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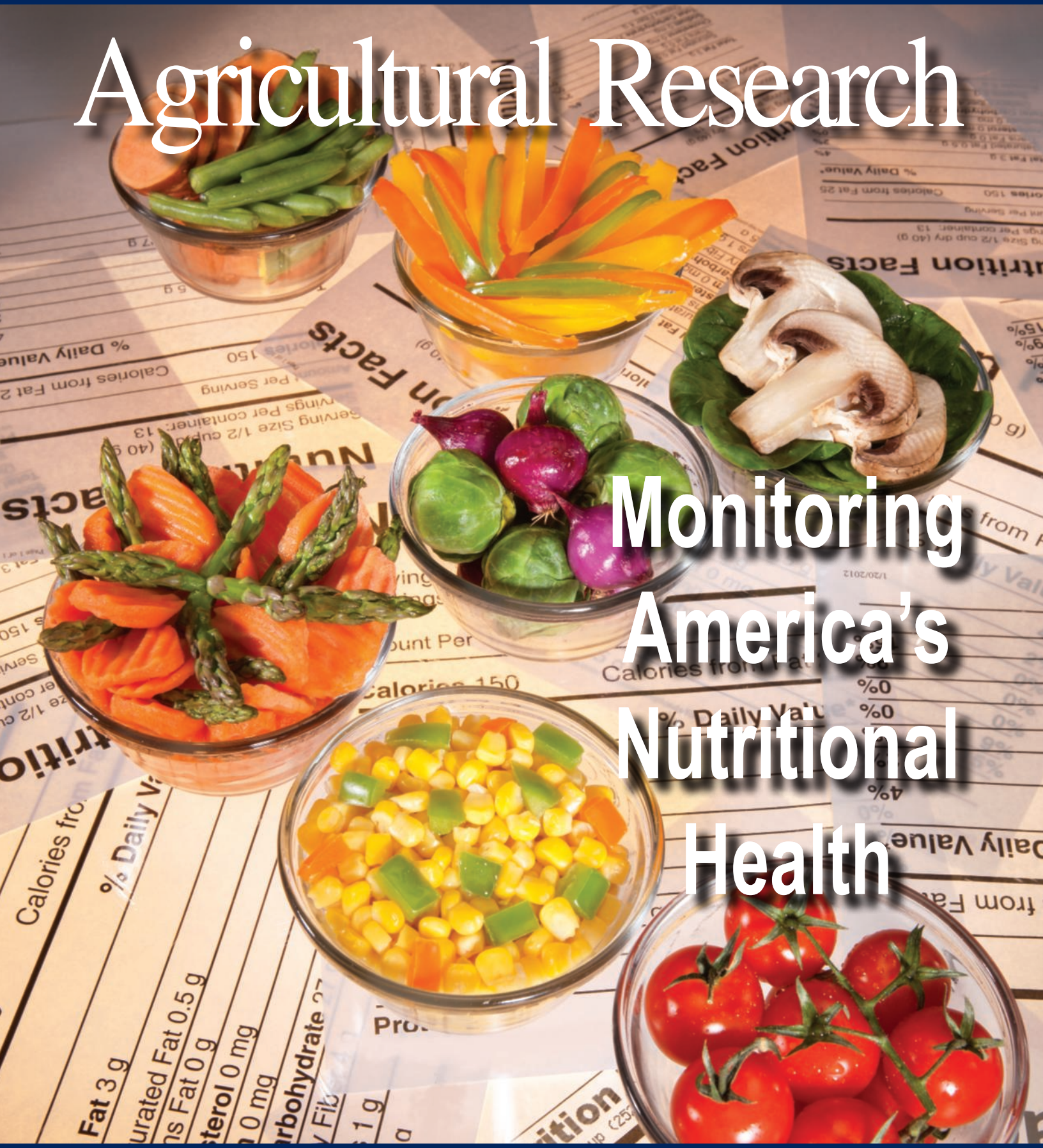

Monitoring America's Nutritional Health

FORUM

Monitoring America's Nutritional Bottom Line

ARS Provides a Wealth of Information

U.S. healthcare costs in 2009 reached an estimated $2.5 trillion, yet America still ranks below several countries in life expectancy and many key indicators of healthy living. "These statistics underscore the vast potential of a healthful diet and lifestyle to prevent chronic diseases before they begin and to reduce healthcare costs," says Molly Kretsch, Agricultural Research Service Deputy Administrator for Nutrition, Food Safety and Quality.

Monitoring the amount and type of food consumed by the U.S. population is important to researchers who track related health biomarkers and to policymakers who evaluate nutrition policies. One key reason for monitoring what we eat in America is that the National Prevention, Health Promotion, and Public Health Council of the Surgeon General referenced 68 percent of adults and 20 percent of children aged 6 and under as overweight or obese. Kretsch is a designee appointed to the council by U.S. Secretary of Agriculture Tom Vilsack.

"The council's report cited the ARS national dietary-intake survey as a key data source to track the ability of everyday people to advance their health through improving diet," says Kretsch. "The mission of the ARS national program for human nutrition is to define the role of food components in optimizing health throughout the life cycle. Our research directly supports the 'Healthy Eating' message of the National Prevention Council."

ARS survey findings show that although the U.S. food supply is abundant and some segments of the population are overfed, many people still fall short of recommended intakes for key nutrients. To figure out what's missing in their diets, nutrition scientists must know what nutrients are being consumed by people in different segments of the population—and that requires scientifically proven food-analysis methods. Read about how ARS researchers develop cutting-edge food-analysis methods on page 4.

Other ARS researchers compile validated nutrient data of what's in foods into an authoritative national nutrient database and keep it current. Policymakers rely on the evidence-based national nutrient database to make recommendations that help Americans know what foods to consume to get all or most of their nutrients from the food supply. Researchers at the ARS Nutrient Data Laboratory are the conservators of the gold standard of nutrient-profile data compilations worldwide. Read about the many U.S. software makers who download and import this premier nutrient database into nutrition products on page 8.

Public and private sector users also rely on results of the annual ARS national "What We Eat in America" survey of the foods people consume, when and where the foods are consumed, and the amounts consumed. Read about how the modern national dietary-intake survey was developed and how results are used by federal, state, and local policymakers on page 16.

Together, researchers at the ARS Beltsville [Maryland] Human Nutrition Research Center support America's public nutrition policies and food and nutrition programs. This feature series also highlights the "science behind the plate." ChooseMyPlate.gov—a free, consumer-friendly, U.S. Department of Agriculture website—was introduced as a reminder for healthy eating and is updated based on the 2010 *Dietary Guidelines for Americans.* (See page 13 for details.)

These ARS researchers provide a wealth of knowledge for monitoring America's nutritional bottom line.

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Solving Problems for the Growing World

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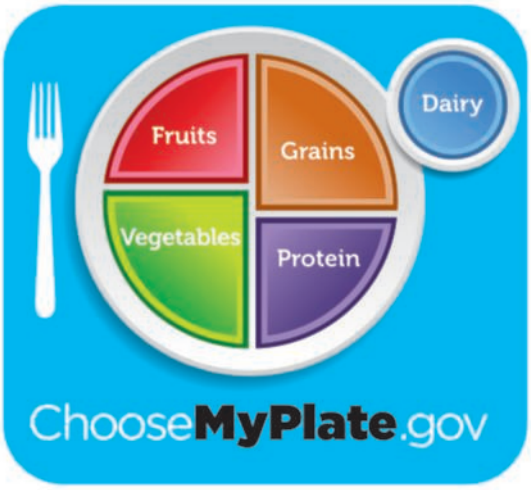
Read about the science behind ChooseMyPlate.com, where consumers enjoy free interactive tools based on ARS national nutrient databases. Story starts on page 8.



Cover: The USDA-ARS human nutrition monitoring program is featured in this issue as a three-part series covering food-analysis procedures, the national nutrient databases, and the national dietary-intake survey called "What We Eat in America." Photo by Peggy Greb. (D2463-1)

Monitoring Best Practices for Food Analysis

The First Step—Monitoring What We Eat

ARS Nutrition Monitoring
A Three-Part Series

Nestled in the Maryland suburbs outside northeast Washington, D.C., is arguably the world's largest and most diversified agricultural research complex—the Henry A. Wallace Beltsville Agricultural Research Center (BARC). Among its 7,000 acres of fields, farmland, and science buildings is the Beltsville Human Nutrition Research Center (BHNRC)—the oldest and most comprehensive of six human nutrition research centers within the Agricultural Research Service. Two new buildings—totaling more than 100,000 square feet of research space—were added to BHNRC in 2003.

"The first human nutrition research conducted by the U.S. Department of Agriculture dates back to the late 1890s," says Allison Yates, the nutrition center's former director, "and USDA nutrition research first moved to the Beltsville area in 1941." Yates is now BARC's associate director. Nutrition center researchers oversee the national food and nutrient databases and national dietary-intake survey. These products are the tools used by scientists to examine the influence of dietary interventions on human health. Besides nutrition monitoring, the nutrition center's research program also includes investigating the role of food nutrients at the cellular level as well as in animal models and in human studies.

