Section 3. Methodology: Development of the Pyramid Servings Database

3.1. Overview

In 1993, researchers at the Agricultural Research Service (ARS) of the U.S. Department of Agriculture (USDA), in collaboration with researchers from the National Cancer Institute began development of a method to assess food intakes in terms of food-guidance-based servings (Cleveland et al. 1997; Krebs-Smith et al. 1995, 1996). The goal was to convert food intake data for the U.S. population collected in the 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII 1989-91) into a form that would yield estimates for the U.S. population that could be compared to the recommendations in USDA's Food Guide Pyramid.

The accomplishment of this goal required development of a method with very specific operational definitions and processing procedures that converted data (in grams) on food as eaten, in its many complex forms and combinations, into data (in servings) consistent with the general consumer-oriented type of guidance provided by the Food Guide Pyramid. Decisions about how to do this were guided by information derived from consumer publications on the Pyramid (USDA/CNPP 1992; USDA 1993) and technical publications about its research base (Cronin et al. 1985, 1987; Welsh et al. 1993), while taking into account the diversity of the U.S. food supply as it existed during the survey period.

Staff in USDA's Food Surveys Research Group (FSRG), continued to develop and document the methods for producing the CSFII 1994 and CSFII 1994-96 Pyramid Servings Databases (USDA/ ARS 1997, 1998) as part of the CSFII related research activities. Maintenance and updates to the Pyramid Servings Database have become the responsibility of the Community Nutrition Research Group (CNRG). Both research groups are within the Beltsville Human Nutrition Research Center (BHNRC), Agricultural Research Service (ARS). CNRG staff now maintains the Pyramid Servings methodology as part of FoodLink, a computerized food data linkage system that links USDA survey food codes to information on ingredients and commodities. The linked results are grouped into databases which are used for further research analyses. (For more information on FoodLink visit CNRG's Web site.)

The same methods documenting the development of the CSFII 1994 and CSFII 1994-96 Pyramid Servings databases were used to update the Pyramid Servings Database for other USDA survey food codes. Methodological differences specific to this and previous releases of the Pyramid Servings database were minor and are noted below in Section 3.2.

Web sites for obtaining the Food Guide Pyramid and the microdata release of the CSFII are listed at the end of this section.

3.1.1. About the Food Guide Pyramid

The Food Guide Pyramid was introduced in 1992 to illustrate a food guide developed by USDA (USDA/CNPP 1992, Welsh et al. 1993). The Pyramid is an educational tool to help explain and interpret the Dietary Guidelines for Americans. These guidelines are the basic principles for healthful eating that form the basis of Federal nutrition policy (USDA and USDHHS 2000; Federal Register 1990). Pyramid recommendations specific for young children, 2 to 6 years old, were released in 1999 (Davis et al. 1999; USDA/CNPP 1999).

The Pyramid characterizes the total diet, specifying amounts to eat from five major food groups (grain, vegetable, fruit, dairy, and meat) and selected subgroups and provides advice about intakes of fats, added sugars, and alcohol (the Pyramid Tip). It is intended to provide easy-to-use, flexible guidance on how to choose a healthful diet that is adaptable to consumers' varying personal tastes and lifestyles. Pyramid recommendations are defined in terms of servings expressed as household measures, such as slices, pieces, and cups.

See Table 1 (page 3-5) for the list of the 30 food groups in the Pyramid Servings database, and how they relate to those represented by the Food Guide Pyramid

3.1.2. About the Continuing Survey of Food Intakes by Individuals (CSFII)

CSFII 1994-96:

The 1994-96 Continuing Survey of Food Intakes by Individuals (USDA/ARS 1998) measures the kinds and amounts of foods eaten by Americans at home and away from home. Information on food eaten was collected by an in-person interview on two nonconsecutive days. Each day's information was collected from 16,103 individuals using a 24-hour dietary recall. Data were collected between January 1994 and January 1997. Previous CSFII were conducted in 1989-91 and 1985-86.

CSFII 1998:

The Food Quality Protection Act of 1996 required the Secretary of Agriculture to provide the Environmental Protection Agency with information on food consumption patterns of a statistically valid sample of infants and children. This requirement was a follow up to a 1993 report of the National Academy of Sciences entitled "Pesticides in the Diets of Infants and Children" in which concern was raised that current food consumption data do not provide sufficient sample sizes to adequately estimate exposure to pesticide residues in the diets of children. USDA conducted the CSFII 1998 to provide a larger sample size of children to meet the 1996 mandate. The CSFII 1998 provides intakes on 5,559 children through nine years of age. Data collection for the CSFII 1998 was between December 1997 and November 1998. The sample design and the data collection procedures were the same as those used for the 1994-96 CSFII so that the data from the CSFII 1998 could be merged with data from 1994-96 CSFII.

3.1.3. About Pyramid Servings and the CSFII

CSFII 1994 Pyramid data:

The microdata on the CSFII 1994 Pyramid Servings CD-ROM (USDA/ARS 1997) was the first public release of food intakes as servings from the 30 Pyramid food groups with a supporting database. The 1994 Pyramid CD-ROM contained two main files:

- The Servings Database (servdb.dat) contained reference data on servings of 30 food groups per 100 grams for all food codes and modifications reported in CSFII 1994. Data were included for 5,957 foods. Additional files in the database provided food descriptions. This database was used to convert CSFII 1994 food intakes from grams to servings to create the Pyramid Intake Data File.

- The Pyramid Intake Data File contained data from the CSFII 1994 on food intakes of 4,953 individuals 2 years of age and older expressed as servings per person per day from 30 food groups.

CSFII 1994-96 Pyramid data:

For the CSFII 1994-96 Pyramid data release (USDA/ARS 1998),

- The Pyramid Servings Database was updated for foods new to the intakes from the CSFII 1995 and the CSFII 1996; Data was included for the 5,637 food codes and 3,268 food modifications reported in CSFII 1994-96.

- Two types of Pyramid intake files became part of the CSFII 1994-96 Pyramid Servings release: one for the number of servings per person per food item, and another for the number of servings per person per day or each person's 2-day average. The CSFII 1994-96 Pyramid Servings intake files contained data on food intakes of 15,016 individuals 2 years of age and older expressed as servings from 30 food groups.

Pyramid Servings Database for USDA Survey Food Codes

Since the release of the Pyramid Servings Data for CSFII 1994-96, two major developments necessitated an update to the Pyramid Servings Database:

- additional foods consumed by children from the CSFII 1998

- a need for servings data for *ALL* codes in the CSFII Food Coding Database to which Pyramid Servings data could be assigned

The new Pyramid Servings Database for USDA Survey Food Codes, provides the number of Pyramid Servings for most food codes in the CSFII 1994-96, 1998 Food Coding Database. The new database includes:

- nearly 5,500 foods previously released in the Pyramid data for CSFII 1994-96 (USDA/ARS 1998)

- more than 1,640 additional foods including 189 foods from CSFII 1998 (USDA/ARS 2000), the remaining foods are those from the CSFII 1996 codebook and recipe databases that were not reported in the CSFII 1994-96, 1998

- baby food and infant formula only if consumed by individuals 2 years of age and over (Pyramid recommendations are for individuals 2 years of age and older)

The inclusion of all codes from the CSFII Food Coding Database, which can be assigned Pyramid Servings data, means the new Pyramid Servings Database for USDA Survey Food Codes can be used with any survey that was coded to the USDA food codes, such as the Third National Health and Nutrition Examination Survey (NHANES III).

Pyramid Servings Intake Data

Unlike previous releases, this new Pyramid Servings Database release does not include Pyramid intake records. The files with Pyramid Servings attached to individual intake records are large (19 to 144 megabytes), therefore, it was not feasible to provide the Pyramid intake files for release online. However, CSFII Serving intake files can be created using programs provided (see Section 6) in this database release and the microdata for food intakes and sample persons from the CSFII 1994-96, 1998 data sets (USDA/ARS 2000a). (Note: the CSFII microdata which is released by FSRG, needs to be obtained separately from the release of this Servings database; the FSRG Web site address is given at the end of this section.)

