- CATEGORY: NUTRIENT VARIABILITY

CARBOHYDRATE DATA FOR SELECTED FOODS IN USDA'S NATIONAL NUTRIENT DATA BASE. **K. W. Andrews and P. R. Pehrsson. U.S. Department of Agriculture, Riverdale, Maryland 20737.**

The Nutrient Data Laboratory (NDL), Agricultural Research Service, conducts food composition research to provide representative estimates for more than 50 nutrients for almost 7,500 foods. These data are disseminated in electronic form (USDA Nutrient Data Base for Standard Reference), in special purpose tables and in research reports. These data are also the basis of the USDA Survey Nutrient Data Base and are used for clinical and epidemiological research, product development, and government nutrition policy and regulation. Currently, total carbohydrate data are calculated by taking the difference between 100 and the sum of the values for water, protein, total fat and ash. Total dietary fiber (TDF) values are reported for most foods while individual sugar data are available for selected foods. In response to increased interest by database users in additional individual carbohydrate fractions, NDL is updating and expanding its carbohydrate database beginning with major nutrient contributors (Key Foods). Recently, over 50 Key Foods were analyzed for starch, total sugars and TDF--the major carbohydrate fractions. In addition, these foods were analyzed for individual sugars (mono- and disaccharides) and soluble and insoluble dietary fiber. In this presentation, the sampling plan and sample preparation procedure for each food type are described. Individual carbohydrate values are reported and their methods of analysis discussed.

POSTER 6- CATEGORY: NUTRIENT VARIABILITY

CONSUMPTION OF READY-TO-EAT CEREALS AND ITS EFFECT ON SELECTED NUTRIENTS AND FOOD GROUP INTAKE. **N.K. Sinha, W.O. Song, S.H. Cash, and J.N.Cash, Dept. of Food Science and Human Nutrition, Michigan State University.**

This study was to examine the consumption patterns of ready-to-eat (RTE) cereals and its effect on selected nutrients and food group intake. Dietary intake data of basic (all income, n = 2349) and low (n = 1133) income population completing 3 days recall from the 1990 Continuing Survey of Food Intakes by Individuals (CSFII-1990) were analyzed by age, gender and income. Intake of RTE was reported by 45% of population; > 80% of children (4-6 yrs), about 70% of young adolescent (11-14 yrs, male) and the lowest rate (32%) of adults (25-50 years, both gender). The average daily intake of RTE cereals (basic income) ranged from: 25 g to 29 g, 26 g to 30 g, and 38 g to 40 g for children (4-10 yrs), adult females and males, respectively. The average intake/meal (aggregated by age and gender) of food energy, fat, dietary fiber, folate, calcium and iron with RTE cereals was: 169 kcal, 2 g, 3 g, 168 µg, 33 mg, and 8 mg; and without RTE cereals: 130 kcal, 5 g, 1 g, 15 µg, 56 mg, and 1 mg, respectively. Correlation analyses showed low but significant associations ($p<0.01$) between RTE cereals consumption and meat group ($r = 0.16$), milk and milk products ($r = 0.21$) and total grain products ($r = 0.10$) intake. Little associations were observed between RTE cereals and fruits, and vegetables group intake. Individuals consuming RTE cereals had significantly higher intake of dietary fiber, folate and iron. Nutrient and food group intake patterns of various age, gender and income will be presented.

POSTER 7- CATEGORY: SURVEY METHODOLOGIES

NEW METHOD FOR PROCESSING FOODS WITHOUT SURVEY CODES IN THE 1994 CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII). **Linda A. Ingwersen, Amy L. Green, Amy Tong, Ellen Anderson, and Martha Berlin, USDA-ARS AND WESTAT, INC.**

In the first year of data collection for the United States Department of Agriculture's (USDA) 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII), 10,900 24-hour dietary recalls were reviewed, coded and electronically transmitted by Westat, Inc. to the Agricultural Research Service (ARS) of USDA. Food coders used a computer-assisted food coding system, Survey Net, to match survey respondents' reports of food descriptions and amounts eaten to the survey food coding data base. Survey Net accesses codes, recipes, and nutrient profiles of over 7,000 foods. However, foods reported in the survey did not always match food codes present in the data base. In the CSFII 1994, these foods were called unknowns. Unknowns were often foods new to the market, ethnic or brand-name foods, as well as one-of-a-kind food mixtures. To process unknown foods consistently and efficiently, ARS added a unique processing feature to Survey Net--a special holding file for unknown foods. Coders entered an unknown food's description and amount as reported on the 24-hour recall, along with the closest existing survey code, in this file. Survey Net assigned the entry a unique identification number that served as a temporary food code. Coders used this number if the same unknown food was reported again. Unknown foods were reviewed by Westat supervisors prior to being sent to ARS for resolution. ARS resolved unknowns by using existing food codes, by modifying survey recipes, or by creating new survey codes that were provided in data base updates. To resolve the unknown foods, ARS sometimes required additional information obtained from market checks conducted by CSFII interviewers. This new method of processing unknown foods was an improvement over time-consuming procedures used in past surveys and contributed to the prompt release of survey data.