One of the nutrition center's five laboratories is the Food Composition and Methods Development Laboratory, where researchers ensure that good food-analysis methods exist. "You can't monitor people's nutrient intakes from their diets without knowing what's in the foods they eat," says Yates.

Headed by chemist James Harnly, the laboratory's researchers design, develop, and improve analytical methods for measuring nutritional components in the food supply. These include nutrients and their secondary metabolites—substances produced by metabolism—and other bioactive food components. The analytical methods help food manufacturers and researchers provide values to the USDA food-composition database that consumers can trust.

The scientists then transfer these technologies to the private, public, and academic sectors. "We transfer our technology and data to users through peer-reviewed publications, official methods, scientific meetings, and scientific contracts," says Harnly.

The most recent addition to the laboratory's capabilities is a high-resolution mass spectrometer (HRMS). Harnly's group is using new spectrometry methods to discover compounds in foods that have never before been documented.

The researchers produce an extraction from a food or supplement sample with which to conduct different types of analyses. They can look at the entire extraction—with no separation—to create a "spectral fingerprint." Using pattern-recognition methods, the fingerprints can be "matched" with other standard profiles, similar to how crime investigators use a fingerprint database to make matches. The components of the extractions can also be separated by chromatography and then identified or detected individually, providing an understanding of all the products of metabolism.

Identifying botanical material in dietary supplements is also a concern. For example, HRMS is useful for identifying potential adulteration of dietary supplement ingredients.

Artist's rendition of the Beltsville Human Nutrition Research Center in Beltsville, Maryland.

(K10784-1)

Other BHNRC studies are showing that HRMS fingerprinting, when combined with chemical and statistical pattern methods called ANOVA-Principal Component Analysis, can clearly establish chemical differences between food samples in terms of growing year and harvest time (early, mid, and late season).

With proven food-analysis methods as a foundation for nutrition monitoring, other BHNRC researchers improve the design and validate the accuracy of dietary-survey instruments. "Scientifically analyzing and tracking the nutritional components within the U.S. food supply provides a foundation for other BHNRC researchers who monitor the food intakes of individuals and analyze the population's overall eating patterns nationwide," says Yates.

Better Analysis Methods for Vitamin D

Accurate data on the amount of vitamins and minerals in the U.S. food supply is critical to accurately assessing the intakes of these nutrients by the U.S. population.

BHNRC chemist Craig Byrdwell has pioneered new, highly precise methods for analyzing vitamin D in foods and dietary supplements. Byrdwell authored a book chapter describing his vitamin D analysis methods, which appears in "Extreme Chromatography." Byrdwell is also a co-editor of the book, which was published in May 2011.

"There are many ways in which multiple instruments that measure molecules can be used in parallel to provide much more information about food samples than single instruments used alone," says Byrdwell. These molecular mass-measuring instruments are called "mass spectrometers." One of Byrdwell's techniques is "dual-parallel mass spectrometry," in which two mass spectrometers are used in parallel. Another technique is "triple-parallel mass spectrometry" in which three mass spectrometers, operating in different modes, are used in parallel.

Byrdwell's experiments have also shown that two systems for separating molecules (liquid chromatographs) can be used in combination to analyze complex food samples for vitamin D and its metabolites.

The amount of vitamin D permitted to be added in fortified American foods is regulated by the U.S. Food and Drug Administration (FDA). For example, orange juice and milk contain very little natural vitamin D, so orange juice is often fortified, and milk is almost always fortified, with vitamin D3. Milk contains calcium, but calcium absorption by the body requires the presence of vitamin D. That is the main reason milk was originally chosen as a main food to be fortified with vitamin D, according to Yates. The goal was to prevent rickets—a disorder caused by a

Chemists Craig Byrdwell (foreground) and James Harnly, with the Beltsville Human Nutrition Research Center, review data from one of the liquid chromatography/mass spectrometry machines used in a process called "triple-parallel mass spectrometry." They use this procedure to analyze the amount of vitamin D in milk, orange juice, and dietary supplements.

STEPHEN AUSMUS (D2438-1)

Vitamin D Needs Reevaluated

Until recently, highly accurate analysis methods for tracking the vitamin D content in foods were not available. (See section on "Better Analysis Methods for Vitamin D," page 5.) Yet very few foods in nature contain vitamin D—so knowing how much vitamin D is in foods and supplements is important for monitoring the population's overall intake.

Vitamin D helps the body use calcium and phosphorus to build and maintain strong bones and teeth. Vitamin D can be formed in human skin by sunlight. But when sun exposure is limited, dietary sources are needed. Vitamin D is added to some foods (called "fortification") and is available in some dietary supplements.

New and relevant scientific research prompted governments to reevaluate the adequate intakes of vitamin D and calcium. As a result, new vitamin D Dietary Reference Intakes were issued in November 2010 by the U.S. Institute of Medicine—part of the National Academies.

The new science-based vitamin D analysis methods from the Agricultural Research Service and analytical values for foods and supplements provided previously unavailable information to those who evaluate the human requirements for vitamin D and to those who monitor vitamin D levels via population studies. The new vitamin D Dietary Reference Intakes are listed on page 6.

New dietary reference intakes (DRIs) for vitamin D.*

Age group	Recommended dietary allowance (RDA) per day**	Tolerable upper intake level (UL) per day***
Children 1-3 years	600 IU (15 mcg)	2,500 IU (63 mcg)
Children 4-8 years	600 IU (15 mcg)	3,000 IU (75 mcg)
Children and adults 9-70 years	600 IU (15 mcg)	4,000 IU (100 mcg)
Adults over 70 years	800 IU (20 mcg)	4,000 IU (100 mcg)
Pregnant/lactating, ages 14-50	600 IU (15 mcg)	4,000 IU (100 mcg)

*The Institute of Medicine (IOM) of the National Academies publishes references and requirements for vitamins, minerals, and other nutrients for healthy people in a series of tables, called the Dietary Reference Intakes (DRIs).

**RDA = Average daily level of intake sufficient to meet the nutrient requirements of nearly all (97-98 percent) healthy people. IU = international units, mcg = micrograms.

***UL = Maximum daily intake unlikely to cause adverse health effects.

"You can't monitor people's nutrient intakes from their diets without knowing what's in the foods they eat."
—Allison Yates

lack of vitamin D, calcium, or phosphate that leads to soft, weak bones in children.

"We can't evaluate vitamin D intake unless we know how much people are getting from food and supplements," says Yates. "And we must attempt to estimate sun exposure." Vitamin D3 is the form of vitamin D that humans make by the action of sunlight on skin.

In May 2011, Byrdwell and colleagues published a study on the use of liquid chromatography, with ultraviolet and dual-parallel mass spectrometry, to analyze the amount of vitamin D3 in samples of retail vitamin D-fortified orange juice.

Currently, FDA has approved vitamin D fortification of fruit juices at levels not to exceed 100 international units (IU)—2.5 micrograms—for about 1 cup of 100 percent fruit juice. (FDA recognizes either vitamin D2 or vitamin D3 as meeting the recommendation/requirement for vitamin D.) Vitamin D-fortified juices must also be fortified with at least one-third of the reference daily value of calcium for balance.

Because there is an acceptable range of vitamin D fortification, there is a need for analysis to determine the initial levels of vitamin D in a food or drink before fortification and the actual amount of the vitamin added to the products.

Byrdwell and colleagues analyzed 47 commercially available fortified orange juice samples to determine their vitamin D3 content. "We sampled 12 cities and 4 brands per city," says BHNRC nutritionist Jacob Exler, a coauthor of the study. (The project is part of the National Food and Nutrient Analysis Program; see page 14.)

Nearly all samples were found by two different analytical methods to contain more vitamin D than the amount listed on the label.

Byrdwell estimates that more vitamin D is put into the juice initially than the label states to make up for potential declining levels during storage, so that the product will contain at least the amount stated on the label.

The study showed that nearly all commercially available orange juice brands tested contained levels of vitamin D3 above the FDA-stipulated amount. The 2011 published study appears in the *Journal of Food Composition and Analysis*.

STEPHEN AUSMUS (D1530-1)

Milk contains very little natural vitamin D, so it is almost always fortified.

In 2007, a BHNRC team also analyzed 5 types of fluid milk collected from 24 sample locations nationwide for vitamin D3 levels: whole, skim, 1 percent fat (white and chocolate), and 2 percent fat. The team used HPLC with ultraviolet spectroscopic detection—a method the team has specifically validated for analyzing vitamin D content in milk.

Since fortification is optional, FDA stipulates that if a manufacturer fortifies milk with vitamin D, the milk must have a vitamin D content of 400 IU (10 micrograms) per quart. Because FDA allows a 50-percent overage, the acceptable range of vitamin D-milk fortification is actually 400 IU to 600 IU (10 to 15 micrograms) per quart.

For people aged 4 through 70 years and older, an 8-ounce glass of milk fortified with 150 IU of vitamin D would provide more than the label's 25 percent daily value (about 37.5 percent).

"This tolerance means the actual vitamin D content of an individual carton of milk can vary widely from the label value, and that's what we found in the milk samples," says Byrdwell. "We did not find that wide a range of variability among the orange juice samples."