The Pyramid Servings summary intake table set for CSFII 1994-96, 1998 is available online from CNRG's Web site (USDA/ARS 2000b). Those results are based on data from 18,071 individuals, 2 years of age and over (USDA/ARS 2000a) and include intakes from a larger sample of children (2 through 9 years of age) than was in the CSFII 1994-96 microdata set alone. These new tables also include:

- changes in Pyramid recommendations for dairy products (USDA and USDHHS 2000)

- specific Pyramid Servings recommendations for children (USDA/CNPP 1999) which resulted in changes for the age groups for which adjustments were made in the standard servings sizes as well as changes in measuring how children 2 to 6 years of age meet serving recommendations (see Sections 5.1 and 5.3)

Table 1.

Pyramid Food Groups and Food Groups on Data Files

Pyramid Food Groups	Food Groups on Data Files
Grain Group	1 Total grain
	2 Whole grain
	3 Nonwhole grain
Vegetable Group	4 Total vegetables
	5 Dark-green vegetables
	6 Deep-yellow vegetables
	7 White potatoes
	8 Other starchy vegetables
	9 Tomatoes
	10 Other vegetables
Fruit Group	11 Total fruits
	12 Citrus fruits, melons, and berries
	13 Other fruits
Dairy Group	14 Total dairy
	15 Milk
	16 Yogurt
	17 Cheese
Meat and Bean Group	18 Meat, poultry, fish
	19 Meat (beef, pork, veal, lamb, game)
	20 Organ meats (meat, poultry)
	21 Frankfurters, sausage, luncheon meats (made from meat or poultry)
	22 Poultry (chicken, turkey, other)
	23 Fish (fish, shellfish, other)
	24 Eggs
	25 Cooked dry beans and peas*
	26 Soybean products (tofu, meat analogs)
	27 Nuts and seeds
Pyramid Tip	28 Discretionary fat
	29 Added sugars
	30 Alcohol

* Can be counted toward the meat group or the vegetable group, according to the Food Guide Pyramid. For further information, see Section 5.2 and Section 6.2.

3.1.4. Pyramid Food Groups

Table 1 lists the 30 food groups in the Pyramid Servings Database and shows how they relate to those represented by the Food Guide Pyramid. These food groups are inherently different from the 71 ARS-defined food groups used in the basic 1994-1996, 1998 microdata releases (USDA/ ARS 2000a). Many food mixtures required separation into ingredients before categorizing survey foods into Pyramid groups. This separation was accomplished using FoodLink, an ARS research tool that systematically links survey foods to additional information on the ingredients and commodities from those foods. More information on FoodLink is found on CNRG's Web site; the address is given at the end of this section.

Foods and ingredients were categorized and assigned serving weights strictly according to Pyramid criteria. The Food Guide Pyramid pamphlet (USDA/CNPP 1992) was used to guide decisions during the development of the Pyramid Servings Data Files. Two other sources provided criteria for assigning Pyramid Servings to food, "Tips on Using the Food Guide Pyramid for Young Children 2 to 6 Years Old" (USDA/CNPP 1999) and "Nutrition and Your Health: Dietary Guidelines for Americans" (USDA and USDHHS 2000). Information from these publications and the research reports on Pyramid Servings recommendations (Davis et al. 1999, Welsh et al., 1993) provided the background information to the development of the Pyramid Servings data releases.

3.2. Method to develop the Pyramid Servings Database

As previously noted, the methods used by ARS to develop the CSFII 1994-96 Pyramid Servings database continued to be used to produce Servings data for CSFII food codes that were not in that previous database release. Methodological differences specific to this release of the Pyramid Servings Database for USDA Survey Food Codes were minor and are noted below.

The remainder of this section is from the documentation previously released with the CSFII 1994-96 Pyramid Servings Data (USDA/ARS 1998). Updates have been made to the references cited, to the lists of vegetables in Section 3.2.2.2, and to the lists of fruits in Section 3.2.2.3.

For additional information on the CSFII methodology, including:

- History of the CSFII/DHKS Surveys and their Methodology
- Sample Design
- Data Collection
- Data Processing
- Quality Control
- Sampling Weights

refer to the documentation for the CSFII 1994-96, 1998 (USDA/ARS 2000a).

3.2.1 General method

3.2.1.1. Converting food consumption data into Pyramid Servings

Many foods cannot be categorized into Pyramid food groups in the forms in which they are eaten and reported in food consumption surveys. To create the Pyramid Servings database, a method developed by ARS was used to separate foods into their ingredients before categorizing them by Pyramid food groups. Eighty-nine percent of the foods reported in CSFII 1994-96, 1998 had to be separated into ingredients in order to report servings for at least one of the Pyramid food groups.

ARS' method for separating foods into ingredients can be conceptualized as multiple-level recipe files (see Table 2). To categorize foods into Pyramid food groups and calculate the servings for each food group, some foods do not need to be separated into ingredients. However, many must be disaggregated to a commodity level or an intermediate level of disaggregation, and multiple-level recipe files are necessary for this process. (Information from ARS' Nutrient Data Laboratory was used in the development of these recipe files).

The level of disaggregation required depends on several factors, including the:

- types of foods included in each Pyramid food group,
- specificity with which Pyramid Serving sizes and their underlying criteria are described in Pyramid documentation,
- methods ARS developed to identify serving weights consistent with Pyramid definitions for servings (see Section 3.2.2, "Sources of serving weights for foods or ingredients").

With ARS' method, serving weights are assigned to foods or to their ingredients, starting with the food as reported in the survey and then, if required, working down from the recipe in the CSFII 1994-96 and CSFII 1998 recipe databases to the commodity level. (For more information on the recipe database, see the CSFII documentation, Section 3.3.5 from USDA/ARS 2000a.) Methods established for this process are described in Section 3.2.2, "Classifying foods and assigning serving sizes," for each food group and the Pyramid Tip. For the Pyramid Servings Database for USDA Survey Food Codes, every attempt has been made to adhere strictly to the concepts and definitions described in the Food Guide Pyramid (USDA 1992). Information on categorizing foods and defining servings was derived from consumer publications on the Pyramid and technical publications documenting its research base (Davis et al. 1999; Cronin et al. 1985, 1987; USDA 1993; Welsh et al. 1993).

Table 2. Conceptualization of Multiple-Level Recipe Files*

Food reported	Ingredients from Recipe .... Level 1	Level 2	Level 3
BEEF BARBECUE ON BUN (survey food code 27510110) --->	ground beef cooked**		
--->	hamburger roll** --->	white bread flour	
		water	
		yeast	
		salt	
		nonfat milk solids	
		sugar**	
		shortening	
--->	barbecue sauce --->	catsup --->	tomato sauce**
			vinegar
			sugar**
		brown sugar**	
		vinegar	
		onions**	
		mustard	
		Worcestershire sauce	
		water	

* Recipes are generic estimates of what people consume.
** Level at which ingredient was categorized in a Pyramid food group and counted toward Pyramid Servings.

3.2.1.2. Sources of serving weights for foods or ingredients

The CSFII 1994-96 and CSFII 1998 food coding databases were the primary sources used to derive food- or ingredient-specific weights consistent with Pyramid definitions for serving sizes. Serving weights were originally developed using the CSFII 1994-96 coding database and continued to be used for foods in that database but not reported consumed in the CSFII 1994-96, 1998. The CSFII 1998 food coding database was used for foods uniquely consumed in CSFII 1998. Both coding databases provide information on the weights of selected household measures for more than 7,300 foods. During the CSFII 1994-96, 1998 coding processes, these volume-weight equivalents and established coding guidelines were used to convert the units in which respondents reported their food intakes into gram weights before the data were released (USDA/ARS 1996, 2000a). These same volume-weight equivalents were used to convert the gram weight data to the units in which Pyramid Servings are expressed. Table 3 shows several examples of the types of information available in the food coding databases. For many food codes, weights for several portion sizes are

available. From these weights, a weight consistent with the Pyramid definition for a serving of that food (or ingredient) was selected or imputed. In some cases, there are notable differences in the weight per serving depending on the form of the food selected. Rationales for choices are discussed in Section 3.2.2, "Classifying foods and assigning Pyramid Serving sizes". Some serving weights were derived from yield information in the food coding databases. Yield information was used to determine serving weights for dry ingredients in recipes, which when rehydrated would equal a serving as described in the Pyramid. The complete CSFII 1994-96, 1998 multi-version (dated) food coding database is available from USDA/ARS 2000a, see \tsf9496\fcdb on Disk 2.

3.2.2. Classifying foods and assigning Pyramid Serving sizes

3.2.2.1. Grain Group

What foods count toward servings from the grain group?

