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Spotlight — on the — Food System



...Upfront

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American Eating Habits Changing: Part 1

Meat, Dairy, and Fats and Oils

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Slowly, and with fits and starts, Americans are shifting their eating patterns toward healthier diets. When it comes to meat, dairy, and fats and oils, on the menu are more low-fat and nonfat products and leaner cuts.

However, this trend has been undermined by a growing preference for high-fat convenience foods, fast foods, and snacks. More Americans eat out, eat on the run, and eat more often than ever before. In the process, some have unwittingly increased their consumption of fats and oils.

For example, the normally lower fat choices of chicken and fish, when served deep-fried in fast food sandwiches, can have a higher fat content than a quarter-pound cheeseburger.

Research indicates that consumer knowledge about dietary fats and other food components is poor. To follow general recommendations to eat less saturated fat or to eat more fiber, people need to better understand what the major food sources of these components are and how their present diet fits in.

Information is critical. The new food label required on almost all foods by mid-1994 (mandated by the Nutrition Labeling and Education Act of 1990) is a powerful tool to help give Americans the information they need to make healthful food choices.

Nutrition education programs can accelerate the shift toward healthier diets. To help consumers get the most from the new food label, government and industry are mounting a multiyear food labeling education campaign to increase

consumers' knowledge and effective use of the new food label and assist them in making accurate and sound dietary choices in accordance with the Dietary Guidelines for Americans. In addition, more and more manufacturers are using USDA's Food Guide Pyramid to show how their product can fit into a healthy diet.

The food industry is responding to consumer demand and marketing opportunities for reduced-fat products by altering fresh meat production and merchandising



Nutritional concern about fat and cholesterol has encouraged the production of leaner animals and the closer trimming of fat before retail sales. The industry has provided scores of new brand-name, value-added products processed for consumers' convenience.

The author is an agricultural economist with the Commodity Economics Division, Economic Research Service, USDA.

practices and by introducing a host of reduced-fat product alternatives. Technological advances in food production and processing have given the food industry new tools, such as protein- or carbohydrate-based fat replacers, that will likely accelerate the introduction of tasty reduced-fat foods in the future.

This is the first article of a two-part series that uses U.S. per capita food supply data (called disappearance, see box for more details) to gauge in broad terms how our eating patterns are changing over time. The focus here is on animal products. A second article in an upcoming *FoodReview* will cover crop products.

Meat, Poultry, and Fish

In 1992, total red meat, poultry, and fish consumption reached a record 189 pounds (boneless, trimmed equivalent) per person, 6 percent above 1980-83. Red meat accounted for 60 percent of the total meat supply in 1992, compared with 70 percent in 1980-83. By 1992,

Behind the Data

USDA's Economic Research Service annually calculates the amount of food available for human consumption in the United States. The U.S. food supply series measures national consumption of several hundred foods. It is the only historical data on food and nutrient availability in the country.

The total food supply is based on records of commodity flows from production to end uses. Total available supply is the sum of production, beginning inventories, and imports. These three components are either directly measurable or estimated by government agencies using sampling and statistical methods.

For most commodities, measurable uses are exports, industrial uses, farm inputs (seed and feed), and yearend inventories. Human food use is normally not directly measured or statistically estimated. The availability of food for human use is, therefore, a residual component after subtracting other uses from the available total supply. In a few cases, food supplies are measured directly and one of the other use components becomes the residual category. This is the case for wheat, in which flour production is measurable and livestock feed becomes the residual.

The availability of food for human use represents disappearance of food into the marketing system. Hence, it is often referred to as food disappearance. Per capita food "consumption" or "use" usually is calculated by dividing total food disappearance by the U.S. total population. The food disappearance estimates measure supplies moving through trade channels for domestic consumption. However, because most foods are perishable, changes in disappearance presumably are associated with changes in actual consumption.

Food disappearance is often used as a proxy to estimate human consumption. Used in this manner, the data usually provide an upper bound on the amount of food available for consumption. Estimates can overstate actual intake because they include food that is discarded in processing, lost in spoilage, and thrown away at home or fed to pets. In general, food disappearance data serve more appropriately as indicators of trends in consumption over time than as measurements of absolute levels of total foods eaten. This is the case so long as changes over time in food production and marketing practices or consumer behavior do not alter the relative disparity between food disappearance and food actually eaten.

But, of course, changes in product forms, market channels, and consumer behavior over time do alter the relative disparity between food disappearance and food actually eaten. For example, consumers and restaurateurs want cut-up broilers, parts, boneless, and skinless items. Fortunately, survey data from the broiler industry allow us to adjust per capita consumption estimates for chicken to reflect changing trends. However, for many other foods (such as turkey and fats and oils) we do not have the data needed to make such adjustments.

Estimates of the nutrient content of the food supply are derived from data on quantities of foods available for consumption per capita per year and from data on the nutrient composition of foods. USDA's Human Nutrition Information Service (HNIS) annually estimates daily levels of food energy and 24 nutrients and food components in the U.S. food supply.

More details on ERS's food consumption series and HNIS's nutrient availability series can be found in *Food Consumption, Prices, and Expenditures, 1970-92*, SB-867. An electronic database also is available. Call toll free 1-800-999-6779 to order.

chicken and turkey accounted for 32 percent of total meat consumed, up from 23 percent in 1980-83. Fish and shellfish accounted for 8 percent in 1992 and 7 percent in 1980-83 (table 1).

Consumption of beef during 1980-92 reached a high of 75 pounds (boneless, trimmed equivalent) per person in 1985, and then steadily declined to 63 pounds in 1992. Similarly, consumption of fish and shellfish reached a record high of 16.1 pounds per person in 1987 and then slid to 14.7 pounds in 1992. Gains in consumption of chicken, turkey, and pork from 1986 to 1992 more than offset the declines in beef and fish.

Prices explain some of the decline in per capita consumption of beef. Per pound retail prices for chicken and pork have remained well below those for beef. In 1992, consumers paid, on average, \$1.41 per pound for broilers. In contrast, retail beef prices averaged \$2.85 a pound, and pork sold for \$1.98. However, boneless, skinless chicken breasts cost about the same

at retail as the better cuts of beef. Between 1986 and 1992, retail prices rose 29 percent for seafood, 24 percent for beef and veal, 22 percent for pork, and 14 percent for broilers—and consumers went for the cheaper meat.

Income changes have done little to strengthen demand for beef in the past decade. Although incomes have grown (normally tending to strengthen beef demand), the growth has been for higher income people whose beef purchases are probably not very sensitive to increasing income. USDA's Nationwide Food Consumption Surveys revealed that meat quantities consumed rose with income in 1977-78, but the opposite was found in the 1987-88 survey. The decline in beef consumption was steep for all income groups, especially for the highest income group.

In addition to changes in prices and incomes, circumstantial evidence suggests that a change has occurred in consumer tastes and, hence, in the demand for beef.

Interest in convenience and health has altered consumer meat choices. Hamburger, which can be prepared quickly, accounted for 45 percent of the beef consumed in 1992, compared with 35 percent in 1985 and 26 percent in 1970. In 1992, each American consumed an average 30 pounds of hamburger, up from 25 pounds in 1980 and 22 pounds in 1970. Purchases of steaks were down a little. Roasts, which take longer to prepare, were down sharply. In addition, a shift has occurred toward eating away from home, especially in fast food places that emphasize hamburgers, fries, and, increasingly in the last decade, chicken and pizza. As total per capita consumption of chicken has increased rapidly since 1980, the share provided by foodservice establishments climbed from 29 percent in 1981 to 40 percent in 1991.

Nutritional concern about fat and cholesterol has encouraged the production of leaner animals and the closer trimming of fat before retail sales. Most retailers now go beyond the quarter-inch trim for red meat cuts to one-eighth inch or closer, and some trim off all visible fat. Most also offer three or four kinds of ground beef with progressively lower fat content (at progressively higher prices). Some ground beef now contains as little as 4 percent fat—less fat than is in most ground chicken and ground turkey products. Many new packaged deli meats meet the definition for "low fat" under the new nutrition labeling rules.

For the millions of Americans who seek to restrict their fat and cholesterol intakes to recommended levels, manufacturers are required to offer pertinent information on their food products by mid-1994, such as: total calories; calories from fat; and the amounts of total fat, saturated fat, and cholesterol per product serving.

If tastes have changed, knowing why they have changed and how

Table 1
Americans Consumed Less Red Meat, More Poultry and Seafood in 1992

Item	Annual average			Change, 1980-83 to 1992	Share	
	1980-83	1991	1992		1980-83	1992
	Pounds per capita ¹			Percent ²	Percent ²	
Total meat	178.3	184.7	188.9	6.0	100.0	100.0
Red meats ³	123.8	111.9	114.1	-7.8	69.5	60.4
Beef	72.9	63.1	62.8	-13.8	40.9	33.2
Veal	1.3	.8	.8	-37.2	.7	.4
Pork	48.6	46.9	49.5	1.9	27.3	26.2
Lamb and mutton	1.1	1.0	1.0	-5.1	.6	.5
Poultry ³	41.8	58.0	60.1	43.9	23.4	31.8
Chicken	33.4	43.9	45.9	37.5	18.7	24.3
Turkey	8.4	14.1	14.2	69.3	4.7	7.5
Fish and shellfish	12.7	14.8	14.7	16.0	7.1	7.8
Fresh and frozen	7.9	9.6	9.8	23.5	4.5	5.2
Canned	4.4	4.9	4.6	3.7	2.5	2.4
Cured	.3	.3	.3	-.6	.2	.2

Notes: Totals may not add due to rounding. ¹Boneless, trimmed equivalent. ²Calculated from unrounded data. ³Excludes shipments to Puerto Rico and the Virgin Islands.

they might shift again would help the industry plan marketing strategies. Major advertising campaigns for beef (and pork) started in the late 1980's, when promotional programs began. Evaluation indicates that beef consumption and prices have been unexpectedly higher since 1987 when changes in income and the prices of other goods are taken into account.