Of the 120 milk samples procured in 2007, 16 percent had less than the stipulated 400 IU of vitamin D3 per quart; 77 percent had vitamin D3 between 400 IU and 600 IU; and 7 percent had more than 600 IU per quart (which is greater than the FDA-allowed overage). The 2010 published study appears in the *Journal of Dairy Science*.

"Fortified milk is an important source of vitamin D for many North Americans, and current and accurate data is important to the assessment of vitamin D intake throughout the population," says Exler. Manufacturers of 2 percent milk enjoy the highest sales figures of all fluid milks, according to Exler. More than 80 percent of the 2 percent milk samples collected in 2007 had at least the required amount of vitamin D3 (400 IU per quart).

Results of the orange juice and milk analyses have been used to update food-composition data in the USDA National Nutrient Database for Standard Reference, the primary source of nutrient information used when estimating the nutrient intake of the U.S. population. Read more about the national nutrient database in part two of this series, beginning on page 8.

These and earlier studies underscore the importance of accurate nutrient analysis of everyday foods to nationwide nutrition monitoring efforts.—By **Rosalie Marion Bliss,** ARS.

SCOTT BAUER (K7237-14)

Because there is an acceptable range of vitamin D that can be added to products, BHNRC researchers have analyzed levels of vitamin D in orange juice and milk before and after fortification. This data is now included in the USDA National Nutrient Database for Standard Reference.

This research is part of Human Nutrition, an ARS national program (#107) described at www.nps.ars.usda.gov.

James M. Harnly is with the USDA-ARS Food Composition and Methods Development Laboratory, 10300 Baltimore Ave., Bldg. 161, Beltsville, MD 20705-2350; (301) 504-8569, james.harnly@ars.usda.gov.

Monitoring Food-Supply Nutrients

The Second Step—Conservators of the National Nutrient Database

ARS Nutrition Monitoring
A Three-Part Series

For more than 115 years, the U.S. Department of Agriculture has provided data on the nutrient composition of foods in the American diet. Over time, a series of USDA institutions responsible for providing this data evolved, and today the data comes from the Beltsville Human Nutrition Research Center (BHNRC), part of USDA's Agricultural Research Service.

"Our mission is to ensure that science-based nutrient profiles exist for the U.S. food supply," says nutritionist and research leader Joanne Holden, who heads the Nutrient Data Laboratory (NDL) at the nutrition center, which is located in Beltsville, Maryland. "We work with other BHNRC, private, and public-sector scientists to acquire, evaluate, and disseminate accurate nutrient-profile data on foods—and now certain dietary supplements—consumed in the United States." (See "National Food and Nutrient Analysis Program," page 14.)

Researchers at NDL are the conservators of the National Nutrient Database for Standard Reference, the major authoritative source of information about food composition used in the United States. Some of the data is also used by other countries in compiling their food-composition databases. "The Standard Reference—called 'SR' for short—is the foundation of almost all of the food and nutrition databases, whether commercial or nonprofit, used in the United States," says Holden. "It is critical for national food policymakers, researchers, and those responsible for monitoring nutritional status and dietary intake."

The laboratory's researchers have developed a system for getting commonly consumed foods identified, obtained, and analyzed for their nutrient content, says NDL nutritionist David Haytowitz. "We work with a large number of industry groups, because they recognize the value of being represented in the publicly available SR database."

The SR database includes more than 7,900 foods—and provides nutrient-composition values, called "nutrient profiles," for each of these food entries. SR is available both online and via free download. There is no intellectual property restriction on the database—which is updated annually—and academic, nonprofit, commercial, and other governmental scientific communities are encouraged to download it.

The food industry is responsible for the accuracy of nutrition facts panels required on packaged-food labels. Some food manufacturers use data from the national nutrient databases, provided by the Beltsville Human Nutrition Research Center, to calculate values.

STEPHEN AUSMUS (D1830-30)

A Moving Target

A major challenge in keeping the SR database current, according to Holden, is that the U.S. food supply has changed dramatically and has become increasingly dynamic. Studies have shown that about 30 years ago, more people cooked at home. Now, people often pick up what are called "multi-component" prepared foods from a wide variety of restaurants and ready-to-eat market counters nationwide.

Another challenge is that across the United States, there are hundreds of thousands of food products in stores—and some come on and off the market annually. More than 600,000 unique Universal Product Codes, often called "barcodes," are found on the products in these grocery stores. Each barcode includes a unique 12-digit manufacturer identification number, and different barcodes are created for different sizes of the same individual product. Store managers use the barcodes to track inventories and to price items.

While SR provides a nutrient profile for more than 7,900 foods, each nutrient profile for each food entry can include about 140 nutrients and other dietary components. In contrast, packaged-food labels carry only about 15 nutrients. "One reason we don't rely solely on a manufacturer's label nutrient data is that the label does not provide all the information we need," says Haytowitz.

So how do NDL researchers accurately track the food supply to create nutrient profiles? They continuously monitor the food supply using annual data from the BHNRC national "What We Eat in America" survey and other sources. They learn of newer products that have become popular in the United States as survey respondents report having eaten the new foods. When the survey uncovers popular new foods, "we add them to our sampling and analytical program," says Haytowitz. "In that program, we arrange for the purchase of representative samples of foods from all over the country to be analyzed using scientifically validated analysis methods, so that the data represents average values across the country."

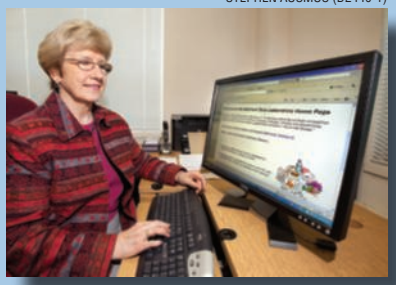
This careful sampling of the food supply is important to other government entities as well, such as the Centers for Disease Control and Prevention, the U.S. Food and Drug Administration (FDA), and the National Institutes of Health (NIH), which also need representative data for research studies and for policy development. (See "The National Food and Nutrient Analysis Program," page 14.)

Accuracy Is Key

"Scientifically validated analytical methods are key to our ability to produce accurate nutrient profiles and therefore to the integrity of the SR database," says Holden. While many foods come on and

Inside the Nutrient Data Laboratory

STEPHEN AUSMUS (D2440-1)



To get an idea of the breadth of users of the National Nutrient Database for Standard Reference (SR), *Agricultural Research* magazine sat down with Nutrient Data Laboratory research leader and nutritionist Joanne Holden (left) to learn more.

Q: How many users download the national nutrient database annually?

A: Because SR is available free, its use in business, industry, and even academia often goes uncited. Once downloaded, the database can be further conveyed in any number of ways, so we can't track users by counting downloads from our government site alone.

Q: What types of commercial hardware and software utilize the database via download and import?

A: Personal and business computers, hand-held devices, mobile applications, commercial retail and proprietary software packages, online tools, and more.

Q: Who are the SR database users?

A: Our data underlies virtually all research into the nutrition/health connection. Users include public policymakers, public and private educators, medical and nutrition researchers, regulators, the food and supplement industries, consumers, and commercial businesses.

Q: Which policymakers use the data?

A: In addition to the Dietary Guidelines Advisory Committee, policy users of the data are federal nutrition assistance programs. These include USDA's Child Nutrition (school meals) and Supplemental Nutrition Assistance (food stamps) Programs and the Special Supplemental Nutrition Program for Women, Infants, and Children (the WIC program). The Department of Defense uses NDL data to formulate feeding programs for soldiers. And international organizations use the data for interventions in countries with malnutrition.

Q: Are creators of U.S. commercial retail products for sale that incorporate SR required to pay a government licensing fee?

A: No, the USDA-ARS national nutrient databases are available copyright free as a government service.

off the market quickly, NDL has fine-tuned methods for honing in on foods with staying power and for those that contain "emerging" compounds important for researchers. Such compounds include, for example, phytoestrogens called "isoflavones" and other plant-based compounds called "flavonoids." These compounds make up supplemental databases that complement the core SR database.

The laboratory also has methods for consolidating multiple near-identical brand-name food products into an accurate generic profile.

"We recognize the nutritional parallels among multiple brands of a single grocery product," says Holden. "We contract only with analysts who use scientifically validated food-analysis methods, which enable us to ensure that an accurate nutrient profile exists for each type of food item." (See "Monitoring Best Practices for Food Analysis," page 4.) For example, while there are many brands of yellow mustard on grocery store shelves, through years of careful analysis, NDL researchers have determined that a single nutrient profile can represent these brands in the national nutrient database under a line item entitled *Mustard, prepared, yellow*.

PapayaHead.com
eating well—having fun!

"We make sure a valid nutrient profile on popularly eaten foods is in, or added to, our databases to keep current," says Holden.

Making Nutrition Fun and Games

After being downloaded, the BHNRC national nutrient databases are often imported into commercial software programs. Such is the case for the "Apps for Healthy Kids" software contest—a competition launched as part of First Lady Michelle Obama's comprehensive "Let's Move!" initiative. The goal of the initiative is to resolve the challenge of childhood obesity within a generation.