Foods that the Food Guide Pyramid counts in the grain group include yeast breads and rolls, quick breads such as muffins, biscuits, pancakes, and tortillas; rice; pasta; breakfast cereals; grain-based snacks such as crackers, pretzels, popcorn, and corn chips; and baked goods made from flour, such as cakes, cookies, croissants, doughnuts, pastries, and pie crust (USDA 1992, USDA 1993). The Pyramid emphasizes whole grain choices; it recommends choosing several servings a day of foods made from whole grains (USDA 1992). For this reason, the Pyramid Servings database presents data separately on servings of whole grains and nonwhole grains.

Some foods in the grain group contain relatively high amounts of fat and sugar; those ingredients count toward the Pyramid Tip. The method used to count them toward the Pyramid Tip is described in section 3.2.2.6 "The Pyramid Tip."

How are grain servings defined in the Pyramid Servings database?

Definitions were derived from the Food Guide Pyramid (USDA 1992, USDA 1993). Educational materials about the Pyramid list the following serving sizes for grain products: one slice of bread; 1/2 of a hamburger bun, English muffin, bagel, or croissant; one small roll, biscuit, or muffin; one tortilla; one ounce of ready-to-eat cereal; 1/2 cup of cooked cereal, rice, or pasta; 3 to 4 small or 2 large crackers; 1/2 of a medium doughnut or danish; or 2 medium cookies. Serving sizes are not specified for all foods in the grain group, and those specified are relatively imprecise. For example, slices of bread come in many sizes, and terms like small, medium, and large are relative.

Table 3. Weights of Selected Household Measures from the CSFII 1994-96 Food Coding Database and Weights Chosen to Equal One Pyramid Serving

FOOD CODES AND SELECTED MEASURES	WEIGHTS	CONDITIONS FOR USING AS WEIGHT OF ONE SERVING
63101000 APPLE, RAW		
1 small (2-1/2" dia)	106 grams	...used if raw apple was reported (R)
1 medium (2-3/4" dia)	138 grams	
1 large (3-1/4" dia)	212 grams	
1 cup, sliced	110 grams	
1 cup, quartered or chopped	125 grams	...used 1/2 if raw apple was ingredient (I)
1 slice	17 grams	
71101000 WHITE POTATO, BAKED, PEEL NOT EATEN		
1 small (1-3/4" to 2-1/4" dia, raw)	75 grams	
1 medium (2-1/4" to 3" dia, raw)	98 grams	
1 large (3" to 4-1/4" dia, raw)	145 grams	
1 cup	127 grams	...used 1/2 (R/I)
73102221 CARROTS, COOKED, FROM FRESH, FAT ADDED IN COOKING		
1 cup, sliced	161 grams	...used 1/2 (R/I)
1 cup, mashed	233 grams	
1 cup, baby carrots	154 grams	
1 baby carrot	8.8 grams	
1 slice	2.8 grams	
41106020 RED KIDNEY BEANS, DRY, COOKED, FAT NOT ADDED IN COOKING		
1 cup	172 grams	...used 1/2 for cooked kidney beans (R/I)
1 cup, mashed	224 grams	
1 oz dry, yield after cooking	68 grams	...used for dry kidney beans as ingredient; serving is weight dry to yield 1/2 cup cooked.
51101000 BREAD, WHITE		
1 very thin slice	15 grams	
1 thin slice	20 grams	
1 regular slice	26 grams	...used (R/I)
1 large slice	30 grams	
1 slice, crust not eaten	12 grams	
1 thin slice, crust not eaten	9 grams	
56203010 OATMEAL, COOKED, REGULAR, FAT NOT ADDED IN COOKING		
1 cup, cooked	234 grams	...used 1/2 for cooked oatmeal (R/I)
1 oz, dry, yields	164 grams	...used for dry oatmeal as ingredient; serving is weight dry to yield 1/2 cup cooked

Broadly defined serving sizes are appropriate for use in educating consumers about how to put the Pyramid into practice, but for monitoring purposes, they needed to be operationalized using standardized definitions and procedures to the extent possible. In doing this, two primary criteria were used:

- Consistency with the underlying rationale for the grain group as the primary source of complex carbohydrate in diets and a major contributor to fiber intake.

- Maintenance of the Pyramid concept of defining servings in common household measures (cups, ounces) and easily recognizable units (one slice of bread, one roll).

Pyramid Serving sizes were used as a basis for selecting or imputing appropriate serving weights from the CSFII 1994-96 or CSFII 1998 food coding databases, but guidelines were developed to standardize the selection process. Where needed, methods were also developed to define servings based on either the grain content or the complex carbohydrate content of the food; details are presented below.

- For yeast breads (rolls, English muffins, bagels, croissants), some quick breads (muffins, tea breads), rice, pasta, and breakfast cereals, the basic Pyramid definitions for servings were used, and guidelines were established for selecting serving weights from the food coding databases (see "Selecting serving weights from the food coding database" below).

- For snack-type grain products (crackers, pretzels, corn chips), grain-based desserts (cookies, cakes, sweet rolls, pastries, pie crust), certain quick breads (hush puppy, dumplings), and miscellaneous grains (thickeners, batter, breading), a method was developed for defining servings based on the grain content of the food (see "Calculating grain servings based on grain contents" below).

- For some grain products, notably quick breads (biscuits, pancakes, waffles, tortillas, taco shells) and pita bread, a combination of the two approaches presented above was used. The grams needed per serving were calculated based on the grain content of the food, but then the serving size was defined as a household measure for which a gram weight was available in the CSFII 1994-96 or CSFII 1998 food coding database (e.g., a pancake of a given diameter). The household measure with a gram weight closest to the weight calculated based on grain content was defined as a serving.

- For popcorn, the serving size was defined in terms of common household units based on its complex carbohydrate content.

Selecting serving weights from the food coding databases

Bread, yeast.--A serving was defined as one slice of bread. For commercial bread, weights for slices described as regular or medium were selected if more than one weight was available. The weight of one regular slice of commercial white bread (26 grams) was used as a standard of comparison for decisions about serving weights for yeast breads. Thus, for bakery or homemade bread, which is

denser than commercial bread, the weight for one thin slice was selected. Of the available choices, this weight (33 grams) was the closest to the standard. For some breads, the food coding databases does not include weights for slices. In those cases, 26 grams was used as the weight of a serving.

Rolls.--One serving was defined as one small (pan/dinner) roll. The one small roll used as a standard weighed 28 grams. When a weight for one small roll was not available for a given food code, the serving size with a weight closest to this standard roll was used. If the only weight available for one roll was greater than or equal to 35 grams (e.g., hamburger roll, submarine roll), one serving was defined as 1/2 roll. This was a natural cut point because, in the CSFII 1994-96, food coding database, one French roll weighs 34 grams, and then the next heaviest roll is a hamburger roll weighing 43 grams. The Pyramid defines 1/2 hamburger roll as a serving. This cut point is also consistent with the Pyramid definition for a serving of English muffin (i.e., 1/2 muffin); weights for 1/2 of an English muffin range from 25 to 29 grams.

English muffin, bagel, croissant.--One serving was defined as 1/2, as specified by the Pyramid.

Muffin.--One serving was defined as one small muffin, as specified by the Pyramid. Small muffins in the CSFII 1994-96 food coding database are defined as 2-1/2 inches in diameter, and they weigh 45 grams whether or not they contain added ingredients such as fruits and nuts. If ARS had based the definition of a serving on the grain content of muffins rather than the Pyramid definition, then weights would have ranged from 32 to 68 grams. Instead, for consistency with the Pyramid concept of defining servings in common household measures and recognizable units, ARS used the serving size specified by the Pyramid.

Quick breads, such as nut bread.-- The weight of a serving was imputed from muffins, and defined as 45 grams (one small muffin).

Rice, pasta, cooked breakfast cereals.--One serving was defined as 1/2 cup cooked as specified by the Pyramid. For raw rice, dry pasta, and dry cereals (e.g., oatmeal) that are used as ingredients in recipes, the serving weight was defined as the amount required to yield 1/2 cup cooked.