POSTER 8- CATEGORY: SURVEY METHODOLOGIES

COMPARISON OF FOOD AND NUTRIENT INTAKES AS MEASURED BY TWO SIMILAR FOOD FREQUENCY INSTRUMENTS IN AN HISPANIC POPULATION. **Patricia Pillow, Rosie Gonzalez, Richard A Hajek, Sara A Gomez, Janice Chilton, Margaret Spitz, Lovell A Jones, UT M.D. Anderson Cancer Center, Houston, TX.**

The diets of Hispanic populations in the U.S. differ in important ways from the diets of other groups. In response, food frequency instruments such as The National Cancer Institute's Health Habits and History Questionnaire (HHHQ) have been modified to accommodate regional Hispanic foods. The Arizona Cancer Center's Southwestern Food Frequency Questionnaire (ASFFQ) was initially based upon HHHQ and is currently being used in the Dietary Assessment in Hispanics and Breast Cancer Study in Houston. Another study conducted in the Houston area, Ecogenetics of Lung Cancer in Minorities (REQUEST), used a modified version of NCI's HHHQ questionnaire with additional foods popular among Hispanics in Texas. These foods were added to HHHQ based upon foods reported on twenty-four hour recalls of local Hispanics (a sample of convenience) and food intakes as reported in other studies conducted in Texas. Although both food frequency questionnaires were initially based upon the HHHQ questionnaire, certain foods are unique to each instrument. Dietary intakes of twenty-two Hispanic women in Houston, as measured by both the ASFFQ and REQUEST instruments will be compared. Similarities and differences in nutrient and food intake as measured by the two instruments will be explored.

POSTER 9- CATEGORY: SURVEY METHODOLOGIES

NUTREINT DATA ACQUISITION AND QUALITY ASSURANCE INITIATIVE. **Laura Winter Falk, M.S., R.D.,The CBORD Group, Inc., Ithaca, New York, Carla C. Heiser, M.S., R.D, Indiana University School of Medicine GCRC Indianapolis, Indiana.**

Responding to a need to develop a national food data clearinghouse, The CBORD Group has proposed to undertake a Small Business Innovation Research (SBIR) project, under the auspices of the USDA. The purpose of this project is to perfect the methodology for collection and dissemination of data to interested parties utilizing a data clearinghouse model. CBORD will develop standardized algorithms, rule sets and a computer system that will facilitate the acquisition, validation ("QA") and dissemination of nutrient data. Beginning with nutrient databases from the USDA, CBORD will build a master nutrient dataset incorporating quality assured data from manufacturers. The system will facilitate creation of database subsets that are currently available in the marketplace, including databases structured to meet the specific and diverse needs of nutritional researchers, food scientists and manufacturers. A metabolic database will be the beta test of the proposed methodologies and algorithms for quality assuring existing nutrient data and acquired analytic reports. Analytic values from SR10, PDS and provisional tables will be the foundation the metabolic database. Missing values will be completed by coordinating unpublished analytic data from manufacturers and academicians not available at the USDA, imputing nutrients from known values of similar foods and by calculating or interpolating data. Foods selected for the metabolic database will include raw food values, and foods selected as being universally accepted by diverse populations. The beta test would lay the foundation for an interactive database that will be made available on a worldwide network. This product will facilitate perpetual growth through academic, industry and government participation. This project will lower costs to manufacturers of distributing nutrient data, allow them to forward calculate, combined ingredients 'recipes' from analytic values, lower software developers database maintenance costs, and lower USDA's cost of keeping current.

POSTER 10- CATEGORY: SURVEY METHODOLOGIES

MODIFICATIONS TO VEGETABLE RECIPES IN THE CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) 1994. **Islam, N., Steinfeldt, L., McPherson, R.S., Douglass, D., Anand, J., and Ingwersen, L., University Of Texas-Houston School of Public Health and USDA-ARS.**

The use of a computer assisted food coding system, Survey Net, in the CSFII 1994 facilitated the coding of all foods reported by 5589 sample persons who contributed a total of 10,900 24-hour dietary recalls. A recipe modification feature in Survey Net allowed ingredients within predefined survey recipes to be changed to match the food reported by sample persons. Within the vegetable group, modifications were created if sample persons reported the use of a fat, milk, or cheese to cook or prepare the food that differed from the survey recipe. As modifications were created, a unique 6 digit code was assigned which linked to the 8-digit survey code modified. This procedure, in effect, expanded the food coding data base, the recipe data base, and the nutrient data base. About 800 different survey codes represented the variability in the consumption and preparation of vegetables among survey participants in the CSFII 1994. Of these, recipes for 180 survey codes were modified at least once, resulting in about 550 unique recipe modifications. The vegetable recipes most often coded as modifications of the survey recipe were mashed potatoes made with milk and fat, home fries, and green beans cooked with fat. The creation and coding of survey modifications provided an efficient way of reflecting differences in the preparation and cooking of vegetables, without the effort involved in the creation of 550 permanent 8-digit survey codes.