"The 'Healthy Kids' competition motivated American entrepreneurs, software developers, and the public of all ages to use our food-nutrient data in a fun, engaging way through tools and games to encourage more nutritious food choices," says Holden.

A runner-up in the "Tools" category, Dean Jenkins of Olympia, Washington, chose to download SR when crafting his submission, which can be accessed at www.Papayahead.com. "There is no better source of real science-based nutrient data," says Jenkins. "We wanted to use the nutrient data to create a product that allows any family or child to make informed choices about what they eat, anywhere, in a fun, easy, and interactive way."

Jenkins mostly uses a "freemium" business model, which provides basic, useful features for free, but also offers premium features for a fee. "We recently launched for-fee content—also based on the USDA-ARS nutrient databases—that is designed for registered dietitians and others who want to publish meal plans for their constituents," says Jenkins. "Since we are entering recipes, we needed mostly single-ingredient food nutrient profiles to work with for all our online content."

The 7,900 nutrient profiles in the SR nutrient database include single- and multi-ingredient foods. These include foods that are raw, cooked, processed, and prepared—from raw eggs to frozen lasagna.

The NDL researchers also produce an additional subset database of approximately 3,000 selected SR foods and profiles for 65 nutrients. These 3,000 profiles are provided to the BHNRC Food Surveys Research Group, which uses them, and ad-

The "Apps for Healthy Kids" software contest—which utilizes ARS food-nutrient data—was launched as part of First Lady Michelle Obama's "Let's Move!" initiative. Here, the First Lady meets with students and chefs during a "Let's Move!" event.

LAWRENCE JACKSON (P060410LJ-0312)

ditional custom-made profiles, to produce another key database—the USDA-ARS Food and Nutrient Database for Dietary Studies (FNDDS). This database is used by the Food Surveys Research Group with modern dietary-intake surveying techniques to obtain national-level data on foods consumed by Americans and the resulting nutrient intakes.

Both of the Beltsville center databases (SR and FNDDS) provide a foundation for multiple USDA consumer-education products. The "Apps for Healthy Kids" competition was administered by USDA's Center for Nutrition Policy and Promotion (CNPP), in Alexandria, Virginia. Contestants were required to incorporate one of the two full Beltsville center databases or a third database produced by CNPP (for the competition) that is based on the Beltsville center databases. All apps remain the intellectual property of the individuals or organizations that developed them. Contestants were also required to commit to providing the winning submissions free of charge to the public for a 1-year period. They can be viewed online at appsforhealthykids.com/application-gallery.

California entertainment software and game developer David Villatoro and his team downloaded the FNDDS database for use in their first-place submission in the "Game" category, a product called "Trainer."

"Trainer gives players, who are kids, the responsibility of caring for creatures—all of whom have dietary and fitness needs," says Villatoro. "Trainer requires the child, or player, to watch how many calories, protein, fat, and carbohydrates are consumed so that the creature can remain healthy."

Villatoro also wanted to select food items from the national database that the player would be familiar with so that players could learn about the types of nutrients they consume every day. "Once players learn how to create a well-balanced, nutritious meal in the game, the goal is that they will apply what they learn from the game in the real world."

The game is currently available in a prototype form that allows for future-development feedback. "Once a final version of the game has been developed, we will decide if Trainer will still be available to play for free," says Villatoro.

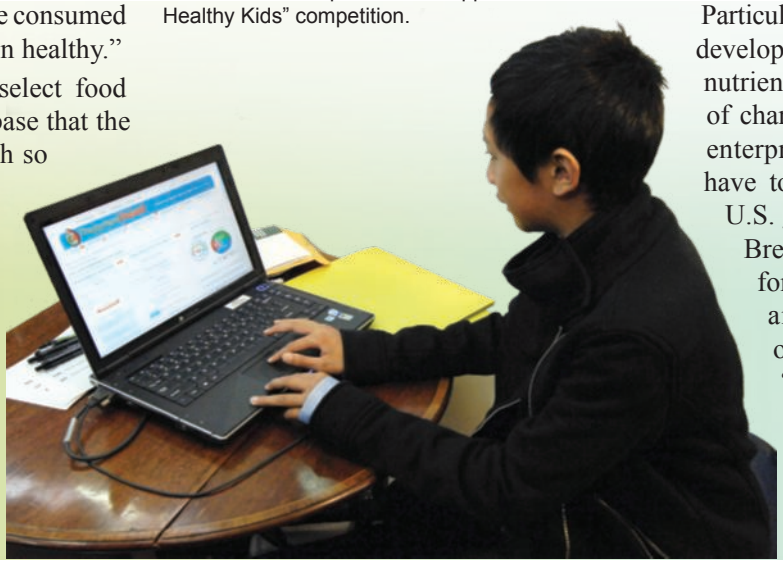
The Beltsville center's national nutrient databases are also available for download and use within products provided by commercial weight-loss enterprises and within the operating systems of mobile hand-held phones and other devices, such as smart phones. Weight Watchers, for example, which has a strong online interactive component, uses nutrient profiles from the BHNRC national nutrient database to represent generic foods within the online program. There are thousands of free and for-fee apps for iPhone, iPod Touch, Android, Windows Phone 7, and BlackBerry hand-held devices. Many of these apps are nutrition/health related and are based on the download and import of the BHNRC national nutrient databases.

STEPHEN AUSMUS (D2453-1)

Weight Watchers' online interactive membership program features nutrient profiles downloaded from BHNRC's national nutrient database to represent the online program's generic foods. Members log in to access interactive tools for managing daily food choices.

Many nongovernmental nutritional websites also incorporate the BHNRC national nutrient databases. Michael Moorehead, based in Granbury, Texas, is the founder and creator of Caloriecounter1.com, a free downloadable mobile nutrition app. He has been working with the BHNRC national nutrient databases for many years. "Caloriecounter1.com consists of a core data set, which is the USDA [BHNRC] national nutrient database," says Moorehead.

"Tweens" (children ages 9-12) are challenged to eat better and be more physically active in PapayaHead.com, winner of second prize in the "Apps for Healthy Kids" competition.



BOB NICHOLS (10DI1507-29)

Particularly attractive to these program developers is that the science-based nutrient profiles are available free of charge. "For this type of private enterprise, business owners don't have to pay a licensing fee to the U.S. government," says Richard J. Brenner, assistant administrator for technology transfer at ARS and director of the Office of Technology Transfer. "Commercial businesses can install this data for use in custom, or proprietary, and retail software products."

Vitamin D's Debut in the National Nutrient Database

Until recently, authoritative values for the amount of vitamin D in the vast supply of food products on the market were not available. Researchers at the Beltsville Human Nutrition Research Center's Nutrient Data Laboratory (NDL) headed up vitamin D food-analysis studies on food products collected randomly from across the nation. For the first time, the researchers were then able to add vitamin D values for 3,000 foods to several of the lab's nutrient data products.

At the same time, the Institute of Medicine (IOM), part of the National Academies, invited NDL researchers to provide input to the IOM committee on revising the Dietary Reference Intakes (DRIs) for vitamin D.

Before the DRIs were revised, the NDL researchers worked with the nutrition center's Food Surveys Research Group to provide ARS food-consumption survey data tables showing nationwide actual vitamin D intakes from foods. "Because estimates of vitamin D intake from food were not available until recently, the data tables were key to assisting IOM with the new 2010 DRIs for vitamin D," says NDL research leader and nutritionist Joanne Holden.

These vitamin D developments have made vitamin D the "it" vitamin in recent years among consumers and the press.

A number of professionals use specialized software products containing the SR database. The Academy of Nutrition and Dietetics (formerly the American Dietetic Association) has a membership that includes nearly 52,000 registered dietitians, among others, nationwide. Many of these professionals run small local businesses in which they provide nutritional advice one-on-one. "I have an online tool called "Nutrihand Pro" that I use when advising my clients, which contains the USDA [BHNRC] national nutrient database," says registered dietitian Marjorie Nolan, based in New York City. "I use the software for logging in the foods consumed by individual clients and many nutrition tracking features. For more than 2 years, the software has helped me advise, track, and monitor the progress of my clients."

Food manufacturers also tap the BHNRC national nutrient databases. The food industry is responsible for the accuracy of Nutrition Facts panels that are required on packaged-food labels as regulated by FDA and the USDA Food Safety and Inspection Service, which regulates meat products. These food manufacturers, particularly smaller ones, do not always procure chemical food analyses for producing information used on packaged-food labels. Some manufacturers use the data from the BHNRC national nutrient databases to calculate values.

For example, Salem, Oregon-based ESHA Research specializes in nutritional analysis software and databases for the United States and Canada. One of ESHA's products is a business-to-business food-labeling software package that incorporates the SR database.

"U.S. food manufacturers must label food packages and containers with nutrient profiles according to the Code of Federal Regulations," says Elizabeth Braithwaite, ESHA's database manager. Also, FDA has proposed nutrition-labeling requirements for restaurants with 20 or more locations.

The proposal requires that calorie-content information be listed on restaurant menus and menu boards, with other nutrient information available in written form upon request, according to Braithwaite.