Ready-to-eat breakfast cereals.--As specified in the Pyramid, one serving was defined as one ounce, but weights of ingredients categorized in food groups other than the grain group were excluded. There is wide variation among cereals in the proportion of ingredients that count toward other food groups. Ingredients, including dried fruits, nuts, seeds, sugar, and fat, can contribute more than 60 percent to the weight of some ready-to-eat cereals. However, the ready-to-eat cereals in food group

composites used to develop and test the Pyramid (i.e., shredded wheat, puffed rice) contain no ingredients other than grain (personal communication, Dr. Anne Shaw, Center for Nutrition Policy and Promotion, USDA). Therefore, to avoid double counting and be consistent with the research base for the Pyramid, only ingredients that were considered typical of grain products were counted toward the serving weight for ready-to-eat cereal.

These included grain ingredients, dry milk, whey, spices, flavorings, vitamins, minerals, baking powder, yeast, and salt. This means that the weight of a serving of ready-to-eat cereal is essentially based on its grain content.

Calculating grain servings based on grain content

The Pyramid provides serving sizes for only a limited number of snack-type grain products and grain-based desserts. Those that are available cannot be applied consistently to similar types of foods. For example, the Pyramid defines two medium cookies as one serving, but cookies vary widely in size. Similarly three to four small or two large crackers are described as a serving, but the range of available sizes varies.

When reasonably standardized serving sizes were not described in the Pyramid, ARS calculated servings based on the grain content of the food. As stated previously, this method was used to derive serving sizes for many snack-type grain products, grain-based desserts, some quick breads, and miscellaneous grains.

The standard used for defining the amount of flour in one grain serving was one regular slice of commercial white bread (26 grams). This standard grain serving contained 16 grams of flour. Thus, one serving was defined as the grams of grain product containing 16 grams of flour. For products containing grain ingredients other than flour and products containing more than one grain ingredient, servings were calculated by summing grain servings from each grain ingredient. For example, the grain servings from oatmeal cookies took into account grain from wheat flour and oatmeal. Thus, grain servings for a given food were defined on a grain equivalent basis.

For most quick breads (biscuit, pancake, waffle, tortilla, taco shell), the grams per serving from the grain equivalent method provided the basis for selecting a serving size and corresponding weight from the food coding databases, which corresponded to a recognizable unit. For example, 38 grams of pancake contains 16 grams of flour (i.e., one grain equivalent). The CSFII 1994-96 food coding database included weights for pancakes ranging from one to ten inches in diameter. Among these, the five inch diameter pancake, at 40 grams, has a weight closest to one grain equivalent, so it was defined as one Pyramid Serving.

How were servings of whole grains and nonwhole grains determined?

Food specialists in ARS classified all grain ingredients used in the CSFII 1994-96 and CSFII 1998 recipe databases as whole grain or nonwhole grain. For each food reported in the survey, the total number of grain servings per 100 grams was determined. Then, this total number of grain servings was divided into whole grain servings and nonwhole grain servings based on the proportion of the grain ingredients in the food that were whole grain and nonwhole grain.

For example, cracked wheat bread contains three grain ingredients, white wheat flour, which is classified as nonwhole grain, and whole wheat flour and wheat bran, which are classified as whole grain. The white wheat flour contributes 67 percent to the total weight of the grain ingredients and the whole wheat flour and wheat bran together contribute 33 percent. Thus, of the four grain servings per 100 grams of cracked wheat bread, 2.7 are nonwhole grain and 1.3 are whole grain. (Some grain ingredients, including oat bran and wheat bran, that are not strictly whole grain were classified as such if they had a high fiber content.)

3.2.2.2. Vegetable Group

What foods are classified as vegetables?

The Food Guide Pyramid separates vegetables into four subgroups: dark-green vegetables, deep-yellow vegetables, starchy vegetables, and other vegetables (USDA 1992, USDA 1993). The Pyramid states that dry beans and peas (legumes) can be counted toward the recommendations for servings of meat and meat alternates or vegetables(see section 5.2).

A list of vegetables classified according to these subgroups is shown below. It includes all those reported in the CSFII 1994-96 and CSFII 1998 food coding databases. The classification for those marked with an asterisk is from a publication describing the Pyramid and its use (USDA 1993). The remainder were assigned by ARS nutritionists and food specialists. Vegetables in italicized font are new additions to these lists which were originally created based on CSFII 1994-96 intakes.

Dark-green vegetables: arugula, *balsam-pear tips*, beet greens*, *bitter melon leaves*, broccoli*, chard*, chicory*, cilantro, collard greens*, *cress*, dandelion *greens**, endive*, escarole*, grape leaves, kale*, lambs quarters, mustard greens*, *mustard cabbage*, parsley, poke greens, pumpkin leaves, romaine lettuce*, spinach*, sweet potato leaves, taro leaves, turnip greens*, watercress*.

Deep-yellow vegetables: calabaza, carrots*, carrot juice, pumpkin*, sweetpotato*, winter squash*, yams.

Starchy vegetables: black-eyed peas (not dried), breadfruit*, *burdock*, casabe, cassava, corn*, cowpeas (not dried), dasheen, green peas*, hominy*, jicama, lima beans (immature)*, parsnips, pigeonpeas, *poi*, *salsify*, white potato*, rutabaga*, tannier, taro*, yambean.

Other vegetables: algae, aloe vera juice, artichoke*, asparagus*, balsam-pear pods, bamboo shoots, bean and alfalfa sprouts*, broccoflower, beets*, Brussels sprouts*, *buckwheat sprouts,* cabbage* (green and red), cactus, capers, cauliflower*, *celeriac*, celery*, celery juice, chayote, Chinese cabbage*, chives, christophine, chrysanthemum coriander, cucumber*, eggplant*, *fern shoots*, garlic, ginger root, green beans*, horseradish, *jute (potherb)*, *kohlrabi*, leek, lettuce*, lotus root, *luffa (Chinese okra)*, mushrooms*, nopales, okra*, olives, onions (mature and green)*, oriental radishes, palm hearts, peppers (green*, red, hot, banana), pimiento, *pumpkin flowers*, radicchio, radishes*, sauerkraut, seaweed, *sequin (Portugese cabbage)*, snow peas*, summer squash*, *string beans (yellow)*, swamp cabbage, tomatillo, tomato*, tomato juice*, *tree fern*, turnips*, water chestnuts, wax beans, waxgourd, winter melon, zucchini*.

Dry beans and peas: bayo beans, black beans*, blackeyed peas*, broadbeans, calico beans, chickpeas (garbanzos)*, cowpeas, fava beans, kidney beans*, lentils*, lima beans (mature)*, *mongo beans*, mung beans*, navy beans*, pinto beans*, pink beans, red Mexican beans, split peas*, soybeans (mature), white beans.

The Pyramid Servings files further subdivide these groups (see Section 3.1.3). White potatoes are listed separately from other starchy vegetables because they comprise a large proportion of starchy vegetable consumption. Similarly, tomatoes are listed as a separate group; the Pyramid includes them with "other vegetables".

How are vegetable servings defined in the Pyramid Servings database?

Definitions were based on those in the Food Guide Pyramid, which defines a serving as one cup of raw leafy vegetables; 1/2 cup of other vegetables, cooked or chopped raw; or 3/4 cup of vegetable juice. These serving sizes were used as the basis for selecting or imputing appropriate serving weights from the CSFII 1994-96 and CSFII 1998 food coding databases.

Often, the food coding databases provided several different weights for the various forms in which a vegetable might be available for consumption. When mashed vegetables were reported, the weight for the mashed form was used. For other forms, the following general order of priority was used to select a serving weight for a given vegetable: chopped, sliced, cubes, diced, pieces, whole. For broccoli, the order of priority was: chopped, cut, pieces, florets, spears. In general, this had the effect of counting as a serving the most dense form of the vegetable for which a weight was available.

For vegetables or vegetable ingredients not specifically covered by the basic Pyramid definitions, the following serving sizes were used:

Dehydrated vegetables.--Although the Pyramid does not specify serving sizes for dehydrated vegetables, some were reported in the CSFII 1994-96, 1998. They include carrot chips, sun-dried tomatoes, dried seaweed, dehydrated chives, dehydrated onion, and freeze-dried sweet green peppers. Dehydrated vegetables were also used as ingredients in recipes. A serving size of 1/4 cup was

assigned to dehydrated vegetables other than dried beans and peas and dehydrated potatoes (discussed below). This serving size was derived from the one designated by the Pyramid for dried fruits.

Tomato puree or paste.-- These tomato products were also assigned a serving size of 1/4 cup. This amount reconstitutes to about 1/2 cup, and the amount of total solids it contains is similar to that in a 1/2 cup of tomatoes.