The pork industry has been very successful with its "Pork: The Other White Meat" advertising campaign, which portrays pork as a light and nutritious alternative to chicken. While pork rated high in convenience and taste, consumers perceived it negatively in terms of fat, calories, and cholesterol. The campaign focused on the industry's leaner cuts and lower fat products. In addition, pork processors are attempting to fully integrate operations—from the production unit to the meat case.

Hormel, the Nation's largest pork processor, introduced a Light & Lean 97-percent fat-free hot dog in 1991, and now has an entire line of meats that are 97-percent fat free. Its Austin hog slaughtering and further processing operation, which slaughters 12,000 hogs a day, moved to a 0.10-inch fat trim.

The poultry industry has enjoyed great success, partly by catering to consumers. Poultry has benefited from a lower real price than beef and from health-related concerns about beef. Health conscious consumers are using fresh ground chicken and turkey in place of hamburger in spaghetti sauces and other recipes.

The industry has provided scores of new brand-name, value-added products processed for consumers' convenience—as well as a host of fast food products. In fact, nearly one-quarter of the chicken Americans consumed in 1991 was prepared by fast food establishments. More than half of this was fried chicken. But roasted chicken is becoming popular.

Roasted chicken contains less fat than fried chicken, particularly if a rotisserie is used—a cooking method that drains off fat. Consumers can reduce fat intake by as much as a fourth if they choose roasted over fried chicken, and by as much as two-thirds if they choose white meat over dark, trim away all visible fat, and discard the skin.

Consumers bent on changing food selections to bring about positive nutritional outcomes (such as fewer calories or less fat) still face a challenge when buying prepared foods or eating out—especially at fast food places—but have more options today. McDonald's patrons, for example, can choose among long-time favorites, such as the Quarter Pounder hamburger (410 calories, 20 grams fat) or McChicken Sandwich with its breaded chicken patty (470 calories, 25 grams fat), and new lower fat alternatives, such as the McLean Deluxe hamburger (320 calories, 10 grams fat) or McGrilled Chicken Sandwich (390 calories, 12 grams of fat) without the cheese and herb sauce (290 calories, 3 grams fat). Adding the mild or hot Picante sauce would add a dash of flavor and only 4 calories and 0.05 gram fat. Adding a half pint of McDonald's 1-percent fat milk to the meal would add only half the fat (2 grams) but 4 times the calcium the cheese would have provided.

The decade ahead is likely to bring more changes. Technological advances will mean a host of new products in the meat case. With little increase in overall consumption of meat products expected in the next decade, the beef, pork, poultry, and fish industries will try to capture a larger share of a stagnant market by offering more higher profit, value-added, prepared products.

Eggs

Average annual use of eggs declined 14 percent between 1980 and 1992, from 271 eggs per person to 234, despite relatively low prices. The increase from 1980 to 1992 in the Consumer Price Index for eggs was less than half that for all food at home, 22 percent versus 55 percent. In 1990, eggs contributed 2 percent of the total fat in the U.S. food supply, 2 percent of the saturated fat, and 33 percent of the cholesterol (see box and table).

Data from the individual intake portion of USDA's Nationwide Food Consumption Survey (NFCS) show that the proportion of individuals eating eggs at least once a day dropped from a third in 1977-78 to a fourth in 1987-88. Data from the household portion of the NFCS show that smaller households had a larger decrease in consumption. In 1987-88, per capita consumption of eggs declined as household income increased.

Table 2
Use of Processed Eggs Stemmed the Decline in Per Capita Egg Consumption¹

Item	Annual average			Change, 1980-83 to 1992	Share	
	1980-83	1991	1992		1980-83	1992
	Number per capita			Percent	Percent	
Eggs	265	233	234	-11.6	100	100
In shell	231	182	180	-22.1	87	77
Processed	34	51	54	59.5	13	23

Note: ¹Excludes shipments to Puerto Rico and the Virgin Islands.

However, a 40-percent jump since 1985 in per capita use of eggs in commercially processed egg products has stemmed the long-term decline. Egg products were responsible for 23 percent of total egg consumption in 1992, up from 13 percent in 1980-83 (table 2).

The home-cooked, eggs-and-bacon breakfast continues to give way to ready-to-eat, "instant" grain-based products as well as processed egg products as dietary concerns grow and as the amount of time allotted to household meal preparation continues to decline.

Buying processed eggs relieves food manufacturers and foodservice operators of the time and expense of breaking eggs, and it keeps egg supplies readily available. Also, the pasteurization given all egg products reduces concerns about salmonella contamination. Consumers avoiding cholesterol and fat in egg yolks may use processed products, such as lower cholesterol, liquid, whole-egg mixes (that cook, look, and generally taste like scrambled eggs) or egg substitutes made with egg whites.

Spurred by food-safety concerns, a growing number of large restaurant chains and airlines are eliminating fresh, whole eggs from their kitchens and switching to processed products, such as pasteurized liquefied eggs. The impact on the egg market could be enormous if McDonald's decides to do so, since it is the country's largest user of fresh eggs.

Many analysts see significant restructuring in the industry, and bet that processed products will capture 40 to 50 percent of the egg market before the end of the decade.

Dairy Products

Per capita consumption of all dairy products (including butter) in 1992 came to 565 pounds (milk-equivalent, milkfat basis), the same as in 1991 but up 12 pounds from 1980 to 1983 (table 3). Between 1980

and 1992, Americans cut their average annual consumption of fluid whole milk by two-fifths, increased use of low-fat milk by two-fifths, and more than doubled consumption of skim milk. But because of the growing yen for cheese, the Nation failed to cut the overall use of milkfat (tables 3 and 4).

Annual per capita consumption of beverage milks declined by 2.3 gallons between 1980 and 1992, to 25.3 gallons per person. A 55-percent increase in per capita consumption of yogurt since 1980—to 0.5 gallon per person in 1992—par-

tially offset the decline in beverage milks.

The trend is toward lower fat milk. While whole milk (plain and flavored) represented 62 percent of all beverage milks consumed in 1980, its share dropped to 38 percent in 1992. The lowfat and skim-milk share increased from 38 percent to 62 percent. Since 1989, 1-percent and skim milk have gained share as 2-percent and whole milk declined. If yogurt (more than 85 percent of which is now lowfat or nonfat) is grouped with beverage milks, the trend toward nonfat fluid milk is even greater.

Table 3
Consumption of Milkfat Remained Flat, Despite Lower Use of Whole Milk

Item	Annual average			Change, 1980-83 to 1992
	1980-83	1991	1992	
	<i>Pounds per capita</i>			<i>Percent¹</i>
All dairy products, milk-equivalent, milkfat basis ²	553	565	565	2.1
Cheese ³	19.0	25.0	26.0	36.4
American	10.7	11.1	11.3	5.9
Cheddar	7.9	9.0	9.2	15.9
Italian	4.8	9.4	10.0	109.6
Mozzarella	3.2	7.2	7.7	137.7
Other ⁴	3.6	4.6	4.7	30.3
Cream	1.1	1.6	1.7	64.6
Cottage cheese	4.3	3.3	3.1	-27.2
Frozen dairy products ⁵	26.6	30.4	30.3	14.1
Ice cream	17.7	17.4	17.6	-2
	<i>Gallons per capita</i>			<i>Percent¹</i>
Beverage milk ⁶	26.8	25.7	25.3	-5.5
Whole, plain	15.6	9.8	9.5	-39.2
2-percent, plain	6.7	9.1	9.1	35.9
0.5-percent and 1-percent, plain	1.8	2.4	2.4	37.6
Skim, plain	1.3	2.8	2.9	127.1
Yogurt (excluding frozen)	.3	.5	.5	55.3
Fluid cream products ⁷	.7	.9	.9	36.7

Notes: Totals may not add due to rounding. ¹Calculated from unrounded data. ²Total includes butter, dry milk products, and condensed and evaporated milk. Individual products are on a product-weight basis. ³Natural equivalent of cheese and cheese products. Excludes full-skim American and cottage, pot, and baker's cheese. ⁴Includes Swiss, Brick, Muenster, Neufchatel, Blue, Edam, and Gouda. ⁵Includes ice milk, sherbet, and nonstandardized dairy products (including frozen yogurt). ⁶Includes flavored milks and buttermilk. ⁷Heavy, light, half and half, sour cream, and eggnog.

Total beverage milk contributed 25 percent less fat to the average American's diet in 1992 than it did in 1980 as a result of the pronounced trend toward lower fat milks and an 8-percent decline in overall per capita consumption of beverage milk (table 4). In contrast, rising consumption of fluid cream products meant that they contributed nearly 50 percent more milkfat to the average diet in 1992 than in 1980. On balance, however, per capita consumption of milkfat from all fluid milk and cream products declined 16 percent between 1980 and 1992.

These changes are consistent with increased public concern about cholesterol and animal fats. However, the decline in per capita consumption of fluid milk also may be attributed to declining numbers of U.S. teenage males

(only partially offset by the rising numbers of infants), an increasing incidence of lactose intolerance among Americans due to the growing ethnic diversity and aging of the population, and increasing preference for soft drinks—especially diet soft drinks—in the last decade.