At ESHA, the SR data is imported electronically into the master database, which also contains brand name and restaurant items. The user keys in a product's recipe ingredients (formulation), processing losses, and serving size, and the program calculates

At Shoppers Food Warehouse stores, people can learn better nutrition and ways of living with diabetes through a program called "Eating Healthy With Diabetes." Jessica Kiel (left), registered dietitian and president-elect of the Maryland Dietetic Association, encourages shoppers to use USDA's ChooseMyPlate.gov interactive tools—which use USDA-ARS national nutrient data—to make better, healthier food choices.

STEPHEN AUSMUS (D2445-1)

STEPHEN AUSMUS (D2446-5)

Clinical dietitian Berit Christensen (right), at the National Rehabilitation Hospital in Washington, D.C., uses materials from ChooseMyPlate.gov and the USDA-ARS National Nutrient Database to teach a recovering stroke patient how to manage weight and blood pressure through better nutrition.

the nutritional analysis per serving. ESHA provides its customers regular updates through product-support agreements that include the SR's annual updated values.

When it comes to the voluntary labeling of the 20 most frequently consumed raw fruits and vegetables and fish, nutritional assessment via proprietary software or other means is not needed. FDA provides posters with general nutritional information for these items that retail stores can put up in the areas where the items are sold. NDL assists FDA in the nutritional data reported for these items, according to Haytowitz.

Downloads for Government Use

Not all commercial downloads for consumer use of the BHNRC national nutrient databases come at a cost. USDA also downloads and imports the national nutrient databases into innovative free products designed specifically for U.S. consumers—to help them achieve their nutritional and dietary goals based on the *Dietary Guidelines for Americans.*

USDA's recently launched ChooseMyPlate.gov website, which replaces MyPyramid.gov, provides a wealth of free tools based on BHNRC's national nutrient databases. ChooseMyPlate.gov is developed and sponsored by CNPP. To support the website and its tools, CNPP has created a new database using several BHNRC databases. In fact, the ARS Food Patterns Equivalents Database is specifically being designed for use with the ChooseMyPlate.gov website and tools.

ChooseMyPlate.gov emphasizes the five food groups: fruits, vegetables, grains, proteins, and dairy and aligns with the consumer message to "Make Half Your Plate Fruits and Vegetables." The USDA Food Patterns, based on the 2010 *Dietary Guidelines,* also are available on ChooseMyPlate.gov.

At ChooseMyPlate.gov, individuals can easily create their own customized healthy dietary plan to ensure that they get their required daily vitamins and minerals, while consuming age- and gender-appropriate daily portions and calorie levels.

On the site's "Interactive Tools" page, users can tap the "Daily Food Plan" option that allows them to find out the amount of each food group they need daily, simply by entering their age, gender, weight, height, and physical activity level.

The new and improved USDA "SuperTracker" tool provides users with free diet and physical activity assessment and planning tools. SuperTracker demonstrates how a person's diet and physical activity compare to the *Dietary Guidelines,* recommended intakes for nutrients, and physical activity guidelines. Users can get a free nutrient-by-nutrient report, complete with a status (over, under, ok) for single nutrients.

The interactive USDA "Food-a-Pedia" provides quick access to food information, food groups, calories, and comparisons. For example, if users wish to check the nutritional difference between spinach lasagna and meat lasagna, Food-a-Pedia

At home, school, or work, consumers can use USDA's free ChooseMyPlate.gov, an interactive website for creating a customized healthy dietary plan that includes required daily vitamins and minerals, and age- and gender-appropriate daily portions and calorie levels. Users can also tap tools called "Daily Food Plan," "SuperTracker," and "Food-a-Pedia."

STEPHEN AUSMUS (D2444-6)

STEPHEN AUSMUS (K10304-1)

provides a quick comparison. Food-a-Pedia also allows users to find out the number of different cups or ounce equivalents of each food group present in a food as well as calorie sources (solid fats, added sugars, and alcohol) in a food.

Among the thousands of apps for iPhone, iPod Touch, Android, Windows Phone 7, and BlackBerry, many are nutrition/health related and are based on the download and import of the BHNRC national nutrient databases.

Downloads for Research Use

The SR database is also imported into custom business software marketed to clinical research dietitians who develop diets for feeding studies, such as clinical trials and epidemiological studies. For example, Princeton, New Jersey-based Viocare, Inc., produces ProNutra and ProNESSy—both of which utilize the SR and FNDDS databases.

The products are tailored to users who both design and assess diets. Research dietitians design nutrient-intake studies and use such custom software products, for example, during studies conducted in research hospitals, universities, and clinical facilities nationwide.

As granting agencies, both NIH and USDA's National Institute of Food and Agriculture fund epidemiology studies, also referred to as "population studies," which track the nutrient intakes of individuals within specified populations.

"Researchers involved in population studies needed special software programs to conduct their research and requested NIH funding to support their development," says Viocare's CEO and president Rick Weiss. "We developed ProNutra at the request of research dietitians, and the software was refined with help from two USDA-ARS human nutrition research centers and NIH."

Viocare worked directly with researchers at the ARS Western Human Nutrition Research Center in Davis, California, and BHNRC in developing the software, according to Weiss.

Downloads for Use Within Local Communities

There are more than 5,500 U.S. hospitals registered with the Washington, D.C.-based American Hospital Association. These hospitals are challenged to provide nutritionally appropriate meals to upwards of 38 million patients admitted annually. There are a number of ways foodservice directors in hospitals achieve these goals, and one is by using software that incorporates the BHNRC national nutrient databases.

West Hills, California-based Compu-trition, Inc., for example, has a software

The National Food and Nutrient Analysis Program

Are U.S. consumers getting adequate vitamins and minerals from their daily diets? The U.S. Departments of Agriculture (USDA) and Health and Human Services (DHHS) work together to make sure that thousands of people are interviewed annually about what they've eaten. Then research nutritionists translate "foods eaten" into "nutrients consumed."

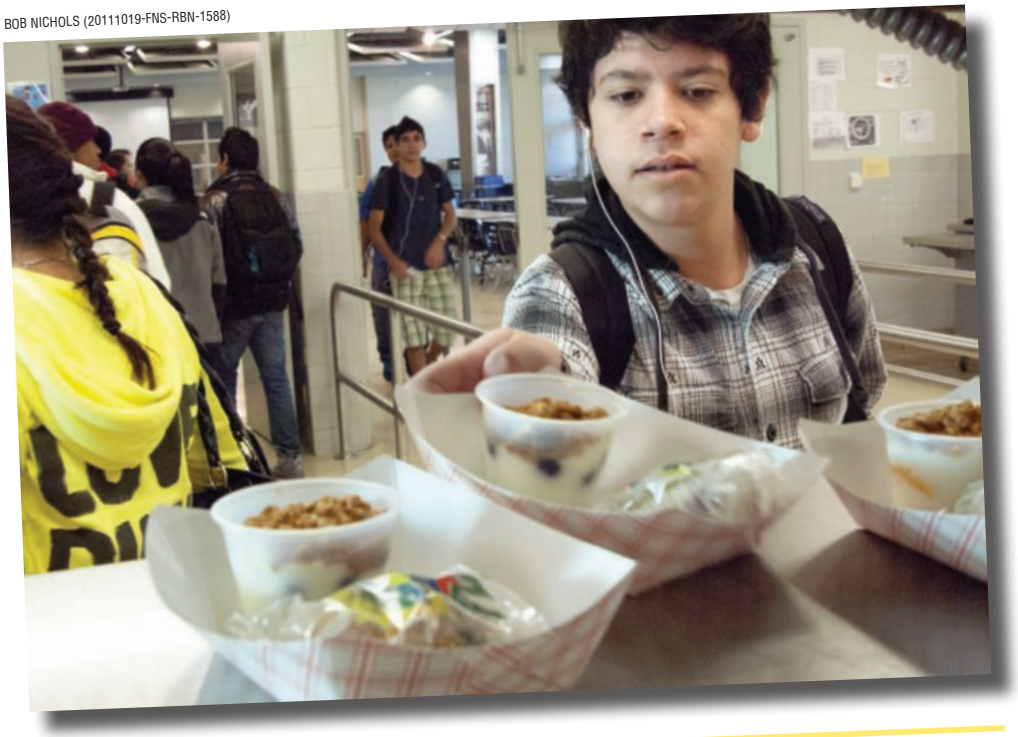
Researchers at the Agricultural Research Service's Beltsville Human Nutrition Research Center develop and validate analytical methods for finding out what's really in the foods, beverages, and dietary supplements people consume. These analytical methods help to improve values in USDA food-composition databases and, in turn, allow food-consumption survey results to be interpreted for a snapshot of the nation's nutritional status.

The heart of the USDA-ARS program to determine science-based nutrient profiles of U.S. foods and supplements is the National Food and Nutrient Analysis Program (NFNAP). This year (2012) marks the 15th anniversary of the NFNAP interagency agreement between USDA-ARS and DHHS. The National Institutes of Health is the lead agency.

Through these collaborations, food-nutrient data are generated and updated on a regular basis for use in a variety of health-monitoring assessments, programs, and studies—as well as by the general public. Private and public agencies use the data to conduct critical population studies, many of which are grant-based.