Dried beans and peas.--Serving sizes for dried beans and peas (used as ingredients in recipes) were defined as the weights needed to yield 1/2 cup cooked. Yield information is included in the CSFII 1994-96 and CSFII 1998 food coding databases.

Potatoes.--Serving sizes for potatoes are not specifically mentioned in basic Pyramid definitions for vegetable servings. However, Pyramid definitions were the basis for the definition of one serving as follows:

- Baked, boiled, and roasted potatoes: One serving was defined as 1/2 cup; the Pyramid does not specify vegetable servings in terms of whole vegetables (e.g., one small potato).

- Mashed potatoes: One serving was defined as1/2 cup.

- Fried potatoes: One serving was defined as 1/2 cup.

- Potato chips: One serving was defined as one ounce (28.35 grams). This quantity has about the same amount of carbohydrate as 1/2 cup of baked or boiled potato, and, therefore, reflects the potato (but not the fat) from the potato chip. Coincidentally, it is also the serving size for potato chips that is used on food labels.

- Dehydrated potatoes: One serving was defined as the amount of dried potato flakes that yields 1/2 cup of prepared mashed potato.

How were serving weights assigned to vegetables?

All vegetables that were ingredients in multi-ingredient foods were disaggregated and any fraction of a serving they contributed, no matter how small, is accounted for in servings from the vegetable group on the Pyramid Servings file. The basic philosophy used in developing these files was to separate foods into ingredients only to the extent necessary to categorize them into Pyramid food groups. Thus, serving weights were assigned to plain vegetables and to vegetables with added ingredients if those ingredients did not increase the volume measure appreciably. The justification for this approach was that the Pyramid defines vegetable servings by volume (i.e., one cup or some fraction of a cup) so a serving weight that included the weight of added ingredients was acceptable

as long as the volume measure was consistent with the Pyramid-defined serving size. Examples of cooked vegetables with added ingredients to which a serving size of 1/2 cup was assigned are: spinach, fat added in cooking; corn relish; glazed carrots; sweet potato canned in syrup with fat added in cooking; and mashed potatoes.

Although serving weights were assigned to vegetables in their "as consumed" form, the nonvegetable ingredients were counted toward appropriate food groups as well. In the examples above, the fat added in cooking and the added sugars were counted toward the Pyramid Tip (see Section 3.2.2.6), and the milk in mashed potatoes was counted toward the dairy group. Vinegar does not count toward a Pyramid food group because it has no calories.

For vegetable combinations containing vegetables from more than one subgroup (e.g., peas and carrots), first the serving weight was selected from the food coding databases. Then the number of servings from each subgroup per 100 grams was determined based on the proportion by weight that each vegetable in the recipe contributed to the total.

3.2.2.3. Fruit Group

What foods are classified as fruits?

The Food Guide Pyramid separates fruits into two subgroups --"citrus, melons, berries" and "other fruits" (USDA 1993). A list of fruits classified according to these subgroups is shown below. The classification for those marked with an asterisk is from a publication describing the Pyramid and its use (USDA 1993). The remainder were assigned by ARS nutritionists and food specialists. Fruits in italicized font are new additions to these lists which were originally created based on CSFII 1994-96 intakes.

Citrus fruits, melons, berries: Acerola, blackberries, blueberries*, boysenberries, calamondin, cantaloupe*, casaba melon, cranberries*, *dewberries*, elderberries, gooseberries, grapefruit*, *huckleberries*, honeydew melon*, June berries, kiwifruit*, kumquat, lemon*, lime, loganberries, *mandarin oranges*, mulberries, orange*, raspberries*, strawberries*, tangelo, tangerine*, ugli fruit*, watermelon*, *youngberries*, and juices made from these fruits.

Other fruits: Apple*, apricot*, Asian pear*, avocado*, banana*, cherries*, currants, dates*, figs*, genip, guava*, quince, grapes*, jackfruit, japanese pear, jobo, *loquats*, lychee, mamey (mamea apple), mango*, nectarine*, papaya*, passion fruit*, peach*, pear*, persimmon, plantain*, pineapple*, plum*, pomegranate, prickly pear*, prunes*, raisins*, red banana, rhubarb*, sapodilla, soursop (guanabana), star fruit* (carambola), sweetsop, tamarind, watermelon rind, wi-apple, and juices made from these fruits.

How are fruit servings defined in the Pyramid Servings database?

Definitions were based on those in the Food Guide Pyramid. It defines a serving as a whole fruit such as a medium apple, banana, or orange; a grapefruit half; a melon wedge; 3/4 cup fruit juice; 1/2 cup berries; 1/2 cup chopped, cooked, or canned fruit; or 1/4 cup dried fruit (USDA 1992). These serving sizes were used as the basis for selecting or imputing appropriate serving weights from the CSFII 1994-96 and 1998 food coding databases. The following broad guidelines were used for making selections from the available choices:

Raw fruits: One serving was defined as a whole fruit if the weight of one fruit was equal to or greater than the weight of 1/2 cup raw and the fruit was not consumed as a recipe ingredient.

When the food coding databases provided weights for several sizes of fruits (e.g., small, medium, large), the size with a weight closest to that of 1/2 cup was defined as one serving. Examples are one small apple, one small banana, 1/2 medium grapefruit, one medium peach, and one small pear.

One serving was defined as 1/2 cup raw when the weight of one whole fruit was less than the weight of the 1/2 cup measure. Examples are apricots, blueberries, cherries, grapes, plums, strawberries, and tangelos. For fruits with pits, the serving weight was for 1/2 cup of pitted fruit.

One serving was also defined as 1/2 cup raw when the weight of one whole fruit markedly exceeded the weight of 1/2 cup raw. Examples are cantaloupe, pineapple, and watermelon.

In addition, one serving was defined as 1/2 cup raw if a raw fruit was used as an ingredient in a recipe on the assumption that most recipes call for volume measures, rather than whole fruits.

Canned or cooked fruit: One serving was defined as 1/2 cup for cooked or canned fruit, fruit sauces, and baby fruits. The following order of precedence was used in choosing a serving weight from among different forms of the fruit: chopped, diced, sliced, halves, whole. The serving weight for the 1/2 cup serving size included the weight of both the fruit and its liquid, if any, because the liquid would have been included in the weight when the respondent's intake was originally converted into gram data.

Dried fruits: One serving was defined as 1/4 cup as specified by the Pyramid.

Fruit juices: For single-strength juices and juices containing less than ten percent sugar by weight, one serving was defined as 3/4 cup. For juice concentrates, one serving was defined as 1-1/2 ounces, which is the amount needed to prepare 3/4 cup of reconstituted juice. Other sweetened fruit juices, juice drinks, and fruit ades were handled as mixtures, and servings were determined based on their fruit ingredients.

How were serving weights assigned to fruits?

Servings from all fruits, whether eaten plain or consumed as an ingredient of any food, were counted toward fruit group servings. As with foods in the grain and vegetable groups, foods were separated into ingredients before serving weights were assigned only if a serving weight consistent with Pyramid guidance could not be determined for the food as consumed. Therefore, serving weights were assigned to fruits prepared with added sugar if the sugar did not increase the volume appreciably. For example, weights from the food coding databases appropriate for a 1/2 cup serving size were selected for fruits that were unsweetened and sweetened and for those canned in juice pack, light syrup, and heavy syrup. A few fruits, such as fruit nectars and cranberry sauces, were defined as mixtures, and separated into ingredients before serving weights were assigned because they contained large proportions of added sugar, which could change the volume measurement.

For fruit combinations containing fruits from more than one subgroup (e.g., fruit cocktail with citrus fruits), first the serving weight was selected from the food coding databases. Then the number of servings from each subgroup per 100 grams was determined based on the proportion by weight that each fruit in the recipe contributed to the total.

3.2.2.4. Dairy Group

What foods are classified in the dairy group?

According to the Pyramid, most dairy foods are classified in this group (also called the milk, yogurt, and cheese group). Dairy foods that are excluded are those that are primarily fat, namely butter, cream, sour cream, and cream cheese.

How are dairy servings defined in the Pyramid Servings database?