POSTER 11- CATEGORY: SURVEY METHODOLOGIES

DEVELOPMENT OF A PRICE DATABASE FOR THE CSFII 89-91 FOODS.

S. A. Bowman and J. Hirschman. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, Washington, DC.

The USDA Continuing Survey of Food Intakes by Individuals (CSFII 1989-91) does not have information on the cost of individual foods items purchased and brought into homes. Therefore it is not possible to estimate how much a person spends on foods they consume. A methodology was developed to estimate the price of foods in the form as reported consumed in the survey. The foods reported consumed in the survey were identified. The foods were disaggregated to their final ingredient forms using the Survey Recipe File. The ingredients were converted to their " purchased" form. Foods such as milk, canned foods, soft drinks, fruit juices, ready-to-eat cereals, cookies, and spices that could be purchased in the form present in the recipe were separated from the other ingredients. Cooked foods such as boiled eggs, rice. pasta, meat, and vegetables were converted to their raw weight equivalents by using conversion factors. Information on yield and moisture content of foods needed to compute the conversion factors were complied from Agriculture Handbooks No:8 and No:102 by the staff of Nutrition Policy and Analysis of the USDA Center for Nutrition Policy and Promotion. Two types of conversion factors were then computed using different sets of algorithms. The first conversion factor adjusted for loss or gain in weight due to cooking. For example steamed vegetables were converted to raw, prepared forms; and boiled eggs were converted to raw eggs without shell. The second conversion factor adjusted for the preparation waste. This factor converted peeled raw potatoes to potatoes with peel, and raw eggs to shell eggs. National average prices for the food ingredients in " purchased" form for the years 1989, 1990, and 1991 were assigned by the USDA Economic Research Service based upon data from A. C. Nielsen, Bureau of Labor Statistics, Agriculture Marketing Service and National Marine and Fisheries Databases. The prices were converted to a 1000 gram basis. The ingredients with prices were reaggregated back to foods in the form reported consumed to give foods with prices for the three years separately. This database is useful to study the cost of nutritious diets.

POSTER 12- CATEGORY: SURVEY METHODOLOGIES

CLASSROOM INSTRUCTION AND WRITTEN MATERIAL HELPED PARTICIPANTS KEEP 3-DAY DIET RECORDS. **Rosemary S. Wold, M.S., R.D., Susan T. Lopez, B.S., Shirley L. Pareo-Tubbeh, M.S., Richard N. Baumgartner, Ph.D., Linda J. Romero, M.D., Philip J. Garry, Ph.D., Kathleen M. Koehler, Ph.D., Clinical Nutrition Program, University of New Mexico School of Medicine, Albuquerque, NM.**

The participants in the New Mexico Aging Process Study are asked each year to keep 3-day diet records. Participants are given a one hour classroom instruction accompanied by written materials. The average class size is 6 participants. Instructional materials used in previous years were redesigned and updated for use with the Food Intake Analysis System (FIAS), version 2.3 (Univ. Of Texas Health Science Center, Houston). These changes included: 1) general instructions for recording food intake; 2) examples of completed Food Intake and Recipe Forms; 3) a food description flow chart. A survey was conducted to evaluate classroom instruction and written materials. Fifty evaluation surveys were distributed to participants during their yearly diet instruction class. Participants were provided a stamped self addressed return envelope and were asked to keep their comments anonymous. During the class, the research nutritionist discussed all materials with the participants. The survey queried the usefulness of specific sections of the instructional materials using a ranking scale. Also queried was a comparison of the revised materials to last year's , and verbal instruction ranking. Participant suggestions were also invited. At the time of this writing, 33 surveys had been returned. When examining various aspects of the written material, 66%-85% found the written materials to be "very useful", 6 %-18% "somewhat useful", 0%"not useful" and 100% found the verbal instruction to be "excellent" or "good". Materials presented this year were rated as more helpful than the previous year's by 96% of respondents. Providing clear concise diet instruction gives the participants a better understanding of what the research nutritionist is looking for on the completed diet record. The research nutritionist is able to shorten home visit times when records are completed in detail and is able to analyze the records in FIAS more efficiently and accurately. (Supported by NIH AG-02049 and AG-10149)