Price is also behind the shift to lower fat milks. Skim milk traditionally has been cheaper than whole milk (but this has not always been the case for 1-percent and 2-percent milks.) However, since 1980, the retail price for a half gallon of lowfat milk has averaged 5 cents below that for whole milk.

Over time, this has eased the way for consumers to accept and prefer the lower fat milk. Evidence of such acceptance is McDonald's switch from whole milk to 2-percent in 1986 and from 2-percent milk to 1-percent in 1991. And

many foodservice operators now provide whole milk or 2-percent, instead of cream, as coffee whiteners. Schools remain a large market for milk, especially whole milk, which is a required offering in the National School Lunch Program.

The percentages of people consuming total milk and milk products were similar across all income groups in USDA's 1989-90 Continuing Survey of Food Intake by Individuals. Nearly 8 of 10 Americans in each income group had one or more milk products on any given day. However, the type of milk and milk product varied by income group. Low-income people were less likely than people in the other income groups to drink lowfat or skim milk and more likely to drink whole milk. Low-income people also were less likely to eat milk desserts and cheese than were people

Table 4
Beverage Milk Contributes 25 Percent Less Fat to the Average American's Diet Than in 1980

Product	1980		1992		Change in per capita consumption, 1980-92			
	Average annual milkfat content	Per capita consumption	Average annual milkfat content	Per capita consumption	Product	Milkfat		
	Percent	Pounds	Percent ¹	Pounds	Percent ¹			
Total fluid milk products	N/A	240.0	6.25	N/A	222.8	4.71	-7.2	-24.7
Total beverage milk	N/A	237.4	6.21	N/A	218.5	4.64	-8.0	-25.2
Plain	N/A	223.3	5.94	N/A	205.8	4.43	-7.9	-25.4
Whole	3.32	141.7	4.70	3.27	81.4	2.66	-42.5	-43.4
2-percent	1.94	54.7	1.06	1.95	78.4	1.53	43.2	44.0
1-percent	.91	15.3	.14	.92	21.0	.19	36.8	38.3
Skim	.27	11.6	.03	.18	25.0	.04	115.4	43.6
Flavored	N/A	10.0	.23	N/A	9.6	.18	-4.3	-20.3
Whole	3.21	4.7	.15	3.25	2.7	.09	-42.7	-42.0
Lowfat and skim ²	1.42	5.3	.07	1.35	6.9	.09	30.3	23.9
Buttermilk	1.04	4.1	.04	.95	3.2	.03	-22.1	-28.8
Yogurt	1.87	2.6	.05	1.60	4.3	.07	66.4	42.4
Total fluid cream products	N/A	5.6	.88	N/A	8.0	1.35	43.2	52.8
Cream	N/A	3.4	.55	N/A	4.8	.87	43.2	58.0
Half and half	10.85	2.4	.26	10.57	3.2	.33	30.3	26.9
Light	18.54	.2	.04	18.20	.3	.06	42.5	39.9
Heavy	34.24	.7	.24	35.57	1.3	.47	88.2	95.6
Sour cream	16.92	1.8	.30	16.41	2.7	.45	51.5	47.0
Eggnog	7.08	.4	.03	7.59	.5	.03	7.8	15.6
Total fluid milk and cream products	N/A	245.6	7.13	N/A	230.8	6.05	-6.0	-15.1

Notes: N/A = Not applicable. Totals may not add due to rounding. ¹Calculated from unrounded data. ²Includes flavored drinks.

Animal Products Contributed Less Fat and Cholesterol in the Food Supply in 1990 Than in 1980

Analysis of the nutrient content of the U.S. food supply by USDA's Human Nutrition Information Service indicates declines in per capita consumption of animal fat, saturated fat, and cholesterol between 1980 and 1990, even as per capita consumption of total fat increased.

The daily level of per capita food energy in the food supply increased from roughly 3,400 calories in 1980 to 3,700 calories in 1990. This 9-percent increase reflects higher levels of all three energy-yielding nutrients: fat, carbohydrates, and protein. The proportion of calories from fat decreased from 42 to 40 percent, while the share from carbohydrates increased from 47 to 49 percent. Protein has consistently accounted for about 11 to 12 percent of calories.

The daily per capita amount of fat in the U.S. food supply increased between 1980 and 1990, from 161 grams to 165 grams. (These food supply estimates include fat that is lost or discarded as waste and are thus much

higher than estimates of actual intakes.) The distribution of types of fat in the food supply changed very slightly. The daily per capita amount of saturated fat dropped from 60 grams to 59 grams, while the amount of unsaturated fat rose from 101 grams to 106 grams.

Food groups contributing fat, saturated fat, and cholesterol in the food supply have shifted. For example, animal products contributed 52 percent of the total fat in the food supply in 1990, down from 59 percent in 1980. The proportion of total fats from meat, poultry, and fish declined to 30 percent in 1990 from 35 percent in 1980. The proportion of fat from red meats declined to 24 percent from 30 percent.

Based on USDA's Nationwide Food Consumption Surveys, fat accounted for about 36 percent of Americans' total energy intake in 1987-88, down from 40 percent in 1977-78. USDA's Dietary Guidelines recommend that Americans limit total fat and saturated fat in their diets to 30 percent of calo-

ries and 10 percent of calories, respectively.

Daily per capita levels of cholesterol in the food supply declined between 1980 and 1990, from 447 mg to 414 mg. The three major food groups supplying cholesterol in 1990 were meat, poultry, and fish (47 percent); eggs (33 percent); and dairy products (15 percent).

Cholesterol is a fat-like substance present in all animal foods—meat, poultry, fish, milk and milk products, and egg yolks. Both the lean and fat of meat and the meat and skin of poultry contain cholesterol. In milk products, cholesterol is mostly in the fat, so lower fat products contain less cholesterol. Egg yolks and organ meats, like liver, are high in cholesterol. Plant foods do not contain cholesterol.

Dietary cholesterol, as well as saturated fat, raises blood cholesterol levels in many people, increasing the risk for heart disease. Some health authorities recommend that dietary chole-

in the middle and upper income groups.

The average American is consuming 1.5 times as much cheese now—excluding cottage types—as in 1980, 26 pounds in 1992 compared with 17.5 pounds 12 years earlier. Two-thirds comes in commercially manufactured and prepared foods (including food service), such as pizza, tacos, nachos, salad bars, fast food sandwiches, bagel spreads, sauces for baked potatoes and other vegetables, and packaged snack foods.

From 1980 to 1992, consumption of Cheddar cheese, America's favorite cheese, increased 34 percent to 9.2 pounds per capita. Consumption of Italian cheeses more than doubled during the same period, to 10 pounds per person in 1992. For example, per capita consumption of Mozzarella—the main pizza cheese—in 1992 was 7.7 pounds, more than 2.5 times higher than in 1980, making it America's second favorite cheese. Cream cheese overtook Swiss in the 1980's to become America's third favorite cheese, at 1.7 pounds per person in 1992. Per

capita consumption of cottage cheese declined 1.4 pounds during 1980-92, to 3.1 pounds.

While cheese is high in calcium and protein, it is also high in saturated fat, cholesterol, and sodium. For example, a 1.5-ounce serving of natural cheese supplies the same amount of calcium as 1 cup of milk or yogurt, but contains 12 to 14 grams (3 to 3.5 teaspoons) of fat. In comparison, the amount of fat in 1 cup of milk is 8 grams (2 teaspoons) for whole milk, 5 grams for 2-percent, 3 grams for 1-per-

terol be limited to an average of 300 mg or less per day. Data from the 1987-88 Nationwide Food

Consumption Survey put average cholesterol consumption at just under 300 mg per capita per

day (roughly 350 mg for men and 250 mg for women).

Per Capita Levels of Fat, Saturated Fat, and Cholesterol in the U.S. Food Supply, 1980 and 1990

Item	Fat				Saturated fat				Cholesterol			
	1980		1990		1980		1990		1980		1990	
	Grams per day	Percent of total	mg per day	Percent of total	mg per day	Percent of total						
Total fat	160.7	164.6	100.0	100.0	60.1	58.6	100.0	100.0	446.6	414.0	100.0	100.0
Vegetable	66.2	79.3	41.2	48.2	13.5	16.5	22.5	28.2	0	0	0	0
Animal	94.4	85.3	58.8	51.8	46.6	42.1	77.5	71.8	446.6	414.0	100.0	100.0
Meat, poultry, and fish	56.8	49.9	35.3	30.3	26.2	22.4	43.6	38.2	204.6	196.0	45.8	47.3
Red meat	48.8	39.9	30.4	24.2	24.0	19.6	40.0	33.5	152.1	129.4	34.1	31.3
Poultry	7.0	9.3	4.4	5.6	2.0	2.6	3.3	4.5	40.6	52.8	9.1	12.8
Fish and shellfish	1.0	.7	.6	.4	.2	.1	.3	.2	11.9	13.8	2.7	3.3
Eggs	3.8	3.2	2.3	2.0	1.2	1.0	1.9	1.7	159.8	137.5	35.8	33.2
Dairy (excluding butter)	18.5	19.4	11.5	11.8	11.6	12.2	19.3	20.8	58.9	60.0	13.2	14.5
Cheese	6.2	8.3	3.9	5.0	4.0	5.3	6.6	9.0	20.1	26.4	4.5	6.4
Beverage milks	7.7	6.0	4.8	3.7	4.9	3.8	8.1	6.6	31.5	24.8	7.1	6.0
Frozen desserts	2.7	2.7	1.7	1.7	1.7	1.7	2.8	2.9	.6	.6	.1	.1
Cream products	1.1	1.5	.7	.9	.7	1.0	1.1	1.6	3.4	4.8	.8	1.2
Canned and dried products	.6	.7	.4	.4	.4	.4	.7	.7	3.2	3.3	.7	.8
Fats and oils	71.2	78.3	44.3	47.6	18.5	12.9	30.8	22.0	23.3	20.5	5.2	4.9
Butter, lard, beef tallow	15.4	12.8	9.6	7.8	7.6	6.5	12.7	11.1	23.3	20.5	5.2	4.9
Vegetable fats and oils	55.7	65.5	34.7	39.8	10.9	6.4	18.1	10.9	0	0	0	0
Legumes, nuts, and soy	4.7	6.0	3.0	3.7	.9	1.1	1.4	1.8	0	0	0	0
Fruit, vegetables, grains, and sweeteners	3.4	4.3	2.1	2.6	.6	.8	1.0	1.3	0	0	0	0
Miscellaneous items ¹	2.3	3.5	1.5	2.1	1.1	1.8	1.9	3.0	0	0	0	0

Notes: Totals may not add due to rounding. ¹Includes chocolate liquor, which is what remains after cocoa beans have been roasted and hulled. Source: USDA's Human Nutrition Information Service.

cent, and a trace for skim milk and nonfat yogurt.