For milk and yogurt, the serving size used in these data files was taken directly from the Pyramid definition. The Pyramid defines a serving as one cup of milk or yogurt (USDA 1992). For cheeses, serving sizes were based on the Pyramid's underlying criterion for a dairy serving, which is that it should provide about the same amount of calcium as one cup of skim milk (i.e., 302 milligrams) (USDA 1992, USDA 1993). The serving size for milk and yogurt and the criterion for dairy servings were used to define serving sizes for dairy products or dairy ingredients as follows:

Fluid milk: A serving was defined as one cup for the following types of milk: cow's, goat's; skim, low-fat, whole; calcium fortified; filled with vegetable oil; lactose-reduced; dry reconstituted; and evaporated diluted. This serving size was also used for chocolate milk as specified by the Pyramid (USDA 1992). Other flavored milks were handled as mixtures, and servings were assigned based on their dairy ingredients since there is wide variation in the amount of dairy product different types of flavored milks contain.

Dry milk: A serving was defined as 1/3 cup, which is the amount needed to make one cup of reconstituted milk. This serving size was also used for dry whey.

Evaporated milk, undiluted: A serving was defined as 1/2 cup, which is the amount needed to yield one cup diluted.

Yogurt: A serving was defined as one cup (8 fluid ounces) for plain nonfat, low-fat, and whole yogurt (not frozen). One cup was also used as the size of a serving for flavored yogurt and yogurt with fruit as specified by the Pyramid (USDA 1992). Frozen yogurt was separated into its basic ingredients (e.g., milk, sugar, fruit), and then servings were defined at the ingredient level.

Cheese: According to the Pyramid, a serving of natural cheese is 1-1/2 ounces and a serving of processed cheese is two ounces (USDA 1992). While these broad definitions are useful for educational purposes, they are not specific enough for monitoring purposes where the serving size must cover the complete spectrum of cheeses on the market. A number of cheeses do not provide the amount of calcium expected of a serving if these serving sizes are used.

Therefore, in developing these data files, the calcium criterion was used to define the serving size for cheese. A serving of natural or processed cheese was defined in terms of the ounces needed to provide 302 milligrams of calcium. Serving sizes were rounded to 1/2 ounce increments, and ranged from one ounce (28.35 grams) to eight ounces (226.80 grams). The most frequently used serving sizes were one ounce, 1-1/2 ounces, and two ounces; and serving sizes for the most frequently consumed cheeses, such as natural cheddar cheese and processed American cheese, fell in this range. Generally, the one ounce serving applied to dry cheeses, such as Parmesan, and reduced fat or nonfat cheeses.

For cottage cheese and ricotta cheese, serving sizes were defined in terms of the number of cups needed to provide 302 milligrams of calcium (rounded to 1/2 cup increments) as follows: two cups creamed cottage cheese, three cups cottage cheese with vegetable or fruit added; 6-1/2 cups dry curd cottage cheese, 1/2 cup ricotta cheese.

Fat free cream cheese was assigned a serving size based on its calcium content. Other types of cream cheese were counted toward the Pyramid Tip, not the dairy group (see Section 3.2.2.6).

Ice cream and other frozen dairy desserts: Although advice about how to count these foods is provided in consumer publications on how to put the Pyramid into practice (USDA 1992, USDA 1993), the amount needed to provide 302 milligrams of calcium can vary widely depending on the ingredients. Thus, ARS felt that the most accurate method for determining servings was to handle these foods as mixtures, and separate them into ingredients and assign servings based on the milk ingredients

How were serving weights assigned to dairy products?

Most foods containing dairy products were separated into ingredients, and the number of servings from the dairy group was determined based on the amount of milk or cheese they contained using the serving sizes specified above. This was true for foods having dairy products as primary ingredients, such as ice cream, ice milk, frozen yogurt, puddings, and custards (including those used as fillings). It also applied to mixed dishes, such as casseroles, omelets, soups, and vegetables with cream or cheese sauces, and to mixtures, such as salad dressings, milk gravies, meal replacements, and candies, that contained milk or cheese as an ingredient.

For a few foods, milk (but not cheese) that was an ingredient was not counted toward dairy group servings. These foods included grain products that counted toward grain group servings and processed meats and meat analogs that counted toward meat group servings. Milk was considered an integral part of these foods; it would have been double counted if it had also been counted toward servings from the dairy group.

With one exception, dairy servings were not assigned to infant formulas. The Pyramid applies to individuals 2 years of age and older, and infant formulas are generally not consumed by this population. In addition, infant formulas are highly formulated products, which in general do not reflect the traditional definitions of foods in the dairy group. For foods where infant formulas were used as an ingredient (for example mashed potatoes made with formula instead of milk), the formula counted toward servings of milk or servings of meat alternate (soy milk).

3.2.2.5. Meat and Bean Group

What foods are classified in the meat group?

The meat group includes beef, pork, lamb, veal, game, poultry, fish, shellfish, frankfurters, sausages, bacon (see discussion below), luncheon meats, organ meats, and meat alternates. Meat alternates include eggs, soy-based products such as tofu and meat analogs, nuts, and seeds. Dry beans and peas generally are counted as a meat alternate (USDA and USDHHS 2000) but they can alternatively count as a vegetable (see discussion below and Section 5.2).

How are servings from the meat group defined in the Pyramid Servings Database?

The Food Guide Pyramid recommends eating two to three servings each day of foods from the meat group. The Pyramid states that the total amount of these servings should be the equivalent of 5 to 7 ounces of cooked lean meat, poultry, or fish per day (USDA 1992). For meat alternates, the Pyramid specifies amounts equivalent to one ounce of cooked lean meat as follows:1/2 cup of cooked dry beans or peas, one egg, two tablespoons of peanut butter, 1/3 cup of nuts, 1/4 cup of seeds, and 1/2 cup of tofu (USDA 1992, USDA 1993). Thus, in these data files, the same serving unit, ounces of cooked lean meat equivalents, is used for all foods that count toward the meat group.

This measure standardizes the definition of a serving unit across the different types of foods that count toward the meat group, and presents the data in the unit of measure in which the meat group recommendation is specified.

Dry beans and peas... meat alternates, or vegetables?

As noted above, dry beans and peas can be used as vegetables but they are also alternates for meat, poultry, and fish. One-half (1/2 cup) of cooked dry beans and peas is equivalent to one ounce of cooked lean meat and also conforms to the definition of a cooked vegetable serving, which is 1/2 cup. Since the units of measure for the meat group and the vegetable group are comparable, data from these files on servings of cooked dry beans and peas can be tabulated with either group, depending on the needs of the analyst. (See Section 4.2 and Section 5.2)

Assigning lean meat servings and discretionary fat servings from meat

When the Food Guide Pyramid was developed, nutrient profiles were established for the food groups and subgroups as a preliminary step toward determining the number of servings to recommend (Cronin et al. 1985, 1987; Welsh et al. 1993). For the five major nutrient-bearing groups and their subgroups, each profile represents the quantities of nutrients one would expect to obtain on average from a serving if foods were in their lowest fat forms. The profile for the meat group provides 2.651 grams of fat per ounce of cooked lean meat, poultry, or fish (level of specificity provided by personal communication with Dr. Anne Shaw, Center for Nutrition Policy and Promotion, USDA). This translates to 9.35 grams of fat per 100 grams of cooked lean meat.

[Note: In 1999, CNPP revised the nutrient profile for lean meat. Lean meat equivalents were redefined from no more than 2.651 grams of fat per ounce to no more than 2.4 grams of fat per ounce. This change was based on CSFII 1989-91 intakes which reflect leaner choices of meat, poultry, fish and meat alternates in the diet than when the initial nutrient profiles were created for the Pyramid (Davis et al. 1999; USDA 1992). ARS continued to use the definition of lean meat (no more than 2.651 grams of fat per ounce) that was used when the Pyramid Database was first developed (USDA/ARS 1997).]

Therefore, the definition of cooked lean meat is meat, poultry, or fish that contains 9.35 grams or less of fat per 100 grams and at least 90.65 grams that is not fat per 100 grams (referred to as "nonfat meat" in this documentation). Thus, by definition, every 100 grams of meat, poultry, or fish with 9.35 grams or less of fat per 100 grams is 3.53 ounces of cooked lean meat (i.e., 100/28.35 = 3.53), and it has no discretionary fat to count toward the Pyramid Tip (see Section 3.2.2.6).

