



The USDA's National Food and Nutrient Analysis Program in Nutrition Research

P.R. Pehrsson, D.B.Haytowitz, J.M. Holden, Nutrient Data Lab, ARS, USDA, Beltsville, MD
and C.R. Perry, NASS, USDA, Fairfax, VA



ABSTRACT

The U.S. Department of Agriculture's (USDA) National Food and Nutrient Analysis Program (NFNAP), a collaboration with the National Institutes of Health, is designed to develop robust and nationally representative estimates of the nutrient content of important foods in the food supply and significantly improve the quality of data in the USDA National Nutrient Databank. These data are the foundation for almost all national commercial databases, diet and health research, food labeling, and nutrition policies and programs. To date, composite samples of more than 600 foods of the projected 1000 have been analyzed for over 100 food components. Up to 12 additional sample units for each of 15 of the 1000 foods were randomly selected and analyzed to determine unit-to-unit variability for select nutrients. These data were used to calculate more precise estimates of variability and will be used to expand our understanding of variability, by nutrient, in different food matrices. Supported by a self-weighting stratified sampling design, the NFNAP approach has been applied to other ancillary programs for the analysis of specific nutrients of recent interest (e.g., phytonutrients in 60 fresh fruits and vegetables) and population-specific ethnic foods (e.g., American Indians and Alaska Natives). These new data are being released through the USDA Nutrient Data Lab website:
www.nal.usda.gov/fnic/foodcomp.

BACKGROUND

The National Food and Nutrient Analysis Program (NFNAP) is a research program dedicated to long-sought improvements to the USDA National Nutrient Databank, through comprehensive revisions of scientific concepts and technical approaches. NFNAP was initiated in 1997 under the direction of the Nutrient Data Laboratory, ARS, USDA and in coordination with the NIH National Heart Lung and Blood Institute and other supporting institutes, centers and offices. It has been endorsed by the Interagency Board for Nutrition Monitoring and Related Research and the Interagency Committee for Human Nutrition research. Through this program, better estimates of the mean nutrient content of foods and variance indicators will permit improved accuracy in assessment of nutrient intakes of individuals in the U.S. This will enhance the ability to detect etiologic relationships, assess time trends in nutrient intakes, and define and serve populations at nutritional risk. Due to the dynamic nature of U.S. food supply, the continued introduction of new foods, and the emergence of new components of potential public health significance, a research effort of this scope is essential.

METHODS

NFNAP data are generated through five linked processes:

Identification/prioritization of foods and nutrients – 1000 foods were identified for analysis, including single and multi-ingredients foods which contribute significantly to nutrient intakes (Key Foods), ethnic foods, commercial ingredients, foods used in clinical studies, and sources of important emerging nutrients. New survey data from USDA-USDHHS National Health and Nutrition Examination Survey (NHANES) indicate no change in top Key Foods (Table 1). Components analyzed include: proximates, sugars/starch/fiber, amino/fatty acids, minerals, vitamins, and recently, carotenoids, vitamin K, phytonutrients (flavonoids and proanthocyanidins), fluoride, choline, TFA, and *n*-3 fatty acids.

Evaluation of existing data quality - Nutrient data are classified as: 1) satisfactory analytical quality; 2) marginal quality, in need of upgrade; and 3) unsatisfactory, in need of replacement. Classification (based on number of samples, sampling plan, sample handling, analytical method and quality assurance) and importance of the food drive the level of sampling and analysis. Most data were either marginal quality or unsatisfactory and new values were generated.

Development of the sampling approach – A Census-based, stratified, self-weighting design was used (Figure 1) and included retail stores with sales >\$2m, and brand selections proportional to market share data. Specialized designs were developed for fast foods, American Indian foods, and tap water collection. The sampling frame will soon reflect the new 2000 Census data (Figure 2).

Sample analysis – This includes use of current official analytical methods at labs qualified by the USDA approval process, a quality control process (SRMs, control composites, blind duplicates), and internal and external data reviews. Samples are composited by brand or variety across locations; additional individual food samples are analyzed for select for estimation of serving-to-serving variability.

Data dissemination – Data will be released in Standard Reference, www.nal.usda.gov/fnic/foodcomp, in special interest data tables and for monitoring nutrient intakes in the NHANES, currently in progress.