POSTER 13- CATEGORY: SURVEY METHODOLOGIES

COMPARISONS OF IRON STATUS, PHYSICAL ACTIVITY, AND NUTRITIONAL INTAKE OF WOMEN ENTERING ARMY OFFICER AND ENLISTED BASIC TRAINING. **A.D. Cline and A. E. Pusateri. U.S. Army Research Institute of Environmental Medicine, Natick, MA 01760.**

In women, participation in long-term physical training has been shown to compromise iron status. This is of concern because evidence suggests that iron deficiency is associated with reduced aerobic and endurance abilities. The present study was conducted to evaluate reported nutritional intake, iron status and physical activity levels of women as they enter initial Army basic training. We examined blood indices of iron status, current physical activity levels by questionnaire, and reported nutritional intake by food frequency questionnaire in 57 female officers (mean +SD: age 25.4+4.2 y, weight 60.5+8.5 kg, height 163.6+6.4 cm), and 53 enlisted women (mean + SD: age 20.4+3.5, weight 63.8+10.6, height 162.9+7.4). Mean reported nutritional intake was below the Recommended Dietary Allowances (RDA) for energy, folic acid, and iron in both groups. Mean serum ferritin for officers and enlisted women was 34.9+22.9 µg/L and 34.6+28.4 µg/L, with 17.5 and 17.1 percent of the women having iron depletion (ferritin <12.0); mean hemoglobin was 13.4+0.8 g/dL and 13.2+1.0 g/dL, with 13.7 and 8.3 percent of the women having iron deficiency (hemoglobin <12.0). These women were physically active prior to entry into training, as indicated by a reported activity expenditure of 2355.9 kcal/wk and 2588.1 kcal/wk. No significant differences were seen between the two groups in iron status, physical activity, or nutritional intake. Evaluation of the data suggests that women entering the Army may be more physically active than their civilian counterparts, and may have a higher prevalence of iron deficiency. (Supported by DWHRP Grant # W4168021)

POSTER 14- CATEGORY: SURVEY METHODOLOGIES

ESTIMATING NUTRIENT CONTRIBUTIONS FROM RED MEATS IN THE U.S. FOOD SUPPLY SERIES. **S.A. Gerrior and L. Bente. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, Washington, DC.**

The U.S. Food Supply Series is a historical data series, beginning with 1909, that measures the amount of food for consumption in the United States. It includes per capita estimates on several hundred foods and the nutrients available in these foods. The basic source of nutrient data used to calculate nutrient per capita values is the Primary Data Nutrient Data Set (PDS) from USDA's National Nutrient Data Bank. To more accurately reflect the nutrient contributions from red meat associated with the closer trimming of fat to one-eighth inch, and greater removal of bone at the market place and to account for leaner animal production, adjustments have been made to both quantity and nutrient databases used to estimate red meat in the food supply. Factors used to convert carcass weight to retail weight for beef, pork and veal have been revised over the series beginning in the mid-1950's and to boneless weight for beef since the mid-1970's. Revised quantities of red meat calculated from these factors were applied to their respective PDS nutrient values. In this way, food supply estimates of red meat uniquely reflect year-to-year changes in nutrient contributions overtime. A comparison made of quantity and nutrient estimates calculated prior to and after adjustment to the red meat databases will be illustrated using data for the years 1970, 1990 and 1994. Revised quantities and their nutrient contributions from energy, total fat, fatty acids, cholesterol and vitamin E are lower after adjustment because of the greater amount of fat and bone removed prior to retail sale reflected by the revised factors. The closer trim of fat is generally associated with increased nutrient contributions per pound of edible portion of lean red meat to the food supply from thiamin and magnesium. The adjustments made to the food supply red meat databases correct for quantity overestimates and reflect up-to-date nutrient information.

POSTER 15- CATEGORY: SURVEY METHODOLOGIES

COMPARISON OF ACCEPTABILITY SCORES OF MODIFIED RECIPES AMONG TEST SETTINGS. **A. Hunt, A.Cline, C.Champagne, K.Patrick and D.H. Ryan. Louisiana Tech University, Ruston, La 71272, USARIEM-MND, Natick, MA 01760, and Pennington Biomedical Research Center, Baton Rouge, LA 70808.**

As part of a Menu Modification Project to lower fat, cholesterol and sodium in soldiers' diets, new ethnic and breakfast menu items were developed and standardized for 100 portions. Acceptability data were collected after initial recipe development, during recipe validation at a collaborating university, and in an actual Army garrison. Acceptability was determined using a 9-point hedonic scale and products rating 6.0 or better in initial tests were prepared in an actual garrison setting. Acceptability data were compared among the test settings, ethnic categories, and food type. We found ratings varied most between the development and validation settings (7.2 vs 6.6, $p<0.05$), and least between the validation and actual Army setting (6.6 vs 6.6, ns). Since acceptability ratings were so similar between validation and Army garrison, we anticipate that future recipe development can continue without additional testing at an actual Army garrison allowing for considerable cost savings and more timely additions to the Armed Forces Recipe File.