School meal planners use USDA-ARS national nutrient databases to ensure adequate nutrition. New USDA meal requirements update meal patterns and nutrition standards for nearly 32 million children who participate in school meal programs.

BOB NICHOLS (20111019-FNS-RBN-1588)



lineup that includes nutrition care management features that incorporate the 23rd edition of SR. The software is capable of analyzing the nutrient content of meals, tracking diet orders, and managing recipes and menus while also measuring nutrition-health outcomes, such as weight change and carbohydrate intake. Food and nutrition professionals within a variety of healthcare and hospitality industries use these Computrition software products to provide nutritionally appropriate meals and assessments.

"Our cutting-edge software adaptations make use of the BHNRC nutrient databases for clinical management, food systems management, recipe analysis programs, calorie counting analysis, and for producing FDA-compliant labels for retail clients," says Marty Yadrick, director of nutrition informatics at Computrition.

Experts involved in the federally funded USDA school meal programs, which provide lunch and breakfast to upwards of 32 million children during the school year, also depend on computer products that incorporate BHNRC nutrient data. Many of the nation's school foodservice directors—who oversee meal planning in school cafeterias and central kitchens—have a long tradition of using USDA-approved computer software products to ensure that menus meet nutritional requirements.

The SR database has been used to support a special Child Nutrition Database, which offers nutrient information on foods that are commonly served under USDA's Food and Nutrition Service child nutrition programs. The Child Nutrition Database is updated yearly with nutrient values from the annually released SR.

At the request of USDA, the Institute of Medicine (IOM), part of the National Academies, reviewed the school lunch program for alignment with the 2010 *Dietary Guidelines for Americans*. As a result, the IOM issued the report *School Meals: Building Blocks for Healthy Children,* which recommended that the USDA standards for school meal menu planning be revised.

USDA then proposed new regulations based on the IOM report and after analyzing comments from the public and from professional groups, including foodservice personnel, a final rule was published January 26, 2012. This rule requires most schools to increase the availability of fruits, vegetables, whole grains, and fat-free and low-fat fluid milk in school meals; reduce the levels of sodium, saturated fat, and trans fat in meals; and meet the nutrition needs of schoolchildren within their calorie requirements. Under the new rule, school foodservice operators and directors will focus their menu planning on meal patterns based on adequate food-group intakes for both the National School Lunch and School Breakfast Programs.

"When the school lunch program was originally conceived decades ago, policymakers were concerned mostly with solving malnutrition. Childhood obesity was not on anyone's radar," says pediatrician Virginia A. Stallings, who chaired the IOM Committee on Nutrition Standards for the National School Lunch and Breakfast Programs that produced the new recommendations. "There was a minimum amount of calories required, but there was no cap on the amount of calories provided, since the goal was to reduce undernutrition and poor growth."

Stallings says during the past decade, using the ARS national "What We Eat in America" survey, policymakers have focused more on dietary patterns. "What we've learned is that if we get the dietary patterns right—by providing the right foods and the right food groups—children will in turn get the nutrients they need." Stallings is director of the Nutrition Center at Children's Hospital of Philadelphia.

The BHNRC develops and maintains the gold standard for America's nutrient data—the National Nutrient Database for Standard Reference. The food industry, commercial businesses, government groups, research and academic institutions, and local schools and hospitals tap this critical treasure trove of data for a wide variety of consumer and professional uses.—By **Rosalie Marion Bliss,** ARS.

This research is part of Human Nutrition, an ARS national program (#107) described at www.nps.ars.usda.gov.

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Monitoring the U.S. Population's Diet

The Third Step—The National "What We Eat in America" Survey

ARS Nutrition Monitoring
A Three-Part Series

In 2010, landmark health legislation—the Affordable Care Act—was passed, leading to a national strategy crossing both private and public sectors and led by the National Prevention, Health Promotion, and Public Health Council of the Surgeon General. The plan is called the "National Prevention Strategy."

Science-based dietary-intake data from the Agricultural Research Service provides a key foundation for multiple public health policy publications, including the council's strategy report, published in June 2011. The report cites the ARS national dietary-intake survey data to underscore the ability of everyday people to improve their health through healthy eating and other preventive measures.

Collecting data on what we eat in America is a key monitoring step that connects what Americans eat to their nutrition and health status and to health outcomes. Research nutritionists work on translating "foods eaten" into "nutrients consumed" to get a snapshot of the population's nutrient-intake status. The dietary-intake survey data—after analysis—helps inform major nutrition policy, such as food fortification regulations, nutrition education, food assistance and safety programs, and various dietary guidelines.

The federal government has a long history of monitoring the nation's nutrient intakes. Nearly 50 years ago, Congress mandated that a regularly conducted national survey be launched to collect statistical data about the dietary intake and health of people in the United States. About 10 years ago, the U.S. Departments of Agriculture (USDA) and Health and Human Services (DHHS) combined two separate federal nationwide dietary surveys into one, which is developed and managed by researchers at the ARS Beltsville Human Nutrition Research Center (BHNRC) in Beltsville, Maryland.

At the nutrition center, the Food Surveys Research Group (FSRG) is responsible for the integrated national survey, which is known as "What We Eat in America." More than 5,000 U.S. residents are interviewed each year about what they ate and drank. This information is collected via a computerized dietary-survey program developed and validated by BHNRC researchers. The dietary data, collected both in person and in a second day's interview by telephone, is accumulated as part of DHHS's National Health and Nutrition Examination Survey, commonly known as "NHANES."

Clifford Johnson, director NHANES Program, Centers for Disease Control and Prevention, DHHS, and Alanna Moshfegh, ARS research leader at the Food Surveys Research Group, Beltsville Human Nutrition Research Center, review sodium intake data from "What We Eat in America," the dietary intake component of the National Health and Nutrition Examination Survey.

PEGGY GREB (D1389-1)

"This effective government partnership has led to cutting-edge technologies and methods being used in a single process for collecting and analyzing nationwide food and nutrient intakes," says Allison A. Yates, a registered dietitian and associate director of the Henry A. Wallace Beltsville Agricultural Research Center, where BHNRC is located.

The mission of the BHNRC is to monitor dietary consumption and assess dietary patterns within the U.S. population. Federal, state, and local policymakers rely on such evidence-based nutritional science to develop nutrition programs. For example, the National Prevention Strategy report cites multiple key indicators based on the "What We Eat in America" survey findings. Most U.S. adults consume, on average, more than twice the maximum daily sodium intake recommended by the government. Reducing average population sodium intake to 2,300 milligrams per day—the recommended maximum for adults with no known risk factors such as hypertension—could potentially save $18 billion in healthcare costs annually, according to the report.

Significantly, food manufacturers are trying to reduce sodium in products as a result of knowing from survey findings that most Americans consume more than the recommended amount. (See "The Stealth Sodium Revolution," page 22.)

In 2005-2006, the "What We Eat in America" survey data showed people consumed nearly 3,436 milligrams of sodium each day—that's more than in 1.5 teaspoons of salt. This is sodium that is mostly added in food processing. Salting food at the table is difficult to measure, but is estimated to add less than one-fifth of the total.

Overall, sodium intakes through 2007-2008 have remained relatively unchanged and are comparable to intakes observed in the 1994-1998 survey, according to the dietary survey data.

Based on national survey data analyses, grain-based desserts account for a greater proportion of daily calories than any other food group in people age 2 and older.

PEGGY GREB (K8919-1)

The survey data show that people consume the equivalent of more than 1.5 teaspoons of salt—nearly 3,430 milligrams of sodium—each day. Most U.S. adults consume on average more than twice the maximum daily sodium intake recommended.

PEGGY GREB (D2452-1)

The national survey data also shows the leading sources of calories in the average American diet. "For people over age 2, grain-based desserts accounted for a greater proportion of daily calories than any other food group," says David Klurfeld, ARS national program leader for human nutrition. Grain-based desserts include cakes, cookies, pies, cobblers, sweet rolls, pastries, and donuts. "The 'What We Eat in America' survey data shows us the main source of excess calories in the U.S. diet, which is important to know in developing strategies to combat obesity in the American public."

Monitoring Food *and* Supplement Intake

While the BHNRC survey group's primary focus traditionally has been tracking the population's food intake, the group now also provides data on dietary supplement intakes collected during the annual national government survey. For the first time, in 2011, the BHNRC survey group released data tables that summarize "Total Nutrient Intakes" in the United States. The tables include individual nutrients people consumed from foods and from supplements.

"The *Dietary Guidelines for Americans* and healthcare professionals recommend that people get their nutrients from foods," says Klurfeld. "While single- and multivitamin supplements can make up for some nutritional shortfalls, dietary supplements are not intended to substitute for food," says Klurfeld. "There are natural compounds in foods that don't translate into tablets."

Still, dietary supplements are widely used, and they contribute to nutrient intakes, so it's important to accurately monitor people's nutrient intakes from both supplements and foods. For example, 48 percent of women aged 20 years and older and 38 percent of men aged 20 years and older report using supplements, according to the national survey data.

