Abstract:
The Nutrient Data Laboratory (NDL) at the Agriculture Research Service, USDA is coordinating development of a National Fluoride Database as a critical element of the comprehensive National Fluoride Database and Intake Study (NFDIAS). This database will be used to project fluoride content in drinking water and provide information for interventions to prevent dental caries and other health issues. The fluoride content of the chief contributors to fluoride intake have been determined based on a national sampling and analytical program. Three drinking water samples were collected from a total of 24 locations, one from each of the four regions of the United States, and one from each of the four seasons. The fluoride content of the drinking water was measured using a direct read method for analysis of clear liquid samples and a micro-diffusion method for analysis of the remaining food samples.

Significance of Study
Assessment of fluoride intake is not only critical to ensure adequate fluoride levels for the prevention of dental caries, but also important to prevent excessive fluoride intake and associated dental fluorosis, and, possibly, other health issues. The fluoride content of the chief contributors to fluoride intake have been determined based on a national sampling and analytical program. Three drinking water samples were collected from a total of 24 locations, one from each of the four regions of the United States, and one from each of the four seasons. The fluoride content of the drinking water was measured using a direct read method for analysis of clear liquid samples and a micro-diffusion method for analysis of the remaining food samples.

Sampling Plan

**Overview of National Fluoride and Intake Assessment Study**

The National Fluoride Database is being developed by Nutrient Data Laboratory (NDL) website, which is expected to be operational in 2004 and will be used to provide fluoride intake information for interventions to prevent dental caries and other health issues. The fluoride content of the chief contributors to fluoride intake have been determined based on a national sampling and analytical program. The study will estimate fluoride content in a U.S. nationwide sampling of bottled and municipal drinking waters, beverages, and foods. This multi-center effort has collected more than 2,000 samples of over 50 foods and beverages up at 344 locations. Product sampling, purchasing, and review of quality control are being handled by USDA/NCS. Samples have been processed and prepared by Food Analysis and Chemistry Division (FACD) under the direction of the National Center for Food Safety and Nutrition (NCFSN) Quality Control Panel (QCP). The QCP, an integrated team of University of Iowa using in vivo fluoride isoenzyme specific electrode signal read method for analysis of clear liquid samples and a micro-diffusion method for analysis of the remaining food samples.

**Step 1: Pilot study**
Food Composition Database-Nutrient Data Lab (NFDIAS)

**Step 2: Mixed Model Analysis/ANOVA of pilot study results**

- Most variability from:
  - among geographically close locations
  - over time
  - not among regions
  - At least 288 samples needed for 90% confidence level.

**Step 3: Preparing Sampling Frame Data**

- County and state code, name and 2000 Census Code, name, zip 2000 Census statistical areas (CMSAs)
- Local variability (residential and water sampling in 24 locations)

**Step 4: Sampling Design Development**

- US population from 2000 Population Census ordered
- Even numbered states, increase in size
- Code, name, popn; 2000 Census consolidated metropolitan statistical areas
- At least 288 samples needed for 90% confidence level
- County and state code, name and 2000 Census Code, name, zip 2000 Census statistical areas (CMSAs)
- Local variability (residential and water sampling in 24 locations)

**Step 5: Sampling Design Development**

- US population from 2000 Population Census ordered
- Even numbered states, increase in size
- Code, name, popn; 2000 Census consolidated metropolitan statistical areas
- At least 288 samples needed for 90% confidence level
- County and state code, name and 2000 Census Code, name, zip 2000 Census statistical areas (CMSAs)
- Local variability (residential and water sampling in 24 locations)

**Step 6: Sampling Design Development**

- US population from 2000 Population Census ordered
- Even numbered states, increase in size
- Code, name, popn; 2000 Census consolidated metropolitan statistical areas
- At least 288 samples needed for 90% confidence level
- County and state code, name and 2000 Census Code, name, zip 2000 Census statistical areas (CMSAs)
- Local variability (residential and water sampling in 24 locations)

**Conclusions:** This participant knowledge survey provides insight on what consumers know about fluoridation and their drinking water. The distribution of fluoride intake is skewed across populations, with the composition of well and the choice to fluoridate municipal waters as a local political decision. Fluoridation reached 66% in 2000, of the US population on public water supplies – more than 162 million people. NDL obtained pilot study data from 144 representative locations with water samples, and a one-page survey from the 144 participants on questions regarding their knowledge of fluoridation of their water, the composition of their water, the use of water purification and/or water softening systems. The survey was conducted by the participant survey (Figure 2.) which was administered by the pickup agent at the time of collection. Survey results revealed that about 49% of participants did not know whether their drinking water is fluoridated or not. Information may be available to address consumer and nutrition education programs for consumers. NDL estimated that fluoride intake for each participant and household was representative and reported municipal fluoride levels to each analyzed F levels. The use of well, home purifier and water softening systems also plays a major role in the variability of fluoride in drinking water making it difficult to estimate daily fluoride intakes for individuals. NDL has relied on participant identification (Figure 2., question no. 2) for well water intake in water intake data aggregations and analyses. Eighteen percent of participants report that they have well water (Figure 7.) in all regions, municipal water F levels are higher than well water F levels (Figure 7.). Natural fluoride content varies with region and is affected by the following: sodium water intake (Figure 7.). Twenty-eight percent of participants (Figure 4.) did not know what type of pipes (Figure 2., question no. 2) are used to supply water in their homes. Based on participant responses (Figure 2., questions no. 6, 8 and Figure 5., question no. 4), it is assumed that participants have knowledge of their water treatment/purification systems indicating knowledge awareness of these systems in their households is high. The optimal water fluoride level is 1 ppm (0.7 to 1.2 ppm) 1 ppm = 100 mcg/100g. The maximum contaminant level for fluoride has been established as 4 mg/L (400 mcg/100g). NDL will include fluoride data along with fluoride content of other beverages and foods in the National Fluoride Database to be released on the website of USDA/ARS, and Johns Hopkins University (JHU), Baltimore, MD 21205.