POSTER 16- CATEGORY: CLINICAL APPLICATION OF DATABASES

ADDITION OF OXALIC ACID TO THE NCC NUTRIENT DATABASE. **Alison L. Eldridge, PhD, RD, and Sally Schakel, RD, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN.**

Kidney stone formation is a painful disease with an annual incidence of seven to 21 cases per 10,000 Americans each year. Most suffers are men, with peak age of onset between the ages of 20 to 30. The majority of kidney stones, 70 to 80%, are composed primarily of calcium oxalate crystals. In patients with calcium oxalate stones, it may be necessary to monitor dietary intake of calcium, sodium, vitamin C and oxalates. To aid clinicians and researchers interested in monitoring dietary intake of oxalates and other dietary factors that may contribute to calcium oxalate stone formation, the Nutrition Coordinating Center has added oxalates to the NCC Nutrient Database. Oxalic acid is a dicarboxylic acid found in most plant tissues, mostly in the form of soluble oxalates. An extensive literature search was conducted to identify published reports of the oxalate content of foods. Papers citing the use of HPLC or enzymatic methods for analysis were selected. Where analytical data were not available, oxalic acid values were estimated using the following standard techniques: 1) substitution of oxalic acid values from a similar food; 2) calculation of oxalic acid values from a different form of the same food (e.g., the value for a cooked or dried food was calculated from the value from a raw food using retention factors or moisture content); or 3) calculation of oxalic acid values by summing the values of all ingredient foods. Oxalic acid values were entered into the database in milligrams (mg) per 100g of food. To convert micromols to mg, the following calculation was used: mg oxalic acid = micromol oxalic acid x 0.09001. Food sources of oxalic acid will be presented.

POSTER 17- CATEGORY: CLINICAL APPLICATION OF DATABASES

IDENTIFICATION OF KEY FOODS AS MAJOR CONTRIBUTORS OF ANTIOXIDANT VITAMINS. **P.R. Pehrsson and D.B. Haytowitz. Nutrient Data Laboratory, USDA-ARS. Riverdale, MD 20737**

The Nutrient Data Laboratory (NDL) develops authoritative and extensive food composition databases for the nation's food supply. Comprehensive data for approximately 7,500 foods are used by researchers in the food, nutrition and medical communities. NDL identifies Key Foods as single- and multi-ingredient foods that contribute significantly to the intake of nutrients cited in the "Third Scientific Report on Nutrition Monitoring in the United States" as being of public health concern (e.g., antioxidant vitamins A, C, E, and carotenoids). Key Foods, recently updated to reflect Phase I (1994) of the 1994-96 Continuing Survey of Food Intake by Individuals (CSFII), are identified: 1) using food-specific consumption data; 2) multiplying the reported intake by the concentrations of selected nutrients in the food; and 3) listing foods that contribute over 80% of the intakes of those nutrients in the U.S. population. The current Key Foods List of 677 foods and additional distribution information on the antioxidant vitamins are presented. The Key Foods database is a valuable tool for prioritizing foods to be analyzed and monitoring food composition. Components in existing databases and other components which researchers are discovering to be of concern in disease prevention can also be evaluated using the Key Foods concept.

Beltsville Human Nutrition Research Center

21st National Nutrient Databank Conference

Nutrient Data Laboratory Update

USDA Nutrient Database for Standard Reference. The USDA Nutrient Database for Standard Reference (SR), Release 11 will be available in August, 1996. This release replaces SR10 as the authoritative nutrient database for more than 5,200 foods and approximately 65 nutritional components including values for proximate components, vitamins, minerals, individual fatty acids and amino acids. SR11 will be available on the Nutrient Databank Bulletin Board and the Internet. The database will adopt a relational structure and will be released as ASCII delimited files. Plans are being made for a CD-ROM release through the National Technical Information Service. In addition to the ASCII delimited files, the CD-ROM release will add files in DBF and the IFDA Data Exchange format.

The Nutrient Data Laboratory contacted various food companies to obtain new data for breakfast cereals, canned vegetables, soups, sauces and gravies, snack foods, luncheon meats, and infant foods and formulas to be added to the PDS and SR. New data will be available for these product categories and will be valuable additions to the National Nutrient Databank due to the popularity of many processed and multi-component foods and restaurant prepared foods.

Contracts were awarded to generate additional data on tocopherols and fatty acids, including *trans* fatty acids. The contract on ethnic foods was completed and data is being entered into the Nutrient Databank System.

