

Was It a Slab, a Slice, or a Sliver?

High-tech innovations take food survey to new level



Nutritionist Linda Cleveland (left) and home economist Linda Ingwersen designed the *Food Model Booklet*, which contains two-dimensional measuring guides (foreground) to help food-survey respondents better estimate portion sizes.

SCOTT BAUER (K7633-3)

According to the last USDA nationwide food consumption survey, conducted from 1994 to 1996, Americans of all ages averaged about 2,000 calories a day. So why are we overweight as a population?

Some Americans obviously eat more than they report, say Linda E. Cleveland and Linda A. Ingwersen, of ARS' Food Surveys Research Group, which develops and oversees the periodic survey. So

often, we tend to forget that soda, bag of chips, or candy bar we snatched yesterday when our tummies rumbled. And we may think we ate smaller portions than actually passed our lips.

So Cleveland, a nutritionist, Ingwersen, a home economist, and other survey group members are working hard to catch those forgotten and underestimated calories in the next nationwide survey—expected to begin in 2002 (see box).

It's Not So Much What You Ask, As How

Staffers have improved the way the interviewers will probe for all the foods and beverages a respondent ate during the previous 24 hours so that the questions don't seem repetitive. "It sounds more conversational," says Cleveland, "like you're chatting about the meal, rather than questioning their memory."

And Cleveland and Ingwersen believe



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Survey participants position the movable arrow on this model to resemble the size of the pizza, cake, or other wedge-shaped food they ate.

households. But during the next survey, respondents will be able to turn to life-size, two-dimensional pictures—each marked by a numbered tab—as well as the cups, spoons, and ruler.

“We’re trying to provide a variety of ways for people to estimate amounts in order to make it as easy for them and as accurate as possible,” Ingwersen says.

Respondents may find it easier to recall the size of that slice of pizza by turning to one of the wedges pictured under tab 7 and adjusting it to just the right width than to estimate its length and width with a ruler (see above diagram).

Under tab 6, the 5-inch-by-5-inch grid for estimating that serving of lasagna, meat loaf, brownies, or corn bread may shake loose old memories of math class, Ingwersen says, noting that focus groups have helped them fine-tune the booklet.

For instance, on the opposite page are blocks for estimating the thickness of lasagna or meat loaf servings. “The focus groups wanted to know the actual measurements, so we added them,” Ingwersen says. One focus group of women wanted a smaller wedge for estimating pie or cake servings. “And they wanted it on a dessert plate,” she says. The researchers obliged.

To put the servings in perspective, Ingwersen and Cleveland had the grid, circles, and several amorphous mounds printed on transparent pages that overlie a full-size dinner plate straddled by a full-size knife. “The transparencies give the quantity a three-dimensional appearance,” Ingwersen says.

And the different-sized mounds—for estimating foods ranging from a dollop of whipped cream to a heap of spaghetti—have depth. A graphic designer used a computer program to draw the mounds and then rotate them to a 55-degree angle—the perspective one would have while sitting at a table, says Cleveland.

Developing the collection of glasses, cups, mugs, and bowls under tabs 2 and 3—each marked at several different

they have improved the accuracy with which people estimate the size of the portions they consume. The two scientists have developed an easy-to-use *Food Model Booklet* that incorporates high-tech graphics and research on how people perceive quantities and on what is and isn’t helpful.

In previous surveys, interviewers were armed with measuring cups, spoons, and rulers when they visited

USDA and HHS Surveys To Be Wed

In an effort to increase efficiency in government, the USDA food survey will be integrated with the National Health and Nutrition Examination Survey—better known as NHANES. Directed by the U.S. Department of Health and Human Services’ National Center for Health Statistics in Hyattsville, Maryland, the NHANES collects food-intake data from participants nationwide, along with biological samples taken during a physical examination.

The merger will enhance food data collection and analysis, says Alanna J. Moshfegh, who oversees the USDA food survey. “For the first time, we’ll be able to compare food intakes with measures of health status,” she says, because the same people are being assessed for both diet and health indicators.

Traditionally, the NHANES emphasized nutrient intakes—such as fat or specific vitamins or minerals—not the foods themselves. So researchers primarily looked for associations between nutrients and health status.