Despite a recent flurry of lower fat cheese introductions, these products still account for only about 5 percent of total cheese consumption. Their share in retail stores—which sell roughly a third of all cheese consumed—is higher (9 percent) than in food service and in manufactured foods. New food labeling regulations—which, for the first time, make nutrition labeling mandatory for almost all processed foods—will give industry

further incentive to use lower fat cheese in the future.

Per capita consumption of frozen dairy products increased 14 percent between 1980-83 and 1992. All of the increase was due to higher consumption of ice milk and frozen yogurt. *New Product News* found that 54 percent of frozen dairy products introduced in 1990 (excluding novelties) carried lowfat or nonfat claims, 50 percent in 1991, and 23 percent in 1992.

Milk and milk products are the primary dietary source of calcium,

which is essential for the growth and maintenance of bones and teeth. One cup of milk has about 300 milligrams (mg). The daily Recommended Dietary Allowance (RDA) for calcium for children under age 11 is 800 mg, 1,200 mg for teenagers and young adults, and 800 mg for most adults. A report of the National Institutes of Health recommends that postmenopausal women, who are particularly subject to osteoporosis (a gradual weakening of the bone structure, which puts them at greater risk for

fractures), maintain a daily intake of 1,000 to 1,500 mg of calcium.

Overall, the U.S. food supply contains an adequate amount of calcium for the population. But while there is enough calcium out there, many people do not get their recommended daily allowance. With about 75 percent of dietary calcium coming from dairy products on average, consumers who do not eat dairy products would be at a disadvantage.

Many Americans fall far short of meeting the recommended dairy servings listed in USDA's Food Guide Pyramid. *Healthy People 2000* challenges the Nation to increase calcium intake by the year 2000, so that at least 50 percent of youth aged 12 through 24 and 50 percent of pregnant and lactating women consume 3 or more servings daily of foods rich in calcium, and at least 50 percent of people aged 25 and older consume 2 or more servings daily. Baseline data from USDA's 1985-86 Continuing Survey of Food Intake by Individuals indicate that 7 percent of women and 14 percent of men aged 19 through 24 and 24 percent of pregnant and lactating women con-

sumed 3 or more servings, and 15 percent of women and 23 percent of men aged 25 through 50 consumed 2 or more servings daily.

Some manufacturers see an opportunity to provide alternative sources of dietary calcium through product fortification. For example, Procter & Gamble introduced Sunny Delight Florida Citrus Punch with calcium in early 1993. The juice drink contains a form of calcium developed by the company. Calcium absorption studies performed at Creighton University showed that Procter & Gamble's product either in citrus juice or apple juice provided superior absorbability compared to spinach (5 percent absorbability), milk, calcium carbonate, or dry calcium. The company is using these results to try to get calcium-fortified fruit juices added to the standard list of calcium sources, which now includes dairy products, tofu (bean curd) if made with calcium sulfate, spinach, broccoli, turnip greens, fortified instant oatmeal, and canned fish (such as salmon and sardines) with bones.

Fats and Oils

Although the total quantities of fats and oils in the per capita food supply have not declined in the past decade, there has been a shift toward a greater proportion from vegetable fats and oils and away from animal fats. This may reflect consumers' efforts to switch from saturated fats to unsaturated fats and oils (table 5).

Annual per capita consumption of added fats and oils apparently increased 7 pounds between 1980-83 and 1992, to 66 pounds per year (fat-content basis). These included fats and oils used directly by consumers, such as butter on bread, as well as shortenings and oils used in commercially prepared cookies, pastries, and fried foods. Excluded is all fat naturally present in foods, such as in milk and meat.

However, the apparent increase in the level of added fat in the food supply does not accurately reflect trends in actual consumption—mainly because more and more fats and oils are used and discarded from the growing number of away-from-home eating establishments, particularly fast food places.

Table 5
Bakery Products, Snack Foods, French Fries, and Salad Dressings Are Behind the 12-Percent Rise in Fats and Oils

Item	Annual average					Change, 1980-83 to 1992	Share	
	1980-83	1984-87	1988-91	1991	1992		1980-83	1992
	Pounds per capita ¹					Percent ²	Percent ²	
Fats and oils (product weight)	61.3	65.7	65.4	66.7	68.6	12.0	100.0	100.0
Butter	4.5	4.8	4.4	4.2	4.2	-6.8	7.3	6.1
Margarine	11.0	10.8	10.5	10.6	11.0	0	17.9	16.0
Lard (direct use) ³	2.4	1.9	1.8	1.7	1.7	-31.4	3.9	2.4
Edible tallow (direct use) ³	1.3	1.6	.8	1.4	2.4	77.7	2.2	3.5
Shortening	18.4	21.9	21.9	22.4	22.4	21.5	30.1	32.6
Salad and cooking oils	22.1	23.2	24.8	25.2	25.6	15.9	36.1	37.3
Other edible fats and oils ⁴	1.5	1.6	1.3	1.3	1.4	-8.2	2.5	2.0
Fats and oils (fat content)	58.2	62.6	62.4	63.8	65.6	12.7	100.0	100.0
Vegetable	46.3	50.2	52.4	54.2	55.2	19.2	79.6	84.1
Animal	11.9	12.4	10.0	9.5	10.4	-12.3	20.4	15.9

Notes: Totals may not add due to rounding. ¹Includes the quantity of frying fat disposed of by food manufacturers and foodservice operators. This quantity may have been as much as 10 percent or more of per capita consumption of fats and oils in 1992. ²Calculated from unrounded data. ³Direct use excludes use in margarine, shortening, and nonfood products. ⁴Includes specialty fats and oils used in such items as confectionery products and coffee creamers.

These outlets discard significant amounts of fats used in frying foods. A 1987 study commissioned by Procter & Gamble and conducted by the research and consulting firm SRI, International indicates that the quantity of frying fat discarded by foodservice outlets and sold to renderers to be processed for use in animal feeds, pet foods, industrial operations, and for export annually amounts to about 9 percent of the 1992 total supply of added fats. A 1993 study indicates that about 50 percent or more of deep frying fat used in foodservice operations is discarded after use and is not available for consumption.

If these supplies were accounted for, per capita levels of added fats and oils since 1980 would be lower, but the 1992 level probably would still be higher than in 1980. Whatever the increase, if any, it probably results from the greatly expanded market for fried foods in foodservice outlets and the increased use in salad dressings, sweet baked goods, snack foods, and prepared foods.

The 1-pound increase in per capita consumption of edible beef tallow in 1992 is perplexing and requires further study. Edible tallow production increased 26 percent in 1992, according to Commerce Department data. As the task of trimming excess fat from retail cuts of beef has shifted since the late 1980's from retailers to large meatpackers, the trimmed fat has become an important byproduct used in the production of edible tallow. Larger supplies of edible tallow have pushed its price to levels very near that for inedible tallow. This may prompt use of edible tallow in the production of nonfood items; to what extent such

"In 1992, each American consumed an average of 63 pounds (on a boneless, trimmed-weight basis) of beef, 50 pounds of pork, 46 pounds of chicken, 15 pounds of fish and shellfish, 14 pounds of turkey, and about 1 pound each of lamb and veal (table 1). That's 12 pounds less red meat, 19 pounds more poultry, and 2 pounds more fish and shellfish than in 1980."

substitution is occurring, we do not know. Low prices also continue to encourage use in baking and frying fats, although a number of major restaurant chains, including McDonald's, Burger King, Wendy's, and Hardee's, have switched to pure vegetable oil for deep-frying.

Companies have responded to consumers' desires for fat and oil products that are reduced in fat, saturated fat, and cholesterol. Major shortening manufacturers removed all animal fats from their products. Salad and cooking oil

manufacturers introduced new vegetable oil blends containing canola oil. Canola oil, made from rapeseed plants, has the lowest saturated fat content of all vegetable oils. It also contains omega-3 fatty acid akin to the cholesterol-countering kind found in fish oil.

There are a host of reduced-fat table spreads and reduced-fat and nonfat salad dressings and mayonnaises on supermarket shelves and in foodservice outlets. McDonald's Corporation has reduced the fat content of its Big Mac sauce and tartar sauce 50 percent. Using reduced-fat tartar sauce in its Filet-O-Fish sandwich, for example, lowered the calorie count of the sandwich by 70 calories and reduced the fat content 31 percent from 26 to 18 grams. Most long-time patrons probably have not detected any change in the sandwich.