Table 1. Top Key Foods, NHANES 1999-2000 and Nutrients

Milk, 3.25% fat	protein, fat, energy, Ca, Mg, P, K, Zn, SFA
Milk, 2% fat	protein, energy, Ca, Mg, P, K, Zn, SFA
Eggs, raw	protein, fat, Fe, Zn, cholesterol, MUFA
Rolls, hot/hamb	protein, energy, fiber, Fe, Mg, Cu, alpha-tocopherol, folate
Margarine, 80% fat	fat, energy, alpha-tocopherol, MUFA, PUFA
Ground beef, broiled	protein, fat, energy, Fe, Zn, SFA, MUFA
American cheese	protein, fat, P, Zn, SFA, MUFA
Orange juice	Fe, Mg, K, Cu, vitamin C
Salt	Na
FF French fries	fat, energy, fiber, Mg, K, Cu, MUFA

Figure 1. NFNAP Sampling Regions (1997- 2002)

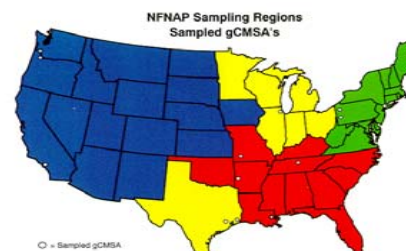
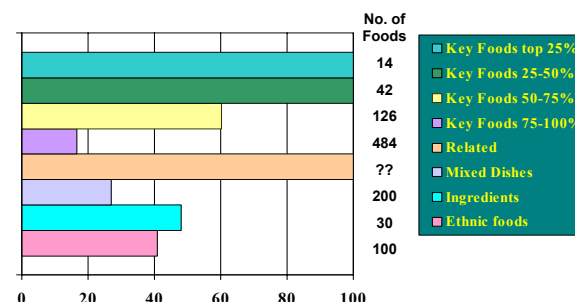


Figure 2. Revised NFNAP County Samples (2002+)



Figure 3. NFNAP Progress – April 2003



RESULTS

NDL and statisticians from the National Agricultural Statistical Service have developed unique sampling plans for specific retail foods and nutrients, as well as specialized plans for fast foods, ethnic foods, and foods containing nutrients of public health importance (e.g., fluoride). Nationwide sample acquisition from 12 or 24 retail locations and chemical analysis for over 100 nutrients have already been completed for approximately 700 types of foods across foods groups (Figure 3) that, in aggregate, contribute approximately 75% of the national intake for about 20 high priority Critical Nutrients (Figure 4). Key Foods contributing to 50% of the intake of the 20 Critical Nutrients have been sampled and analyzed (Figure 3). To date, about 40,000 samples have been analyzed. NFNAP samples are being used to expand the databases for these nutrients and to develop databases for additional components, including carotenoids, TFA, and *n*-3 fatty acids, phytonutrients (flavonoids and proanthocyanidins), choline, fluoride and vitamin K. Data from an extensive sampling of 3 fast food hamburger chains and 1 fast food taco chain are currently being reviewed; sampling of the top 4 pizza chains is scheduled for 2003. Approximately 40 traditional foods from American Indian reservations have been sampled and analyzed under the NFNAP program. The model for sampling of drinking water in 144 locations across the U.S. was based on the NFNAP sampling approach; samples were processed using the Quality Control standards employed with retail foods.

Nutrient data for 250 foods have been released in the USDA Nutrient Database for Standard Reference; over the next few years, all QC approved data will be released in through our Web site: www.nal.usda.gov/fnic/foodcomp/. Additional studies of serving-to-serving variability for select nutrients in high consumption foods and stability studies for vitamin C and folate are also underway. The NFNAP data provide an authoritative, nationally representative foundation of food composition information for nutrition and health research, nutrition policy development, and food industry applications. Continuation of NFNAP would allow continued monitoring of top contributors of nutrients in the food supply, sampling and analysis of foods consumed by ethnic populations, analysis of new foods in our dynamic food supply, and the flexibility to study new emerging nutrients of public health importance.

Figure 4. NFNAP Progress: %Nutrient Intake - April 2003