“Now, we’ll be able to look at both foods and nutrients in relation to health,” says Moshfegh. “For example, do people who eat more fruits and vegetables have more favorable health outcomes?”

Moshfegh’s group will oversee training of the data collectors contracted to conduct the food-intake interviews using the new tools developed by her staff. Interviews along with comprehensive physical examinations will take place in the mobile exam centers currently being used in the NHANES. Plans call for a second day’s intake to be collected by telephone interview a few days after the first interview.

Moshfegh, Joseph Spence, director of ARS’ Beltsville [Maryland] Human Nutrition Research Center, and their counterparts at the National Center for Health Statistics are working out details for the merger, which is slated to begin sometime next year. Spence says the integrated survey will continue to collect data annually from 5,000 participants, who are selected to represent U.S. demographics. And Moshfegh’s group will continue to process and compile the data, which will be released annually.

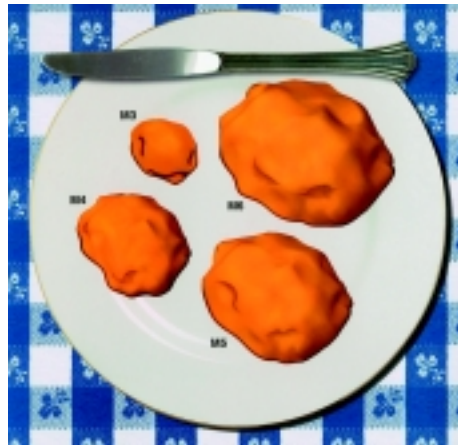
volume amounts—took a lot of thought, as well as some computer tricks.

“We filled a table with glasses and bowls. We surveyed stores and looked at what people had in their cabinets to determine which shapes and sizes to include in the booklet,” says Cleveland. And, adds Ingwersen, “we included a wine glass. That says, ‘Yes, we do want you to report any alcohol you drank,’” because it contributes calories.

All their planning should produce more accurate data, according to tests conducted by the ARS researchers. The tests involved 264 men and women from age 20 to over 60, who estimated the portion sizes of all types of foods and beverages using the booklet or the cups, spoons, and ruler.

“People estimated serving sizes reasonably well with both types of guides,” says Cleveland. “But they did a little better using the booklet, especially the mounds.” On average, estimates improved by about one-third with the

These two-dimensional drawings represent foods that mound on a plate, such as casseroles, vegetables, or rice. The plate and knife provide a size reference.



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mounds compared to the measuring cups.

Asking Without Badgering

The booklet is only part of the effort to improve the survey data, says Alanna J. Moshfegh, who oversees the Food Surveys Research Group. During the last 3 years, the group has expanded and

improved the method of questioning to help respondents remember the foods they ate. They’ve also automated the whole interview, computerizing the questions, prompts, and details about the food and how it was prepared.

“Since the first nationwide collection of individual dietary intakes in 1965,” Moshfegh explains, “the focus of research in USDA’s nutrition monitoring program has been the question, What is the most effective way to collect a complete 24-hour dietary recall?”

In the 1994–96 survey, interviewers used a triple-pass method, she explains, because her group’s research had shown that asking people about their intakes in different ways helped respondents recall more of the foods they ate the day before. Since then, Cleveland, Ingwersen, and their colleagues have been testing and refining a better instrument—the new USDA Multiple-Pass Method.

In addition to asking the respondent to remember all they ate, interviewers specifically ask about “forgotten foods,” such as nonalcoholic and alcoholic beverages, sweets, snacks, or breads.

“Our research showed that beverages accounted for half of forgotten foods,” says Moshfegh. “Sweets accounted for one-third.”

The method has a number of built-in cues to help jog the memory. One step, for example, asks respondents what time they ate the food and what they would call the eating occasion—lunch, snack, dinner, etc. The questions don’t seem repetitive, says Moshfegh. “The respondents remain engaged because they are still adding foods throughout the interview.”

Based on the results of pilot tests, “we believe this method does a better job of collecting more complete food intakes,” she contends. In the first test, 383 women recalled eating an average 16 foods instead of the 14 reported by their counterparts in the last survey. And they reported 300 more calories, on

PEGGY GREB (K9308-2)



A new, computerized interview process, developed by the Food Surveys Research Group, prompts nutritionist and group leader Alanna Moshfegh to ask survey respondents about “forgotten foods.” The mounds help the respondents estimate portion size.

average. In a larger study with nearly 800 men, women, and children, the trend of more food and more calories continued.