Fat replacement has become an ambitious goal of making baked goods, including sweet baked goods traditionally high in fat, without any fat at all, or at the most with only a minor amount of unsaturated shortening. In 1987, for example, Entenmann's began developing a line of cakes and cookies that contain no fat or cholesterol, and fewer than 100 calories per serving. However, fat-free products remain a small niche in the sweet baked goods market.

Recent product reformulations to reduce added fats are evident in numerous product categories, from frozen entrees to soups and spaghetti sauces. In 1994, USDA's Economic Research Service will gain a new database with much more specific information about consumer retail purchases of reduced-fat and lowfat products. Fat use trends in the away-from-home market will remain largely a mystery. ■

Russian Price Reform Eliminates Shortages, Alters Meat Consumption

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Setting the stage for the evolution toward a free-market economy from central planning has entailed both positive and difficult adjustments in Russia—the largest former Soviet republic. Food shortages in state stores, once universal, are now sporadic. Overall food consumption has dropped—particularly consumption of livestock products, which had been maintained at artificially high levels before the reforms. These changes resulted from partial price deregulation (which eliminated shortages and shifted relative prices) and restrictive wage policy (which eroded real incomes).

These trends will likely continue in 1994, if prices remain deregulated and if the level of producer subsidies does not increase substantially.

Before the 1992 Reforms

...Planned Distribution at Fixed Prices

When Russia was part of the Soviet Union, most agricultural

products were produced on state and collective farms according to production quotas set by government planners. Products were delivered to state processors, slaughterhouses, and mills, which paid prices set by the government. Sales by processors were well below costs of production, and large subsidies were paid to cover losses. Wholesalers, in turn, sold the cheap food to retail stores at low prices plus an established margin. Consumers purchased the food in

retail stores at fixed prices after a retail margin was added.

...Short Supplies Directed Consumption

Before 1992, food consumption trends were the direct result of state agricultural and price policies. Russian consumers faced widespread and worsening food shortages in state stores. Shortages formed as wages rose while state prices remained at low fixed rates. As wages rose, the income consum-



Overall food consumption has dropped—particularly consumption of livestock products, which had been maintained at artificially high levels before the reforms.

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ers wanted to spend on food greatly exceeded the value of the food available in state stores at fixed prices. Over time, consumers accumulated considerable savings that they could not spend on low-priced food in state stores due to shortages.

An indicator of the severity of food shortages in state stores is the ratio of free-market prices in collective-farm markets to controlled prices in state stores. In 1990, collective-farm market prices for meat were about four times those in state stores. Those for butter, potatoes, and vegetable oil were about three times as high. After reforms, in May 1993, collective-farm market prices for these products were only about double prices in state retail stores.

...Agricultural Policy Aimed at Increasing Livestock Product Consumption

Soviet agricultural policy since the 1970's aimed to increase per capita consumption of livestock products—as a sign of a high living standard. Consumer prices for meat, milk, butter, and other animal products were kept artificially low, presenting an implicit subsidy to consumers who were able to buy these products. Likewise, farm prices for animal products were kept slightly high, compared with world prices, so some livestock producers also received an implicit price subsidy.

Subsidies led to a dramatic increase in Soviet per capita meat consumption from the 1960's to 1990. In 1990, Russians consumed as much meat per capita each year as in Great Britain or Sweden, though per capita income in Russia was less than half that in those countries (table 1).

Russia's high level of meat consumption was supported by massive producer and consumer subsidies (fig. 1). For example, the price subsidy for livestock products actually exceeded the retail

Table 1

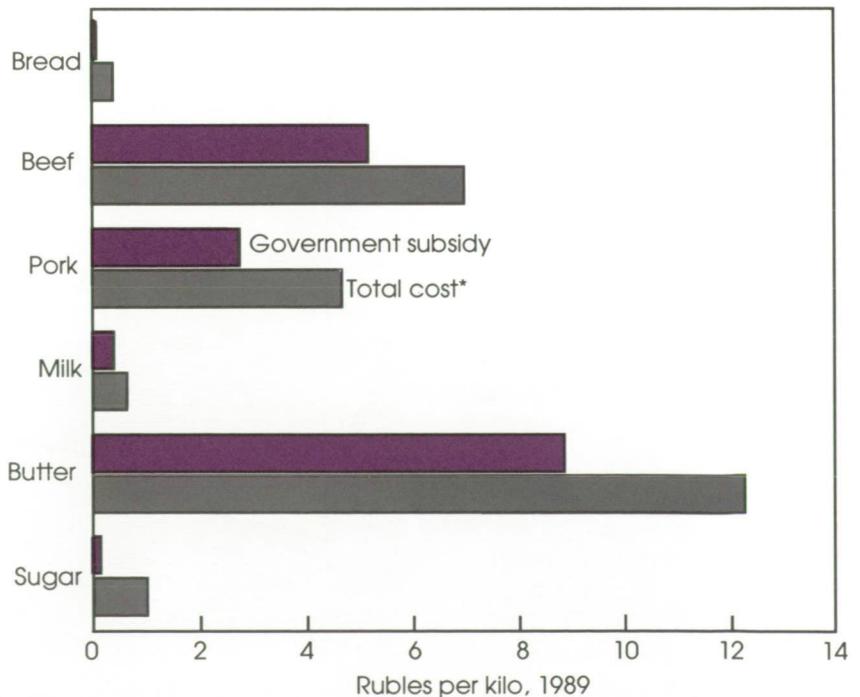
Before Reforms, Russia's Food Consumption Paralleled Finland's, Despite Much Lower Per Capita Income

Item	Russia	Finland ¹	United States	Britain ²
Kilograms				
Per capita consumption, 1989:				
Meat and products	66*	61	113	70
Milk and products	386	411	263	313
Eggs (number)	297	200	229	193
Fish and products	20*	22	12	12
Sugar	48*	35	28	40
Vegetable oil	10*	7	23	19
Potatoes	106	92	57	101
Vegetables and melons (fresh weight)	89	62	117	89
Fruit and berries (fresh weight)	37*	70	94	93
Bread and grain products	119*	77	100	90
1985 U.S. dollars				
Per capita gross domestic product, 1990	5,867	13,378	18,347	12,715

Notes: *Estimate. ¹All data are 1986, except fish which is 1985. ²Fish is 1986; sugar, potatoes, vegetables, fruit and berries, and bread are 1988. Sources: *Narodnoe khoziaistvo SSSR v 1990 godu (The USSR National Economy in 1990)*. Moscow 1991. pp. 670-71. *Potreblenie naseleniem produktov pitaniia za 1989 god (Consumption of Food in 1989)*. Moscow 1990. pp. 1-6. A. Illarionov, "Byvshie soiuznye respubliky v mirovoi sisteme ekonomicheskikh koordinat" ("The Former Soviet Republics in World Economic Perspective"), *Voprosy ekonomiki*, April/June 1992, pp. 122-43.

Figure 1

Subsidies Paid a Major Share of the Cost of Russian Food



*Total cost = subsidy + retail price. Source: World Bank, *Food & Agricultural Policy Reforms in the Former USSR*, 1992. p. 219.

price in state stores. The cost of direct food and agricultural subsidies in Russia in 1988-91 ranged from 10 percent to 12 percent of Russian gross domestic product (GDP).

Agricultural Reforms Impact Food Consumption

Russian agricultural reforms in 1992 changed the system of production and marketing somewhat, though the reforms were partial and inconsistent. The Russian Government partially deregulated farm and food prices for agricultural commodities, allowed the establishment of a small number of private farms, and permitted the formation of a limited number of private commodity exchanges as well as private purchasers of agricultural goods. These policy changes allowed market forces and consumer demand to play a greater role in the Russian agricultural economy.

At the same time, producers were partially cushioned from the employment changes that price deregulation, the establishment of private producers, and consumer demand-driven markets entail. For example, the state continued to guarantee purchases of marketed commodities from state producers. Moreover, the government granted "soft credits" (that neither borrower nor lender expected to be repaid) and subsidies to unprofitable state producers to keep them in business. These actions kept inflation rates high, reinforcing trends of the previous years toward barter trade both within and between republics.

The most significant economic reform in agriculture was the partial deregulation of prices formerly set by the central government. Price deregulation generally eliminated food shortages in state stores. But since local price controls were allowed, state store prices lagged behind free-market prices

in some cities. Price deregulation also changed consumption patterns through a shift in relative prices (at least in the first half of 1992). Such deregulation also allowed prices to rise faster than consumer income, leading to a decrease in real consumer income.

Food Shortages Eliminated

When deregulated on January 2, 1992, consumer prices immediately jumped 245 percent. Nominal incomes increased by a mere 31 percent in January, leading to a sizable decrease in real incomes. By March, food shortages that resulted from consumer purchasing power exceeding the value of desired goods available at fixed prices were virtually eliminated.