KEN HAMMOND (97CS3319)

ARS survey data tables show that older people tend to take dietary supplements more often than younger people. Nearly 60 percent of women age 60 and older take a calcium supplement, but only 22 percent of women aged 20 to 39 take one.

PEGGY GREB (D2455-1)

"The data also shows that older people tend to take supplements more often than younger people," says FSRG nutritionist Donna Rhodes, who heads the development of the tables. Nearly 60 percent of women aged 60 and older, for example, take a supplement that contains calcium. But only about 22 percent of women aged 20 to 39 years take a supplement containing calcium.

Among adolescents, use of calcium-containing supplements drops even more. Among those aged 12 to 19 years—both boys and girls—about 11 percent took a supplement containing calcium. Unfortunately, the average intake for milk has been decreasing among kids and adolescents while soda consumption has been going up. For adolescents, the percentage reporting milk consumption on a given day 30 years ago was 76 percent, but by 2005-2006, that percentage had dropped to 49 percent, according to FSRG data.

The *Dietary Guidelines for Americans* encourage people aged 9 years and older to consume 3 cups per day of fat-free or low-fat fluid milk or equivalent milk products, which are major sources of vitamin D and calcium. Yet BHNRC 2005-2006 survey data shows that the average intake of fluid milk was around three-fourths of a cup.

Among the many findings, the new "Total Nutrient Intake" tables confirm what has long been suspected: People who take dietary supplements in general have higher nutrient intakes from the foods they choose than do those who don't take supplements.

The average intake for milk has been decreasing among kids and adolescents while soda consumption has been going up, according to the ARS Food Surveys Research Group in Beltsville, Maryland.

"Many who are in most need of additional nutrients due to poor dietary choices do not choose to take supplements," says Yates.

Overfed but Undernourished

The "What We Eat in America" survey results show that although the U.S. food supply is abundant, many U.S. residents are experiencing nutritional shortfalls. That's based on the results of earlier surveys of dietary food and beverage intakes that were gathered before supplement intakes were evaluated and included.

When compared to the Recommended Dietary Allowances, the national "What We Eat in America" survey has shown that more than half of the people in the United States aren't getting ideal levels of magnesium; about 40 percent aren't getting enough vitamin A; and nearly one-third aren't getting enough vitamin C from the foods and beverages they consume. In addition, researchers at the National Cancer Institute (NCI) produced 39 tables based on the national "What We Eat in America" survey data, which was used by the Dietary Guidelines Advisory Committee in formulating the 2010 guidelines.

Such data is used to develop recomended Food Patterns. For example, while we should be eating—depending on age range—between 1 and 2.5 cups of fruit per day, the dietary-intake survey data shows most adults eat less than 1.5 cups per day, according to NCI analyses. While we should be eating between 1.5 ounces to 5 ounces per day of whole grains depending on age range, most age groups and both sexes are eating less than 2 ounces of whole grains per day, according to NCI's Susan Krebs-Smith.

Krebs-Smith also says that while the recommendation for a typical 2,000-calorie-per-day Food Pattern is 7 cups of red, orange, and dark-green vegetables per week, the ARS dietary-intake survey data shows the average American eats only about 3.5 cups per week.

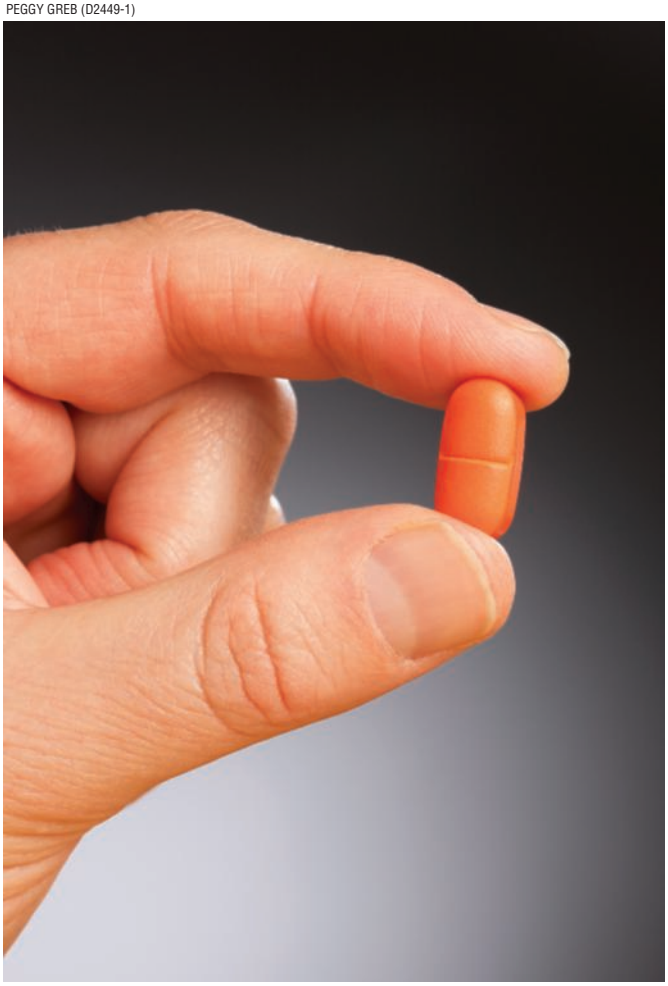
"We are one of the biggest users of the ARS survey data," says Krebs-Smith. "Several types of analyzed data we provided made an impact on the latest edition of the *Dietary Guidelines for Americans*."

The USDA Food Patterns, based on the 2010 *Dietary Guidelines for Americans,* encourage reducing intake of calories from fats and sugars, and there is a limit based on an individual's overall calorie needs. For someone who fits into the 2,000-calorie per-day USDA Food Pattern, male or female, the maximum is 258 calories from fats and sugars.

A Backbone for Policymakers

The national "What We Eat in America" survey data is also used by other government policymakers. "One of the many uses of dietary intake data is to keep pace

PEGGY GREB (D2449-1)



PEGGY GREB (D1662-2)

Left: The ARS Beltsville Human Nutrition Research Center in 2011 released data tables that summarize not only nutrients gained from foods and beverages consumed—but for the first time also from supplements consumed. Right: Based on USDA Food Patterns, depending on age range and calorie needs, people should be eating between 1.5 ounces to 5 ounces of whole grains daily. But most age groups are eating less than 2 ounces of whole grains per day, according to ARS survey data analyses.

with the serving sizes people consume and what serving sizes work in terms of those used on food labels," says Alanna Moshfegh, FSRG research leader. She collaborates extensively with colleagues with the U.S. Food and Drug Administration's (FDA) Nutrition Assessment and Evaluation Team.

At this time, FDA bases label serving sizes on reference amounts per eating occasion for specific food product categories. In principle, foods with similar dietary usage have uniform reference amounts so consumers can make "like-product" nutritional value comparisons.

"Currently, these reference amounts are derived from nationwide food-consumption survey data from the 1970s and 1980s," says Moshfegh. "But much has changed since then." FDA is now working with Moshfegh and colleagues at FSRG to redefine serving sizes using key data indicators from the ARS national "What We Eat in America" survey.

"As we work on a proposed rule for the FDA-regulated Nutrition Facts labels on processed foods and beverages, seeing nationwide food consumption survey trends is tremendously helpful," says FDA nutritionist WenYen Juan. "Having this ARS survey data allows us to see consumption trends and changes over a 30-year period."

The national "What We Eat in America" survey is also used by FDA's Center for Food Safety and Applied Nutrition in an ongoing program to monitor exposure to levels of various pesticides, radionuclides, elements, and industrial chemicals in foods. The FDA program develops baseline information on the levels of these substances in the U.S. food supply.

Foods are prepared as they would be consumed—table ready—before analysis, so the analytical results provide the basis for realistic estimates of the dietary intake of those elements, called analytes, once the amounts typically consumed are determined.

"The food list and the consumption amount we use to estimate intake exposures to these chemicals are based on results of the 'What We Eat in America' survey," says Katie Egan, a nutritionist/exposure analyst with FDA's Office of Food Safety. "Any time we produce an exposure-intake estimate, we rely on that ARS survey data."

In addition, the U.S. Environmental Protection Agency (EPA) uses ARS national dietary survey data when evaluating pesticide exposures in all segments and age groups of the U.S. population. "EPA regulates and sets limits on pesticide residues on foods, which are called 'tolerances,' or maximum legal residue limits," says David J. Miller, chief of EPA's Chemistry and Exposure Branch, part of the Health Effects Division, which is responsible for reviewing and evaluating data on pesticides, as well as assessing and characterizing exposure and risks to humans.

"We work closely with scientists from USDA's Agricultural Research Service, and we use—as an integral part of our risk assessments—a number of ARS consumption surveys and databases, including the national 'What We Eat in America' survey

Using the computerized dietary-intake survey program that was developed and validated by BHNRC scientists, an interviewer, nutritionist Grace Omolewa-Tomobi (left), helps a participant recall portions of the foods and beverages she consumed while being surveyed.

STEPHEN AUSMUS (K11188-1)

and the Food and Nutrient Database for Dietary Studies," says Miller. "These data products are essential components of the models and tools we use to evaluate pesticides and ensure food safety as part of our dietary risk-assessment process."