Primary Data Set. During 1995-1996 the Nutrient Data Laboratory (NDL) completed the 1995 Primary Data Set, a nutrient database for approximately 2,500 foods and 30 components, to be used with the USDA recipe file to create the USDA Survey Nutrient Database for the 1995 Continuing Survey of Food Intakes by Individuals. New values for many foods including margarines and spreads, breakfast cereals, infant formulas and canned vegetables, as well as dietary fiber were added.

Child Nutrition Program. The National Nutrient Database for Child Nutrition Programs (Release 2) was made available in Fall 1995 in collaboration with the Food Surveys Research Group, ARS and the USDA Food and Consumer Services. During 1996, NDL will continue to provide updated data from the SR11.

Databank Redesign. During 1997, the Nutrient Data Laboratory will begin a major revision of the National Nutrient Databank System. The project will take several years to plan and execute and will replace the mainframe computer system which has been in use since 1984.

NDL Home Page. The NDL Home Page has moved to a USDA server at the National Agricultural Library. The bulletins and data have been rearranged so that they are linked together. This permits easy access from a web browser such as Mosaic, Netscape or Internet Explorer. The URL is:

http://www.nal.usda.gov/fnic/foodcomp

The Nutrient Databank Bulletin Board continues to operate at 301-734-5078. NDL food specialists can be reached at 301-734-8491.

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PROPOSAL: SERVING SIZES

The Food and Drug Administration (FDA) plans to publish a proposal to amend the final rule entitled "Food Labeling; Serving Sizes", as modified by the technical amendments, which established the general rules for declaring serving sizes as part of the nutrition label. The regulation is especially important because nutrient levels for each product are declared relative to the serving size. The proposed changes are intended to:

1) make the serving sizes easier for consumers to use and understand;
2) make the regulations simpler for industry to implement;
3) correct problems identified by the agency;
4) respond to suggestions received in petitions, letters, and telephone calls; and
5) improve the organization, consistency, and accuracy of the serving sizes regulations.

The agency is also proposing to establish reference amounts customarily consumed per eating occasion for new product categories and to modify currently existing reference amounts based on new information.

FOOD LABEL AND PACKAGE SURVEY (FLAPS)

FDA is in the final stages of completing the 1995 FLAPS database. The database consists of 1255 processed, packaged food products from 186 product classes. FLAPS provides label and product information recorded from the packages of a scientifically derived sampling of food products, representative of stores with at least $2 million in annual sales and accounting for 82% of all products sold. The sampling frame for FLAPS is based upon sales data provided by Nielsen Marketing Research, initially through its syndicated national database of grocery store warehouse withdrawals, and since 1985, through a more comprehensive Universal Product Code (UPC) scanner-based system. FDA weights FLAPS data by Nielsen sales data to determine estimates describing any number of label-related issues, such as the percent of products sold bearing nutrition labels, prevalence of use of nutrient content and health claims, and use of ingredients such as MSG. The Nielsen sales data also provide the agency with valuable dollar and volume information at the item, brand and product class levels. FDA can now determine trends in product sales from 1989 through 1995.

FINAL RULE: VOLUNTARY LABELING OF RAW FRUITS, VEGETABLES, & FISH

FDA plans to publish this summer a final rule for its voluntary nutrition labeling program that will make the program more consistent with mandatory nutrition labeling of other foods regulated by FDA. The agency is revising the guidelines for the voluntary nutrition labeling of raw fruits, vegetables, and fish and revising the nutrition labeling values for the 20 most frequently consumed raw fruits, vegetables, and fish. On May 29, 1996, FDA announced in the Federal Register the availability of the updated nutrient values to assist those food retailers who wish to update the labeling information that they make available to consumers before FDA's next survey of retail stores to determine whether there is

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substantial compliance with the voluntary nutrition labeling program. Interested parties may obtain a faxed copy of the nutrition labeling values if they call 202-205-5483 or 205-5592. Otherwise, please submit requests in writing (with a self-addressed adhesive label or fax number) to the Division of Technical Evaluation (HFS-165), Food and Drug Administration, 200 C St., SW., Washington, DC 20204.

POLICY FOR DATABASE REVIEW FOR VOLUNTARY AND MANDATORY NUTRITION LABELING

FDA will set out its policy on its review of nutrition labeling databases in the final rule for the voluntary nutrition labeling program for raw fruits, vegetables, and fish. The agency continues to request food manufacturers and trade associations representing products falling under both the voluntary and the mandatory nutrition labeling regulations to submit proposed studies to collect nutrient data for nutrition labeling database compilation. The agency acknowledges the potential usefulness of databases to reduce costs associated with nutrition labeling. A database compiled and submitted by a trade association representing a large number of members would represent less cost than would be required if each member company were to analyze its own products and submit its own individual database. The agency wishes to emphasize that submission of a database to FDA for the purpose of nutrition labeling is voluntary. Each manufacturer, however, is responsible for ensuring the validity of the nutrient values that appear on its label.