To determine the ounces of cooked lean meat and grams of discretionary fat from cooked meat, poultry, or fish with more than 9.35 grams of fat per 100 grams, an algorithm was developed based on the following procedure:

STEP 1. Determine grams of nonfat meat per 100 grams by subtracting the grams of fat per 100 grams (hereafter called "FAT") from 100:

NONFAT MEAT = 100 - FAT

Example: If there are 31.16 grams of fat in 100 grams of cooked sausage, then, the sausage has 68.84 grams of nonfat meat per 100 grams (i.e., 100 - 31.16 = 68.84).

STEP 2. Determine the grams of allowed fat associated with the nonfat meat, replicating the ratio of fat to nonfat meat in the meat profile as follows:

ALLOWED FAT = (9.35/90.65) * (NONFAT MEAT)

Example: For sausage–

$$\frac{9.35\ g}{90.65\ g} = \frac{X}{68.84\ g}$$

Therefore: X = 9.35/90.65 * 68.84 = 7.10 grams of allowed fat in 100 grams of cooked sausage.

STEP 3. Determine the grams of lean meat per 100 grams of meat, poultry, or fish by summing the nonfat meat and allowed fat per 100 grams:

GRAMS LEAN MEAT = NONFAT MEAT + ALLOWED FAT

Example: For sausage, 68.84 + 7.10 = 75.94 grams of cooked lean meat in 100 grams of cooked sausage.

STEP 4. Convert the grams of lean meat to ounces of lean meat per 100 grams of meat, poultry, or fish by dividing by 28.35:

OUNCES LEAN MEAT = GRAMS LEAN MEAT / 28.35

Example: For sausage, 75.94/28.35 = 2.68 ounces of cooked lean meat in 100 grams (3.53 ounces) of cooked sausage.

STEP 5. Determine the grams of discretionary fat per 100 grams of cooked meat, poultry, or fish by subtracting the grams of lean meat (step 3) from 100:

DISCRETIONARY FAT = 100 - GRAMS LEAN MEAT

Example: For sausage, 100 - 75.94 = 24.06 grams of discretionary fat per 100 grams of cooked sausage.

Collapsing terms, the algorithms for calculating ounces of cooked lean meat and grams of discretionary fat per 100 grams of cooked meat, poultry, or fish for these data files are:

OUNCES COOKED LEAN MEAT =
[(100 - FAT)+(9.35/90.65)*(100 - FAT)] / 28.35

GRAMS DISCRETIONARY FAT =
100 - [(100 - FAT)+(9.35/90.65)*(100 - FAT)]

Therefore:

OUNCES COOKED LEAN MEAT = 0.03891 * (100 - FAT)

GRAMS DISCRETIONARY FAT = 100 - [1.1031 * (100 - FAT)]

These algorithms were used to calculate ounces of cooked lean meat, poultry, or fish and discretionary fat from meat, poultry, and fish. They were also used for meat analogs (simulated meats).

The algorithms provide a standardized method for determining the amount of cooked lean meat and the amount of discretionary (or excess) fat in 100 grams of cooked meat, poultry, or fish. This means that meats generally considered high in fat, such as frankfurters and bacon, for which there are now low-fat alternatives, can be systematically categorized into Pyramid food groups in a manner that is consistent with the concepts on which the Pyramid is based. As the variety of low-fat meat products on the market increases, this will be increasingly important.

Some recipes in the CSFII 1994-96 and 1998 recipe databases contain raw meat, and consumption of raw meat and fish has been reported. Thus, ARS developed a standard for the grams of fat allowed in 100 grams of raw meat, that is equivalent to having 9.35 grams of fat per 100 grams once cooked (i.e., the Pyramid standard for cooked lean meat). The raw meat standard is 6.16 grams of fat (or less) per 100 grams. To convert from the raw to the cooked weight, ARS assumed an average cooking yield of 75 percent. Thus, 1-1/3 ounces of raw lean is equivalent to the one ounce cooked lean standard.

3.2.2.6. The Pyramid Tip

What counts towards the Pyramid Tip?

The Pyramid Tip includes fats, sugars, and alcohol that supply calories, but little or no vitamins and minerals. Fats and sugars eaten separately or added to foods obviously count toward the tip. So do most of the fats and the added sugars from foods in the five major food groups (USDA 1992).

Because the Pyramid was developed as an educational tool to describe food guidance recommendations to the general public, it describes what counts toward the Pyramid Tip in terms of foods rather than food ingredients. The foods it specifically lists in the tip have fats or sugars as primary ingredients. Some, however, also contain primary ingredients that fit into the major nutrient-bearing food groups. Examples are some gravies (e.g., milk gravy), candies, and jams. In addition, many foods that the Pyramid counts toward the major food groups are high in fats or added sugars, which count, in part, toward the Pyramid Tip. Examples are french-fried potatoes, croissants, ice cream, sweetened yogurt, chocolate milk, fruits canned with heavy syrup, and sweetened bakery products like cakes and cookies.

For the purposes of the Pyramid Servings Database, we have conceptualized the Pyramid Tip as containing only the fat, sugar, or alcohol components of foods. Three food groups on these data files relate to the Pyramid Tip:

Discretionary fat, which includes--

- all "excess" fat from the five major food groups beyond amounts that would be consumed if only the lowest fat forms were eaten, and
- fats added to foods in preparation or at the table, including cream, butter, margarine, regular or low-fat cream cheese, oil, lard, meat drippings, cocoa, and chocolate.

Added sugars, which include--

- all sugars used as ingredients in processed and prepared foods, such as breads, cakes, soft drinks, jam, and ice-cream, and
- sugars eaten separately or added to foods at the table.

Alcohol, which includes--

- beer,
- wine, and
- distilled spirits.

More information about discretionary fat.

The Food Guide Pyramid recommends selecting the lowest fat choices from the five major food groups. It indicates that people will consume about half of the maximum amount of fat recommended by the Dietary Guidelines for Americans if they eat the recommended number of

servings from each food group, select the lowest fat choices, and add no fat to their foods in preparation or at the table (USDA 1992). Any additional fat can be viewed as discretionary fat in that people can add it to their diets by choosing higher fat foods from the major food groups (e.g., whole milk instead of skim milk), by using fat as an ingredient in prepared foods (oil in fried chicken), or by adding it to foods at the table (e.g., cream in coffee; spread on bread).

When the Pyramid was developed, nutrient profiles were established for each food group (Cronin et al. 1985, Welsh et al. 1993). These profiles represented the nutrients expected, on average, in a serving of the food group if foods were in their lowest fat form. Thus, the nutrient profile for the milk group includes only skim milk. The profile for the meat group includes lean cuts of meat trimmed of all fat and poultry without skin. Fruits and vegetables have no added fats. For the Servings data in these files, these nutrient profiles were used to define "allowable" amounts of nutrient fat for each Pyramid food group (see Table 4). Discretionary fat represents the fat from foods in excess of these allowable amounts. Examples are the excess fat from whole milk, cheese, sausage, cake, and fried potatoes. Discretionary fat also includes fat from foods such as cream, butter, and salad dressing that are added to other foods. Discretionary fat is expressed as grams of nutrient fat.

Table 4. Allowable Fat Values by Pyramid Food Group

Grain Group	1.010 grams per serving
Vegetable Group	0.218 grams per serving
Fruit Group	0.280 grams per serving
Dairy Group	0.441 grams per serving
Meat and Bean Group	2.651 grams per ounce cooked lean equivalent

The allowable fat value for the meat and bean group has been applied in calculating discretionary fat from meat, poultry, fish, organ meats, frankfurters, sausages, luncheon meats, and meat alternates (eggs, tofu, meat analogs, nuts, nut butters, and seeds). The allowable fat value for the vegetable group has been applied in calculating discretionary fat from dried beans and peas which, according to the Pyramid, can be counted as either a meat alternate or a vegetable.

The allowable fat values for the grain and vegetable groups were derived from nutrient profiles for subgroups and suggestions in publications on the Pyramid's development regarding how foods should be divided among subgroups. They represent the fat per serving expected, on average, if servings from subgroups are consumed according to Pyramid suggestions (Cronin et al. 1985, Welsh et al. 1993). For the grain group, the values are based on the assumption that half of the servings are from whole grains and half from nonwhole grains. For the vegetable group, the values are based on the assumption that servings of vegetables are obtained equally from dark-green and deep-yellow,

starchy, and other vegetables, and that each dark-green and deep-yellow serving consists of three-sevenths of a serving of dark-green and four-sevenths of a serving of deep-yellow vegetables, and each starchy vegetable serving consists of three-sevenths of a serving of dried peas and beans and four-sevenths of a serving of other starchy vegetables (Cronin et al.1985).