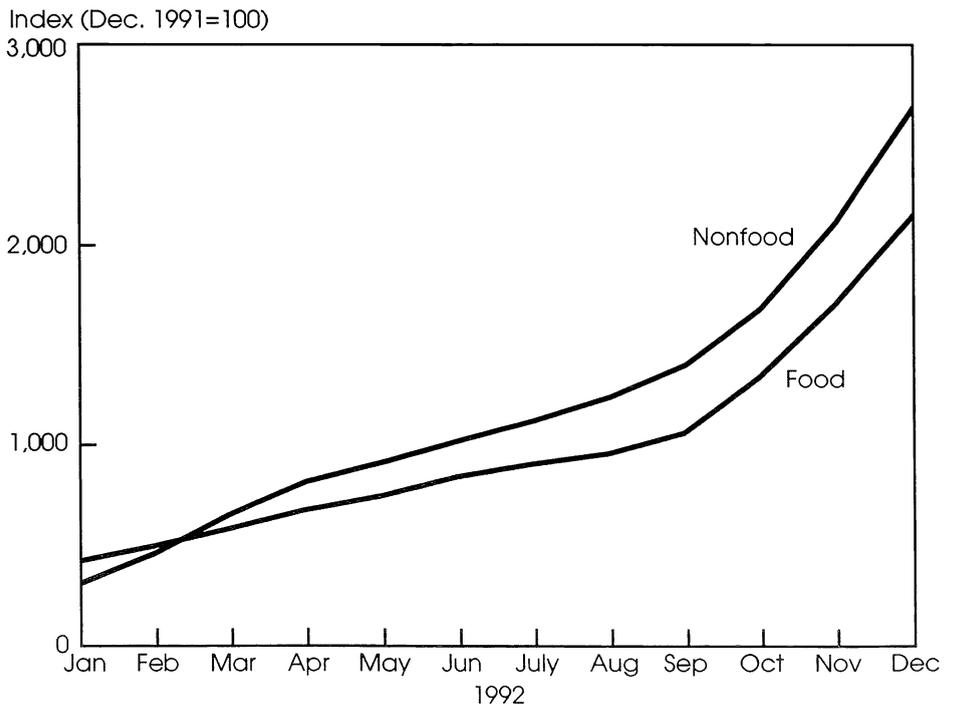
A good indicator of the elimination of food shortages is the narrowing of the difference between collective-farm market prices and state retail store prices mentioned

above. From December 1991 and July 1992, for example, the ratio of milk prices in Moscow collective-farm markets to those in state stores fell from 50.8 to 4.6. Retail stocks increased to the point where many warehouses had excess supplies of food. Meat inventories at Russian processors and in wholesale and retail trade doubled from January 1, 1992, to January 1, 1993, from 1.1 to 2.2 kilograms per capita.

Relative Prices Shifted

The relative prices of food compared with nonfood goods decreased in 1992 (fig. 2). This price shift increased purchases of food compared with other consumer goods. While deliveries to wholesale distributors fell in 1992, the declines were more for durable goods than for foods (table 2), reflecting greater falls in demand. Food spending as a portion of total consumer expenditures increased from 32.9 percent in 1991 to 40.3 percent

Figure 2
Once Price Controls Were Lifted in January, Retail Prices in Russia Jumped



Source: O razvitií ekonomicheskikh reform v Rossiiskoi Federatsii v 1992 godu (The Development of Economic Reforms in the Russian Federation in 1992). 1993. p. 9.

Table 2
Reforms Cause Wholesale Sales To Plunge¹

Product	Change in deliveries to wholesalers, 1991-92
	Percent
Food:	
Meat and meat products	-47
Milk and dairy	-45
Eggs	-34
Sugar	-37
Vegetable oil	-29
Potatoes	-33
Vegetables	-40
Fruit and berries	-47
Nonfood:	
Cloth	-72
Sewn goods	-80
Knitted goods	-67
Leather footwear	-50

Note: ¹Includes imports and deliveries between republics. Source: *O razviti ekonomicheskikh reform v Rossiiskoi Federatsii v 1992 godu (The Development of Economic Reforms in the Russian Federation in 1992)*. 1993. pp. 16, 18.

in 1992, also reflecting a shift from nonfood purchases to food.

Prices also shifted among food items. With the removal of consumer subsidies, retail prices for livestock products rose more than for other food products. From March 1991 to March 1992, consumer prices of pork, beef, poultry, and butter rose 9-13 times, while prices for rice, bread, and wheat flour rose 6-8 times. This relative increase in livestock product prices

pushed down meat consumption in favor of other food products (table 3).

Real Consumer Income Fell

Severe inflation in 1992, combined with a wage policy that allowed consumer income to lag considerably behind price rises, caused a substantial drop in real income. Real consumer income in Russia fell by half from December 1991 to December 1992.

This large drop did not, however, lead to a comparable decrease in food purchases, because much of the "income" received in 1991 and prior years was largely unspendable. Therefore, the level of *spendable* real income in 1991 was actually considerably less than conventionally calculated. The 1992 price deregulation eliminated unspendable real income by eliminating shortages. In 1992, all real income earned could be used to purchase goods, so the apparent 50-percent fall in real income is actually equivalent to a 20- to 30-percent fall in *spendable* real income.

This drop in real income generally reduced consumer demand, though demand for staple items fell less than for luxury goods. Among consumer goods, food is more of a staple than are durable goods. Among foods, meat products are more of a luxury good than are other foods. Therefore, the decrease in income reduced consumption of nonfood goods relative to food and cut meat consumption relative to other foods (table 3). (The trend described here actually started in 1991, as prices began to rise despite official controls.)

Declines in average food consumption should not be exaggerated, however. In 1992, Russians still consumed over 2,500 calories per day and continued to eat a diet more similar to those in Northern Europe than to developing countries. In short, there was no threat of hunger in Russia in 1992.

Table 3
Russia's Food Consumption Falls After Reforms

Product	1980	1990	1992*
	Kilograms		
Per capita consumption:			
Meat and products	59	69	52
Milk and products	328	386	295
Eggs (number)	279	297	256
Fish and products	23	20	13
Sugar	47	47	34
Vegetable oil	9	10	7
Potatoes	118	106	119
Vegetables	84	79	73
Fruit, berries, and grapes	30	35	33
Bread and grain products	126	119	122

Note: *Estimate. Source: *Potreblenie osnovnykh produktov pitaniia naseleniem Rossiiskoi Federatsii 1992 (Consumption of Main Food Products by the Russian Population)*. 1992.

Outlook Depends on Price Deregulation and Subsidies

Producer and consumer subsidies were reintroduced in 1992 and 1993, partially reversing the effects of price deregulation. Subsidies for crop and livestock producers were announced in May 1992 and increased in the fall.

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Widespread local consumer subsidies also partially reversed the effects of price deregulation. For example, in 1993 farms delivering grain to state mills were to receive an advance equal to half the total value of the grain; a 50-percent discount on agricultural machinery prices; a 30-percent discount on fertilizer, chemicals, electricity, and fuel; and bank credit at highly negative real interest rates.

In December 1992, sizable federal subsidies to state bakers were announced to slow price increases for bread and bakery products.

Subsidies are a way of backtracking on reform, since they preserve the existing structure of production in agriculture, rather than allowing it to change in response to consumer demand. But despite subsidies, important reforms—such as the elimination of food shortages and a considerable drop in livestock production—were achieved in 1992.

If price deregulation continues, reforms in the Russian food economy should eventually decrease demand for livestock products and, thus, feed grains. Decreases in Russian demand for grain may be accompanied by increases in demand for oilmeal, as Russia's mixed-feed producers increase the protein content of their product to make up for the traditional protein shortfall in mixed feed. Increased demand for oilmeal and falling meat production may provide opportunities for American exports of oilmeal and poultry. ■

Price Reform and the Consumer in Central and Eastern Europe

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The collapse of Communism in Poland, Hungary, and then-Czechoslovakia over the last several years has set the stage for the difficult beginning of free-market economies. In 1990, these countries started to wean consumers away from the government subsidies that had kept food prices artificially low for many years. After the subsidies stopped—and price controls were lifted—food prices soared at both producer and consumer levels. In quick succession, inflation rose and purchasing power dropped, reducing consumer demand—especially for meat and dairy products.

Three years later, however, food prices in these countries appear to have stabilized, despite some continuing contraction in demand. Following the reforms, income has fallen, but a broad range of new goods have appeared on the market, fundamentally changing the range of choices available to consumers.

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Reforms Liberalize Prices, Redirect Spending and Consumption

To assess how price liberalization and other reforms affected con-

sumption trends in each Central and Eastern European (CEE) country, two issues must be examined. First, how much food prices increased relative to overall inflation and relative to real income. Second, how patterns of consumption and spending on food in these coun-



tries changed in response to the new prices.

Except in the first 2 to 3 months following the price liberalization, food-price inflation lagged behind overall rates of retail inflation in Poland, Hungary, and the Czech and Slovak Republics. Thus, the declines in food consumption were most acute immediately following the reform in each country as the people adjusted to initial food price increases relative to both incomes and other prices. Per capita consumption of meats, eggs, milk, and butter suffered the largest declines in Hungary, Czechoslovakia, and Poland (excepting meat consumption in Poland).

Poland's Abrupt Moves to Market Economy Spur Inflation

Poland's approach to introducing widespread market reform was initially the most abrupt and comprehensive of all CEE countries, most likely because its new Government knew that the Poles were already accustomed to a ubiquitous black market and high levels of inflation at different times throughout the 1980's. The Government's trust in Poles' patience and resilience was born out as the price liberalization quickly realigned domestic prices and promoted private sector activity in the food markets.

The first step in the Polish transition was the liberalization of prices in August 1989. The immediate effect was a brief period of high inflation unknown in Hungary and Czechoslovakia. During the 1980's, the Polish Government had significantly increased the budget deficit by giving in to demands for wage increases and by continuing subsidies to keep food prices low. Rather than gradually removing subsidies at the consumer and producer level, the Government froze

these subsidies in late summer 1989 and liberalized food prices, allowing them to reach market-equilibrium levels.

This first stage of reform produced the most dramatic results. From June through December 1989, the overall inflation rate was 350 percent—while food-price inflation hit 500 percent. During this initial stage, food prices increased at almost double the rate of nonfood prices.