Survey Data To Bank On

The ARS national "What We Eat in America" computer-based dietary survey interview is conducted continuously, and data is reported in 2-year groupings. FSRG provides periodic Dietary Data Briefs, which focus on a single topic and highlight key results that are of interest to both consumers and professional users.

FSRG has examined 2007-2008 survey data from 5,334 adults aged 20 years and older for a brief that focuses on snacking, which is associated with increased calorie intake and decreased nutrient intake. Snacking is a dietary behavior that has increased in recent decades in the United States—while the percentage of the population who are overweight and obese has also increased.

Caloric sweeteners added to foods during processing or preparation are referred to as "added sugars." Both the 2005 and the 2010 *Dietary Guidelines for Americans* encourage reducing intake of calories from solid fats and added sugars—and there is a limit based on an individual's overall calorie needs. To find your limit, go to ChooseMy Plate.gov and click on "Find Daily Foods."

The briefs indicate that snacks provide about one-third (32 percent for women and 31 percent for men) of all daily calories from solid fats and added sugars. The average intake of solid fat and/or added sugars for men aged 20 and older surveyed in 2007-2008 was 923 calories per day. So men on average are consuming 2 to 3 times their limit in the fats and sugars category. For women aged 20 and older, the average intake of solid fat and/or added sugars was 624 calories per day. So women on average are consuming almost 2 to 4 times their limit in that category.

There is a positive side to snacking, however, according to FSRG nutritionist Rhonda Sebastian, who headed up the snacking patterns Dietary Data Brief. "Snacks provide just over one-third of the total daily fruit intake for both men and women, which is already low in the American diet," says Sebastian.

For example, women are recommended to get 1.5 to 2 servings of fruit daily, but most women are getting only 1 serving of fruit a day, and nearly half that comes at snack time. Men are recommended to get 2 to 2.5 servings of fruit daily, but most men are getting only slightly over 1 serving of fruit a day, with nearly half of that coming at snack time.

"Choosing a food group pattern recommended in the *Dietary Guidelines for Americans* can generally help people better reach and maintain a healthy weight, reduce the risk of chronic disease, and promote overall health," says Sebastian.—By **Rosalie Marion Bliss,** ARS.

This research is part of Human Nutrition, an ARS national program (#107) described at www.nps.ars.usda.gov.

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PEGGY GREB (D2454-1)

Men should get 2 to 2.5 servings of fruit daily, but most men are getting only slightly over 1 serving a day, according to survey data analyses.

Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container about 2

Amount Per Serving	
Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Trans Fat 3g	
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**
Dietary Fiber 0g	**0%**
Sugars 5g	
Proteins 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

For educational purposes only. This label does not meet the labeling requirements described in 21 CFR 101.9.

Nutritionists with the Beltsville Human Nutrition Research Center and the U.S. Food and Drug Administration are working together to redefine serving sizes for nutrition labels. They are relying on key data indicators from the national "What We Eat in America" survey.

The Stealth Sodium Revolution

Salt has become one of a handful of sensitive nutrients in the public spotlight, according to major food company executives who attended the 2011 National Nutrient Databank Conference in Bethesda, Maryland. The conference is supported annually by the Agricultural Research Service's Nutrient Data Laboratory (NDL) and Food Surveys Research Group (FSRG) and other organizations. Both ARS groups are part of the Beltsville Human Nutrition Research Center in Beltsville, Maryland.

Salting is an ancient food-preservation practice still in use today to help preserve some foods. While salt-cured country hams and corned beef are still crowd pleasers, 80 percent of our dietary sodium comes from salt added to processed foods, according to experts.

At the conference, three major food companies described long-term "silent" or "stealth" sodium-reduction plans. One company reported already having removed 2 million pounds of salt from retail food brands in less than 10 years. Another announced plans to reduce sodium in prepared foods by 10 percent before 2015. Yet another reported plans to reformulate 600 products to reduce sodium while identifying healthy, functional alternative ingredients. All of the food companies talked about the need to "retrain the American palate" and to give consumers time to "adapt their taste buds" to less salt in their retail foods.

The effort could not come at a better time. The Institute of Medicine (IOM), part of the National Academies, has called on the U.S. Food and Drug Administration (FDA) to set mandatory national standards for the sodium content in foods. Congress asked IOM to recommend strategies for reducing sodium intake to levels recommended in the Dietary Guidelines for Americans. The IOM's 2010 report concluded that restaurants and food-processing manufacturers need to meet sodium standards, so that all sources in the food supply are involved. NDL and FSRG have been teaming up with the Centers for Disease Control and Prevention's new sodium surveillance efforts, which also involve FDA and the National Institutes of Health.

NDL researchers developed a plan to monitor the levels of sodium in foods—particularly the processed foods and ingredients that make up 80 percent of our population's added-sodium intake as assessed in USDA's 2007-2008 national "What We Eat in America" survey. Foods that rank highest in sodium are being validated by chemical analysis.

One NDL study showed that sodium in pizza has increased in the past 10 years, but sodium in pasta sauce and tomato soup decreased. The NDL also studied salt in baked products over a decade, including a variety of snack products (potato, tortilla, and corn chips; pretzels; and cheese puffs). "Mean sodium values declined in all snacks studied," says nutritionist Pamela Pehrsson, "with the biggest drop—40 percent—found in canned, stacked potato chips."

Having such accurate data on sodium in foods processed by manufacturers, restaurants, and foodservice firms supports efforts to monitor changes in sodium content of foods as well as future assessment of sodium intake in the U.S. population. The new data reported here has been included in the most recent release of the USDA-ARS National Nutrient Database for Standard Reference.—By **Rosalie Marion Bliss,** ARS.

ARS National Program for Human Nutrition Monitoring

The ARS human nutrition monitoring program helps watch over the healthfulness of the country's food supply and diet. This includes determining the food consumption and dietary patterns of Americans as a whole and for a variety of subgroups based on characteristics such as age, gender, ethnicity, and income.

Unique national resources that contribute to the success of the ARS human nutrition monitoring program include the National Nutrient Database for Standard Reference and the national "What We Eat in America" survey, which is the dietary intake survey component of the broader National Health and Nutrition Examination Survey, commonly referred to as "NHANES."

Data on national dietary habits from this program serve as the foundation for many epidemiological (population) studies of diet and health. The information developed by the ARS human nutrition monitoring program provides invaluable information to policymakers, farmers, food processors, and manufacturers, as well as researchers.

Nutrition monitoring data identifies relationships between foods, nutrients, and disease occurrence. But such epidemiological information reveals only correlation—not proof of cause and effect. So when a trend is highlighted by nutrition monitoring data, the next step is to set up hypothesis-driven research to examine possible mechanisms that could be provoking the problem.

The nutrition monitoring data provides the foundation for many of ARS's nutrition research projects. New research questions are posed from the data to solve nutrition-related problems.

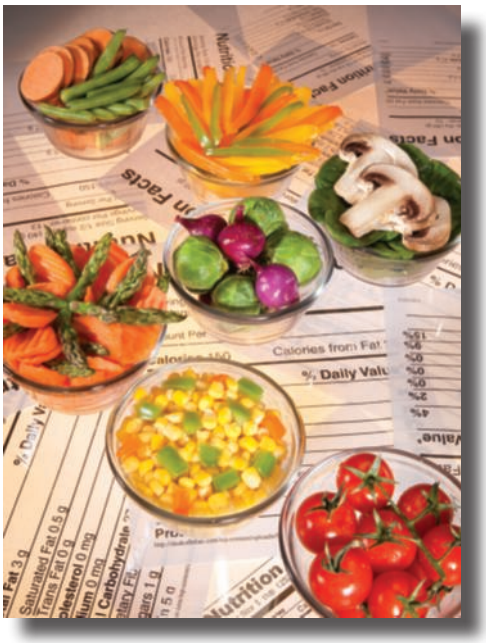
Laboratory research generates high-impact science that can change paradigms in nutrition management. ARS provides not only the state-of-the-art equipment and facilities for human nutrition research, but also the ability to carry out multidisciplinary long-term research crucial to understanding and improving the American diet from conception through old age.

The centerpiece of the nutrition monitoring program is "What We Eat in America," the only nationally representative dietary survey. ARS is responsible for the survey in partnership with the Department of Health and Human Service's National Center for Health Statistics.

The other part of the nutrition monitoring program is defining the nutrient content of foods. This is a challenging task because of a rapidly changing U.S. food supply, evolving consumer food choices, and growing demand for data on newly discovered, potentially health-promoting food components. ARS is the keeper of the food-composition databases, not only developing new data and new analysis techniques, but ensuring wide access to all of the data.

Partnerships are critical to accomplishing this work. ARS and the Department of Health and Human Services are partnering on the National Food and Nutrient Analysis Program to enable nutrient analyses of foods that are major contributors of health-promoting food components in the U.S. food supply. The Dietary Supplement Ingredient Database has also been created through this partnership.

Cutting-edge research on what we eat as a population and what nutrients are in those foods is critical for ensuring that people have the opportunity to plan diets that support optimal health.



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