[Note: In 1999 (USDA/CNPP 1999), the nutrient profiles were revised, reflecting consumption patterns from CSFII 1989-91. However, ARS continued to use the allowable fat values noted in Table 4 above to update this release of the Pyramid Servings Database for the USDA Survey Food Codes, thus maintaining the standards originally used when the Food Guide Pyramid was developed.]

More information about added sugars.

Added sugars do not include naturally occurring sugars. For example, they do not include the lactose in milk or the fructose in fruit.

Added sugars are defined as white sugar, brown sugar, raw sugar, corn syrup, corn syrup solids, high fructose corn syrup, malt syrup, maple syrup, pancake syrup, fructose sweetener, liquid fructose, honey, molasses, anhydrous dextrose, crystal dextrose, saccharin, and aspartame (powder) that are eaten separately or used as ingredients in processed or prepared foods. There are a few minor exceptions to this definition of added sugars. Sugars used as ingredients in soy-based imitation milk, processed meats such as cured ham and luncheon meats, meat analogs, and processed cheeses are not counted because recipes for all foods in these categories were not available when the data files were developed.

Quantities on the Pyramid Servings Database are expressed in terms of teaspoons of sugar. One teaspoon of sugar is defined as the quantity of a sweetener that contains the same amount of carbohydrate as a teaspoon (4 grams) of table sugar. Thus, added sugars are standardized on a carbohydrate equivalent basis. No adjustments were made to the amount of added sugar from bakery products containing yeast, such as bread. The total amount of ingredient sugar consumed (per person per day) from bread, reported as a separate food item and from sandwiches, is less than one teaspoon per day (Personal communication with FSRG staff, August 2000).

More information about alcohol.

The Pyramid defines a drink as 12 fluid ounces of beer, 5 fluid ounces of wine, and 1-1/2 fluid ounces of 80-proof distilled spirits. Each of these provides about the same amount of alcohol (USDA 1992).

One drink as defined by the Pyramid contains between 13 and 14 grams of alcohol (12.96 grams for beer; 13.72 grams for table wine; 13.93 grams for distilled spirits). These amounts were used as the

basis for defining serving sizes for alcoholic beverages not covered by the standard definitions. Serving sizes were rounded to half ounce units. Thus, for the Pyramid Servings Databases, one drink is:

regular beer	12.0 fluid ounces
light beer	12.0 fluid ounces
table wine (dry)	5.0 fluid ounces
dessert wine	3.0 fluid ounces
rice wine (saki)	3.0 fluid ounces
light wine	7.0 fluid ounces
cooking wine	14.0 fluid ounces

wine, baked or simmered:

table wine--

1 to 60 minutes..... 14.0 fluid ounces
1 to 1-1/2 hours..... 20.0 fluid ounces
2 to 2-1/2 hours..... 51.0 fluid ounces

dessert wine--

1 to 30 minutes..... 7.0 fluid ounces
46 to 60 minutes..... 10.0 fluid ounces
1-1/2 to 1-3/4 hours.... 14.5 fluid ounces

wine stirred into hot liquid:

table wine..... 6.0 fluid ounces
dessert wine..... 3.5 fluid ounces
distilled spirits..... 1.5 fluid ounces
cordial or liqueur..... 1.5 fluid ounces

liqueur stirred into hot liquid:

sweet..... 2.0 fluid ounces

3.3. References

Cited references

Cleveland, L.E., D.A. Cook, S.M. Krebs-Smith, and J. Friday. 1997. Method for assessing food intakes in terms of servings based on food guidance. Am J Clin Nutr 65(suppl):1254S-1263S.

Cronin, F.J., A.M. Shaw, S.M. Krebs-Smith, P.M. Marsland, L. Light. 1987. Developing a food guidance system to implement the dietary guidelines. J Nutr Ed. 19:281-302.

Cronin, F.J., A.M. Shaw, S.M. Krebs-Smith, P.M. Marsland, L. Light. 1985. Developing the food guidance system for "Better Eating for Better Health," a nutrition course for adults. U.S. Department of Agriculture, Human Nutrition Information Service, Administrative Report No.377.

Davis, C.A., A. Escobar, K. Marcoe, C. Tarone, A. Shaw, E. Saltos, R. Powell. 1999. Food Guide Pyramid for Young Children 2-6 years old. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, CNPP-10.

Federal Register. October 22, 1990. Public Law 101-445. National Nutrition Monitoring and Related Research Act of 1990.

Krebs-Smith, S.M., D.A. Cook, A.F. Subar, L. Cleveland, J. Friday, L.L. Kahle. 1996. Fruit and vegetable intakes of children and adolescents in the United States. Archives of Pediatric and Adolescent Medicine 150:81-86.

Krebs-Smith, S.M., D.A. Cook, A.F. Subar, L. Cleveland, J. Friday. 1995. U.S. adults' fruit and vegetable intakes, 1989 to 1991: A revised baseline for the Healthy People 2000 objective. Am J Public Health 85:1623-1629.

USDA (U.S. Department of Agriculture). 1993. Eat a variety of foods. USDA Home and Garden Bulletin 253–2.

USDA/ARS (U.S. Department of Agriculture, Agricultural Research Service). 2000a. 1994-96, 1998 Continuing Survey of Food Intakes by Individuals. CD-ROM.

USDA/ARS (U.S. Department of Agriculture, Agricultural Research Service). 2000b. Pyramid Servings Intakes by U.S. Children and Adults, 1994-1996, 1998. *Online*. ARS Community Nutrition Research Group, available on the Web site at http://www.barc.usda.gov/bhnrc/cnrg on October 2000.

USDA/ARS (U.S. Department of Agriculture, Agricultural Research Service). 1998. 1994–96 Continuing Survey of Food Intakes by Individuals and 1994–96. Diet and Health Knowledge Survey. CD–ROM.

USDA/ARS (U.S. Department of Agriculture, Agricultural Research Service). 1999. USDA Nutrient Database for Standard Reference, Releases 11. *Online.* ARS Nutrient Data Laboratory Web site at http://www.nal.usda.gov/fnic/foodcomp/ on September 2000.

USDA/ARS (U.S. Department of Agriculture, Agricultural Research Service). 1997. 1994 Continuing Survey of Food Intakes by Individuals: Pyramid Servings– Intakes and Databases. CD-ROM

USDA/ARS (U.S. Department of Agriculture, Agriculture Research Service). 1996. 1994 Continuing Survey of Food Intakes by Individuals and 1994 Diet and Health Knowledge Survey. CD-ROM.

USDA and USDHHS (U.S. Department of Agriculture and U.S. Department of Health and Human Services.) 2000. Nutrition and Your Health: Dietary Guidelines for Americans, 5th ed. USDA Home and Garden Bulletin No. 232.

USDA/CNNP (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion). 1999. Tips for Using the Food Guide Pyramid for Young Children 2 to 6 Years Old. CNPP Program Aid 1647.

USDA/CNPP (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion). 1992, slightly revised 1996. The Food Guide Pyramid. USDA Home and Garden Bulletin 252.

Welsh, S.O., C. Davis, A. Shaw. 1993. USDA's food guide: background and development. USDA Miscellaneous Publication No. 1514.

For additional information

Online accessibility to the complete Pyramid Servings Database for USDA Survey Food Codes and to the summary tables for Pyramid Servings Intakes by U.S. Children and Adults, 1994-96, 1998 is available from the Community Nutrition Research Group's Web site at, http://www.barc.usda.gov/bhnrc/cnrg/.

Information on CSFII 1994-96, 1998 can be found at the Food Surveys Research Group's Web site: http://www.barc.usda.gov/bhnrc/foodsurvey/home.htm. Instructions for joining the SURVEY Discussion Group are also on the FSRG Web site.

National Technical Information Service has information on purchasing the CSFII 1994-96, 1998 microdata http://www.ntis.gov/fcpc/ntcallhs.htm#FoodInt

The Food Guide Pyramids and Dietary Guidelines for Americans are available from these Center for Nutrition Policy and Promotion (CNPP) Web sites:
http://www.usda.gov/cnpp/pyramid2.htm
http://www.usda.gov/cnpp/KidsPyra/index.htm
http://www.usda.gov/cnpp/Pubs/DG2000/Index.htm