No Easy Task

The fact that the questions and prompts are computerized is one reason for its success. "It's easier to administer and more consistent," Moshfegh says. "Participants said they liked the interview. And the interviewers who previously collected data with paper and pencil liked the automated version much better."

That's because the automated program prompts the interviewers and leads them through the details they must ask about each food. For instance, the program would prompt the interviewer to ask, "Was that candy bar regular, king size, or fun size? Was that apple small, medium, or large?" explains Moshfegh.

Prepared foods require more details. Take carrots, for instance. Were they cooked, creamed, fried, pickled, or raw? the program would prompt. If the answer is "raw," you get to move on to the next food. If it's "cooked," however, the interviewer would ask if they started as fresh, frozen, or canned. Were they cooked with fat or oil? And so on.

If you had beef stew, the interviewer might ask if it was home prepared, canned, frozen, a restaurant entree, or something else. If it was a home recipe, what were the ingredients? If it was a frozen brand name, what brand?

"There are 2,400 questions about foods and 21,000 possible answers," says Nancy R. Raper, who oversaw the automation. And the job is never ending: "We have to keep up with the foods on the market to assess whether the questions we ask are relevant," she notes.

Programming all these questions took about 2 years, Raper says, with input from several scientists in the survey group. They used survey software developed in The Netherlands and used by the U.S. Bureau of the Census and other government agencies. So far, she says,

This grid is used to estimate the length and width of square and rectangular foods like meat loaf, brownies, or lasagna.



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the program developed for the food survey is the largest and most complex application of this software.

Finding the Trends

As the data is collected, another program—Survey Net—will code each reported food by number. "We have over 7,000 foods in the database, with descriptions of their package sizes and weights, types of preparation, and nutrient profiles," says Ingwersen, who ensures that the database is updated.

When all the survey data is translated into numbers, it can be analyzed for intake levels of either nutrients or foods, Ingwersen says. "And it can be sorted by any variable you want: age, gender, socioeconomic group, geographic region, food or nutrient, Food Guide Pyramid servings, foods eaten on weekday versus weekend, or outside the home versus at home."

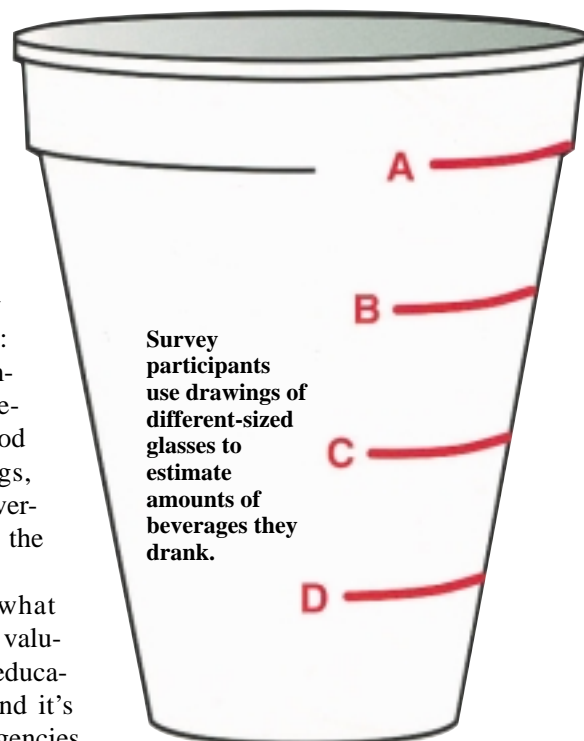
That versatility is what makes the survey data so valuable to researchers and educators, says Moshfegh. And it's critical to government agencies

in planning food assistance programs and nutrition education programs.—By **Judy McBride**, ARS.

This research is part of Human Nutrition, an ARS National Program (#107) described on the World Wide Web at <http://www.nps.ars.usda.gov>.

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Survey participants use drawings of different-sized glasses to estimate amounts of beverages they drank.