THE MANUAL: The “FDA Nutrition labeling Manual: A Guide for Developing and Using Databases” provides generic guidelines for industry to use in preparing and developing databases. Industry may choose to follow these guidelines or may use alternative procedures even though they are not provided for in the manual. If industry wishes to submit a database to FDA, but chooses to use alternative procedures, the organization preparing the database may wish to discuss those procedures with the agency to prevent expenditure of money and effort on activities that the agency may later find unacceptable. The agency recognizes that everything recommended in the manual cannot be achieved at the present time for most commodities, even by some of the larger trade associations. FDA does expect, however, that all planned studies will continue to be based upon consideration of the statistical random sampling, methodology, design, and treatment of data that are described in the manual. The agency has stated that analysis is not needed for nutrients where reliable database or scientific knowledge establish that a nutrient is not present in the product (58 FR 2109, January 6, 1993).

NUMBER OF SAMPLES FOR ANALYSIS: A great deal of information already exists for some foods regarding factors that influence nutrient variability (e.g., variety, season, species). As a result, it may be possible to reduce the number of samples to be assayed on the basis of data and knowledge of which nutrients vary with changing parameters. In addition, information describing the effect of various factors on the nutrient content of foods may be obtained through the completion of experimental pilot studies. These data in turn may provide information on nutrient variability that will also provide a basis for reducing the number of samples necessary for a valid database.

DATA SOURCES: FDA continues to acknowledge the value of data available from USDA Handbook 8 and from the scientific literature, but mean composition values derived from those sources are generally not suitable for labeling purposes. The agency’s policy is to recommend that products be

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labeled according to nutrient composition based upon laboratory analysis. FDA recommends that industry submitting databases to FDA provide nutrient data on both the 100 gram and the reference amount bases. The agency continues to encourage industry to submit data not only to FDA but to USDA for use in compilations such as Handbook 8. Data submitted for inclusion in Handbook 8 should be provided on a mean 100 gram basis and not as label values that have been derived by FDA compliance algorithms.

ANALYTICAL METHODOLOGY: The manual's recommendations are consistent with the Code of Federal Regulations in ζ 101.9(g)(2), wherein the agency advises companies or associations to use non-AOAC methods where no AOAC method is available or appropriate. The manual recommends the use of non-AOAC methods only in the absence of AOAC-validated methods. FDA respects the worldwide consensus surrounding the applicability, specificity, sensitivity, accuracy, precision, and detectability of methods validated by AOAC International and continues to recommend the use of those methods in obtaining measures of nutrient content. Database developers should submit a table delineating proposed analytical methods for each nutrient, with accompanying information concerning specific validation of the method used by the on-site or commercial lab for the matrix of interest.

ELECTRONIC SUBMISSION OF DATA: FDA will consider use of electronic methods for data collection as it continues to assess and improve its database submission and review process.

HISTORICAL DATA: The agency has decided to review and to allow the use of historical data submitted for labeling purposes, as long as those data are accompanied by a planned study to collect additional data for updating the label values. FDA will evaluate the historical data for completeness and reasonableness. If analytical methods have changed substantially from those used in gathering the data, or if it is obvious that the sampling design used to develop the data is incorrect, the agency may choose not to accept the historical data. Otherwise, if FDA determines that the historical data are complete and reasonable, the agency will allow use of the data, as long as the manufacturer plans to collect additional data to update those values.

DATABASE REVIEW PROCESS: FDA has modified its approach to databases that are submitted to the agency for review. The new policy directly addresses concerns relevant to interim review and approval of databases. FDA implemented a new discretionary enforcement strategy for those manufacturers who submit interim data to the agency for approval. Interim data in the form of nutrition label values should be accompanied by raw data. If there are data that the manufacturer has determined as unsuitable, they should also be submitted with explanation. FDA will continue to evaluate interim data (i.e., historical or newly collected) submitted for review if those data are accompanied by a plan to collect additional data for the purpose of updating label values. However, in order to facilitate the use of the developing nutrient database and to limit the uncertainty that cold result from an unforeseen delay in agency review of the database, firms will be free upon submission to begin use of the nutrient label values and to initiate the planned studies to collect and update nutrient values. During this interim period, FDA does not anticipate that it will take action against a product bearing label values included n a database submitted to the agency for review. If any product is identified through FDA compliance activities as including label values that are out of compliance, contingent on the company's willingness to come into compliance, the agency intends to work with both the manufacturer and the database developer to understand and correct the problematic label values.