The second stage of reform took place with what became known as the "Big Bang" in January 1990, when subsidies were completely phased out and all prices remaining under control were liberalized. This time, however, the overall inflation produced was not nearly so severe—reaching 249 percent in 1990. Food-price inflation during this time, 217 percent, was lower than for nonfood prices and overall inflation.

The major contributing factor to the hyperinflation of the fall of 1989 was the wage indexation scheme introduced by the government in August 1989 to protect consumers from the initial shock. This scheme provided income supplements to compensate for 100 percent of food price increases and 80 percent of nonfood price increases for 2 months. After January 1990 (the second round of price reform), wage growth was tightly restricted in order to dampen further wage-push inflation.

Share of Income Spent on Food Rises, Then Drops to Pre-Reform Levels

Inflation in 1990 caused real income (adjusted for inflation) to fall 30 percent (based on 1989 zlotys). The shock to real income from rapidly increasing prices probably had a dramatic effect on consumption. In order to maintain food consumption in a situation of falling real income, Poles were forced to limit nonessential purchases, such as appliances, travel, and entertainment.

As a result, the portion of Polish consumers' income spent on food increased, while spending on non-food items decreased. A comparison of pre- and post-reform spending habits illustrates this point. In 1989 (before prices were liberalized), Poles spent approximately 40 percent of their income on food (compared with 11.6 percent in the United States). In 1990, the share of Polish income spent on food increased to 45 percent.

Effects of the price increases were more severe for some groups. Pensioners, for example, were hit especially hard because they spent a higher proportion of their income on food than did all other income groups. In 1990, almost 60 percent of pensioners' disposable income went to buy food, compared with 41 percent for employee households (which make up about 60 percent of the population).

The large fall in real income and the relatively small increase in share of income spent on food by the average Pole in 1990 meant that the real level of food expenditures fell in 1990. As food prices rose only slightly less than overall inflation in 1990, overall food consumption levels clearly declined. In 1991, real income improved, overall inflation rates slowed to 60 percent, and food inflation had fallen to 36 percent. Consequently, the consumer budget/spending situation for Poles also began to stabilize and recover. The share of income spent on food dropped back to pre-reform levels of 40 percent by 1991.

Higher Pork Consumption Offsets Steep Drops in Other Protein Sources

The general increase in food price levels and changes in relative prices of foodstuffs changed consumption patterns from the pre-reform period. The most notable adjustments were sharp reductions in consumption of dairy products

Table 1
Who's Eating What in Central and Eastern Europe

Annual per capita consumption	Poland		Hungary	
	1991	Change, 1989-91	1990	Change, 1987-90
	Kilograms*	Percent	Kilograms*	Percent
Meat	73.2	6.7	75.8	-6.8
Beef	15.6	-4.3	6.5	-18.8
Pork	42.0	11.4	38.5	-11.9
Poultry	8.2	-2.4	22.8	.4
Fish	6.2	1.6	2.7	28.6
Butter	6.3	-28.4	1.7	-37.0
Milk (in liters)	231.0	-11.2	169.9	-14.7
Eggs (units)	162.0	-16.5	21.6	18.7
Cereals	116.0	-.9	110.4	-2.3
Potatoes	144.0	.7	61.0	20.8
Vegetables	126.0	8.6	83.3	4.1
Sugar	35.4	-24.5	38.2	-4.7
Beer (in liters)	37.2	18.8	105.3	3.8
Wine (in liters)	8.6	11.7	27.7	27.1

Annual per capita consumption	Czech Republic		Slovak Republic	
	1990	Change, 1985-90	1990	Change, 1985-90
	Kilograms*	Percent	Kilograms*	Percent
Meat	96.5	8.1	84.0	6.2
Beef	28.4	-6.3	22.1	-.9
Pork	50.0	13.9	44.5	9.3
Poultry	13.6	28.3	15.2	10.9
Fish	5.4	-3.6	4.4	-6.4
Butter	8.7	-10.3	6.4	-8.6
Milk (in liters)	91.5	-11.3	107.6	-15.4
Eggs (units)	340.0	.9	348.0	-2.8
Cereal	162.0	.1	157.0	-3.4
Potatoes	77.9	-4.9	85.8	20.7
Vegetables	66.6	-2.2	100.6	13.9
Sugar	44.0	20.2	46.3	39.9
Beer (in liters)	155.2	5.7	95.6	-2.9
Wine (in liters)	14.8	-3.3	15.9	-8.1

Note: *Unless otherwise noted. Sources: *MagyarStatistikai Evkonyv 1991*, *Statisticka Rocenka CSFR 1992*, *Rocznik Statystyczny 1992*.

and eggs, which were partially offset by increased pork consumption.

Removal of subsidies had the greatest effect on dairy and egg consumption, which saw the largest declines in 1989-91. Milk consumption in Poland decreased 11 percent from 1989, from 260 to 231 liters per capita; egg consumption fell 16 percent from 194 to 162 eggs per capita; and butter consumption fell 28 percent.

Milk, butter, and dairy products were highly subsidized at the con-

sumer level compared with meat, on which people actually paid implicit taxes in the pre-reform period. Consequently, removal of subsidies substantially pushed up prices for these products. Prices for dairy products and eggs rose 550 percent in 1989-90 and another 92 percent in 1991. Butter prices increased 252 percent in 1989-90 and another 75 percent in 1991.

Meat consumption in Poland increased 7 percent from 1989 to 1991. Yearly per capita consump-

tion of meat and offals increased from 68.6 kilograms (kg) to 73.2 kg. Increased consumption of fish (1.6 percent) and pork (11 percent) more than offset the declines in beef (4 percent) and poultry (2 percent). Pork—a preferred meat in Poland and throughout Central and Eastern Europe—made up 57 percent of total meat consumption in Poland. In 1991, Poles consumed 42 kg of pork, 15.6 kg of beef, and 8.2 kg of poultry per capita.

The increased meat consumption is contrary to what one might expect in a situation of rapidly rising food prices and falling real incomes. However, prices for meat in Poland rose more slowly than for other foods. Moreover, consumption of meat has substituted for dairy products whose prices rose even more. In Poland, milk and soft cheeses are consumed mainly for their protein value.

Consumption of vegetables rose 7 percent in 1989-91, from 116 kg to 126 kg per capita. Per capita consumption of bread—a staple and a small item in the consumer's budget—remained stable at 116 kg in 1991. Potato consumption increased less than 1 percent from 1989 to 1991.

The relative decreases in Polish food consumption apparently were in response to new price levels and declining real income. The declining share of income spent on food in 1991, as well as lower rates of inflation for food than for nonfood items, suggests that within 2 years of reform, Polish consumers have regained some stability in food consumption habits.

Hungary's Gradual Reforms Cushion Impacts to Consumers

Hungary did not take a "Big Bang" approach, but its more gradual economic reforms and price liberalization also prompted changes in consumption patterns in the

1990's. Price liberalization for food, consumer durables, and services were announced at different times, giving Hungarian consumers more time to adjust to price increases.

Rising Food Prices Outpace Other Prices and Income—But Not for Long

As price ceilings were raised and subsidies phased out, food prices in Hungary rose substantially, outpacing overall inflation in each year from 1987 to 1990. Prices on foodstuffs were 101 percent higher in December 1990 than in January 1987, while the total Consumer Price Index (CPI) rose only 89 percent during the same period.

However, this trend changed from 1991 to 1992. Price reform and liberalization focused on agricultural and food prices first and then shifted to liberalization of energy, fuel, and other nonfood prices. Therefore, food prices rose only 46 percent in 1991-92, while the total CPI rose 66 percent. By the end of 1992, almost all prices had been liberalized and were based solely on the interaction of supply and demand. Imposition of a value-added tax (VAT) in January 1993 caused food prices to rise sharply again, by 9.8 percent, compared with an overall increase in the CPI of 6.8 percent for the month.

Consumption Falls, and Shifts

Meanwhile, income did not keep pace with the overall CPI. This was especially true in 1990 and 1991 when real income decreased 1.5 percent and 3.6 percent, respectively.

Consumers' buying habits changed in response to drops in real income. Changes in consumption have been manifest more as declines than as anything else. But, there also were shifts between goods and increases in consumption of specialty products.

Three main changes in consumption patterns have taken place. The first is substitution of fish, eggs, and vegetables for red meats and dairy products. The second, following increases in new, previously unavailable consumer goods on the market, is a shift to more luxury goods, especially tropical fruit. The third is increased consumption of alcoholic beverages.

Consumption of meats, meat products, and fish, for example, declined 7 percent from 81 kg per person in 1987 to 76 kg in 1990. Among meats, pork consumption declined 11 percent to 39 kg per person and beef and veal consumption decreased 19 percent to 6 kg. Consumption of poultry and fish, less expensive sources of protein, increased during the period by 0.4 percent and 29 percent, respectively. Hungarians now consume 23 kg of poultry meat and 3 kg of fish per person per year.

Milk and dairy product consumption (on a milk-equivalent basis) declined 15 percent to 170 kg per capita. Likewise, cereal, sugar, cocoa powder, and coffee consumption declined, by between 2 and 15 percent. Per capita consumption of eggs increased, as did consumption of fats and oils, potatoes, vegetables, citrus fruit, wine, beer, and other alcoholic beverages (table 1).

As real income dropped in Hungary, consumers were forced to make more careful choices about foods. Consequently, we can see shifts among substitutes taking place in reaction to relative price changes. With meats, consumer preferences turned from beef and pork to fish, eggs, and poultry. Likewise with fats and oils, consumption of butter and animal fat decreased in favor of margarine and edible oil.