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When FDA receives the interim data and planned studies referred to above, it will first evaluate the label values relative to the raw data. FDA will recalculate label values based solely on the raw data that have been submitted. The agency will derive label values using compliance calculations based upon 95 percent prediction intervals and, when appropriate, will use weighting procedures, as recommended in the nutrition labeling manual. FDA will evaluate the data for completeness and reasonableness, e.g., it will consider whether or not there are enough samples, and whether all nutrients are included. FDA requests that supporting documentation, such as analytical methodology and a sampling plan, accompany interim data,. The agency acknowledges, however, that a large amount of the interim data available from manufacturers and trade associations are based upon historical data, where the analytical methodology and sampling plan are not available. Hence, FDA will not refuse to accept data solely on the basis that it is not accompanied by comprehensive documentation, so long as the reason such documentation is not provided is fully explained and is acceptable to the agency.

FDA will review the accompanying planned studies to collect additional data, concentrating on analytical methodology and on the reasonableness of the factors that could account for nutrient variability (e.g., style, region), rather than on the rigor of sampling design or statistical treatment of the data. FDA cautions, however, that database submittals should follow the FDA recommendations regarding sampling strategies, weighting procedures, and statistical treatment of data that are described in the nutrition labeling manual.

FDA will respond in writing after review of the data and the planned studies. FDA will address the nutrient label values that were submitted and will indicate whether it has any objection to continuing the planned studies or to continued use of the label values for two years from the date of the agency response. After those two years, manufacturers will be expected to provide the agency with a summary update that reassesses the interim label values based upon completion of the planned laboratory analyses. The agency will evaluate how the study findings bear on the interim label values and will consider whether it would have any objection to continued use of the updated interim values for up to an additional five years. At the same time, however, the agency may suggest modifications to the ongoing plan of study. If after review of data and planned studies, FDA determines that the label values or studies are not appropriate, as indicated above, the agency will notify the manufacturer of that decision.

21ST NATIONAL NUTRIENT DATABANK CONFERENCE GOVERNMENT UPDATES

Food Surveys Research Group
Beltsville Human Nutrition Research Center
Agricultural Research Service, USDA

1994-96 CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) and the DIET AND HEALTH KNOWLEDGE SURVEY (DHKS)

Data collection for the third and last year of the 1994-96 CSFII/DHKS is underway. It began in January 1996 and will continue through January 1997. Data collection for 1995 was very successful. The following are the sample yields and response rates for both 1994 and 1995:

	1994	1995	
Intake questionnaires completed	10,900	10,400	
DHKS questionnaires completed		1,800	1,970
Response rate for one-day recall	80%	81%	
Response rate for two days of recall	77%	77%	

DATA RELEASES

The **1994 CSFII/DHKS microdata** were released in record time for any USDA survey--8 months from receipt of data from the contractor. The 1994 CSFII/DHKS CD-ROM is available for sale from the National Technical Information Service (NTIS) for $50 in the U.S., Canada, and Mexico; $100 for other addresses. To order the CD-ROM, call NTIS at (703) 487-4650 with order number PB96-501010. Be sure to attend the computer demonstrations on Friday afternoon to see the 1994 CSFII/DHKS CD-ROM. Demonstrations of both the microdata from the survey and the technical support files including the Survey Food Coding Data Base, Survey Nutrient Data Base, and Survey Recipe Data Base will be conducted.

1995 CSFII/DHKS release is on schedule. We anticipate its release to the public by the end of 1996.

Food Guide Pyramid Servings Data Base is under development by FSRG to facilitate analysis of the 1994 CSFII for comparing food intakes to recommendations in the Food Guide Pyramid. The data base will contain food code level data for all foods reported in the 1994 CSFII in terms of numbers of servings per 100 grams from Pyramid food groups and subgroups. Also included will be aggregate food intakes per person presented in terms of servings consumed per day from Pyramid food groups and subgroups. This data base will be released on CD-ROM early in 1997.

STAY IN TOUCH

The **FSRG Home Page** is a great way to stay in touch with activities and products of USDA's nationwide food surveys. Our address is:

http://sun.ars-grin.gov/ars/Beltsville/barc/foodsurvey/home.htm

A recent addition to the home page that you won't want to miss is a set of **DATA TABLES: Results from USDA's 1994 CSFII/DHKS** that includes 14 selected data tables and summary highlights.

Another way to stay in touch with survey research activities is to join the FSRG Survey Discussion Group on the Internet. FSRG established this interactive discussion group called **"SURVEY"** on the Internet for persons interested in sharing information about USDA's food consumption surveys. "SURVEY" is intended for discussion of research issues and questions. Follow the directions below to subscribe:

Send a message to: **majordomo@nal.usda.gov**
In the message space, type: **subscribe survey yourname <your e–mail address>**
for example: subscribe survey jdoe <jdoe@bhnrc.usda.gov>

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