The price of potatoes rose more slowly or even fell relative to other starches between 1987 and 1990. Potatoes registered a large increase in consumption (up 21 percent) from 50.5 kg per person in 1987 to 60.9

kg in 1990. Consumption of vegetables increased 4 percent over the period. Vegetable prices did not adjust sharply after price liberalization because most vegetables were produced and sold privately before reform began. Although total fruit consumption declined in the period, consumption of tropical fruit rose 20 percent, a dramatic increase since these fruit are considered luxury goods in Hungary.

Consumption of wine, beer, and other alcoholic beverages rose modestly, due to lower real prices. The increase in consumption of wine was especially large in 1987-90, rising 27 percent to 27.7 liters per capita per year. Wine prices have fallen in real terms since 1987 due to the loss of much of the Soviet market, creating large stocks in Hungary. Beer consumption continued a steady rise, which has been the trend for more than a decade. Consumption now stands at 105.3 liters per person per year, compared with 130.2 liters per person per year in the United States. The most striking increase in consumption is in distilled spirits. Having fallen 10 percent from 1980 to 1988, consumption of distilled beverages jumped 8 percent in 1989 and then leveled out in 1990—despite the fact that prices have increased at a rate comparable with that of other beverages. Therefore, the higher consumption could be partly attributed to difficult economic times.

Little Change in Share of Income Spent on Food

Although the percentage of income spent on food has changed relatively little in the last few years, the share spent on individual food categories has shifted. Hungarians spent 40.3 percent of their income on food, tobacco, and beverages in 1990. The share spent on meat rose from 5.8 percent in 1988 to 6.3 percent in 1990. Likewise, expenditures on milk, dairy products, and

eggs increased from 2.7 percent of income in 1988 to 3.9 percent in 1990.

Butter and buttercream's share of spending declined from 0.3 percent of income to 0.2 percent in 1988-90, while edible oil and margarine increased from 0.5 percent to 0.7 percent. As expected, the price of butter and buttercream rose much more quickly (136 percent) than that of margarine and edible oil (56 percent).

The proportion of income spent on fruit and vegetables remained nearly constant during the reform period at 2.0 to 2.1 percent.

While wine consumption increased dramatically, spending on wine as a share of income decreased. It accounted for 1.7 percent of total income in 1988, but only 1.5 percent by 1990—which points out that the price of wine not only has lagged behind inflation, but also behind real income growth.

Price Reform Comes Later in the Czech and Slovak Republics

The former Czechoslovakia began price reforms in late 1990, some time after Hungary and Poland had begun to free prices. Consumer subsidies were removed in three rounds of administrative price increases from mid-1990 through early 1991. Inflation in the Czech and Slovak Republics immediately following reforms was not nearly as severe as that experienced by Poland but was higher than in Hungary.

Only in 1990, when the cumulative rate of inflation for food prices hit 25 percent, did food inflation surpass the overall inflation rate of 16 percent. With removal of price controls in January 1991, overall inflation rose to 54 percent in 1991, with food prices increasing 35 percent.

Removing consumer subsidies in 1991 contributed to the 25-percent fall in real income during the first half of 1991. Despite being spared rapid inflation, Czech and Slovak consumption fell sharply from the markedly reduced income. In 1992, retail inflation slowed to about 11 percent. However, with the formal separation into Czech and Slovak Republics and the devaluation of the Slovak Crown against the Czech Crown, inflation in the Slovak Republic is expected to increase much more than in the Czech Republic, possibly resulting in further decreases in food consumption.

Changes in Czech and Slovak Consumption

From 1985 to 1990, the Czech and Slovak Republics' consumption of milk and dairy products decreased markedly. These declines were more pronounced in the Slovak Republic, where demand was weaker and the unemployment rate was five times that in the Czech Republic.

Declines in the consumption of dairy products were evident in both republics as early as 1990. Consumption of milk and butter in

the Czech and Slovak Republics, as in both Poland and Hungary, was hit hard by the removal of consumer subsidies in late 1990. From 1985 to 1990, total Czech and Slovak consumption of butter dropped 10 percent. The drop in butter consumption was more acute in the Czech (10.3 percent) than in the Slovak Republic (8.5 percent). Milk consumption, on the other hand, suffered more in Slovakia (15 percent) than in the Czech Republic (11 percent).

Bread, potato, and vegetable consumption increased in Slovakia during this same period. Vegetable consumption in Slovakia increased 14 percent from 1985 to 1990 and fell 2 percent in the Czech Republic. Potato consumption also increased in Slovakia from 1985 to 1990 (21 percent) and decreased in the Czech Republic (5 percent).

The 17-percent decline in meat consumption in the Czech and Slovak Republics together was less than in Hungary and other CEE countries (except Poland).

Consumption of sugar, mostly produced in the Czech Republic with the excess exported to the Slovak Republic, increased 40 percent

Table 2
Reforms Send Prices Skyward

Prices	1989	1990	1991	1992
	<i>Annual percent increase</i>			
Poland:				
Retail	357.8	249.3	60.3	47.2
Food	503.4	217.3	35.5	43.9
Nonfood	212.3	301.7	102.3	52.5
Hungary:				
Retail	NA	26.7	33.8	21.8
Food	NA	17.8	9.9	27.3
Nonfood	NA	34.8	40.6	11.8
Czechoslovakia:				
Retail	NA	15.7	53.7	11.5
Food	NA	24.6	34.6	11.2
Nonfood	NA	11.8	68.9	9.6

Note: NA = Not available. Sources: *MagyarStatistikai Evkonyv 1991*, *Statisticka Rocenka CSFR 1992*, *Rocznik Statisticzny 1992*, and monthly bulletins from each country.

in Slovakia from 1985 to 1990 and 20 percent in the Czech Republic.

In 1990 and 1991, food prices increased more slowly than prices of other goods. Therefore, the cost to Czech and Slovak consumers of food relative to other goods has not increased with reform. With one of the lowest inflation rates in Central and Eastern Europe—and a relatively smooth path to reform—the transition for the Czech and Slovak Republics may not prove to be as painful as the separation from one another.

Patterns of consumption in Slovakia in 1990 (particularly the increased bread, potato, and vegetable consumption) show some in-

itial signs of the substitution patterns observed in other transition economies, with other foods being substituted for meat. In 1991, Slovakia experienced a somewhat larger decline in real income (21 percent from January through October 1991), than did the Czech Republic (17 percent). As the economic situation of Slovakia continues to deteriorate with the split, we might expect this pattern of substitution away from meat consumption to become more pronounced.

Food Prices Lead the Way in Price Reform

The liberalization of food and other prices in Poland, Hungary, and the Czech and Slovak Republics were important steps toward correcting past price distortions, providing clearer signals to consumers and producers, and allowing the interaction of supply and

demand to determine market prices. Allowing food prices to increase sent strong signals to consumers. Relative price changes for foods caused CEE consumers to alter their decisions regarding expenditures between food and nonfood items, and within categories of food, thereby changing the mix of goods consumed. Excess demand created by artificially low food prices disappeared, and income was reallocated to other new and previously unavailable goods on the market. In the post-reform period in Poland, Hungary, and the Czech and Slovak Republics, *prices*—rather than government decree or long food lines—direct consumer decisions. ■

Food Spending Grows Slowly

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Food expenditures rose 2.3 percent in 1992 to \$601 billion, with food at home up 1.3 percent and food away from home rising 3.5 percent (table 1). This growth was lower than for any other major category of personal consumption expenditures, as is typical (table 2).

With the Nation gradually climbing out of recession in 1992 and with very small price increases for food at home, food expenditures adjusted for inflation rose 0.7 percent (0.1 percent at home and 1.5 percent away from home)—less than population growth. In other words, food spending per person at constant prices declined 0.4 percent in 1992.

Price rises were modest—the smallest in 25 years—due to ample supplies, and were much less than for most other products and services. Vigorous competition among sellers of food—both for use at home and away—helped restrain price increases.

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Recession Dampened Spending, Especially at Restaurants

In keeping with the typical recession trend, real food spending per person declined in 1991—but less than in typical recession years. A

decline was found in each recession since 1953, except the brief one of December 1969–November 1970. In 1981, for example, real food expenditures per capita declined 1.0 percent after having increased every year since the bottom of the preceding recession in 1974. In



Recession-squeezed consumers shopped around for bargains to stretch their food dollars. That paid off through lower spending—and heightened competition for business.

Table 1
Food Spending Rose 2 Percent in 1992

Expenditures	1970	1980	1990	1991	1992	Change, 1991-92
	<i>Billion dollars</i>					<i>Percent</i>
All food and beverages¹	139.1	356.0	645.2	669.3	687.2	+2.1
All food (excluding alcohol)	117.1	306.0	566.6	587.5	600.9	+2.3
At-home food	77.5	185.6	311.3	324.2	328.4	+1.3
Sales	73.4	177.4	302.7	315.3	319.4	+1.3
Home production and donations	4.1	8.3	8.7	8.9	9.0	+1.1
Away-from-home meals	39.6	120.3	255.2	263.3	272.6	+3.5
Sales	33.8	103.1	225.3	232.4	240.4	+3.4
Supplied and donated ²	5.8	17.2	29.9	30.9	32.2	+4.4
Alcoholic beverages	22.0	50.0	83.0	85.7	86.3	+0.8
Packaged	12.9	29.4	48.6	50.2	51.6	+2.8
Drinks	9.1	20.7	34.4	35.5	34.7	-2.1

Notes: ¹These expenditures include all food and alcoholic beverages, regardless of who paid for them. Data may not total due to rounding. ²Includes child-nutrition subsidies.

Table 2
Personal Food Expenditures Rose Less Than Disposable Personal Income in 1992¹

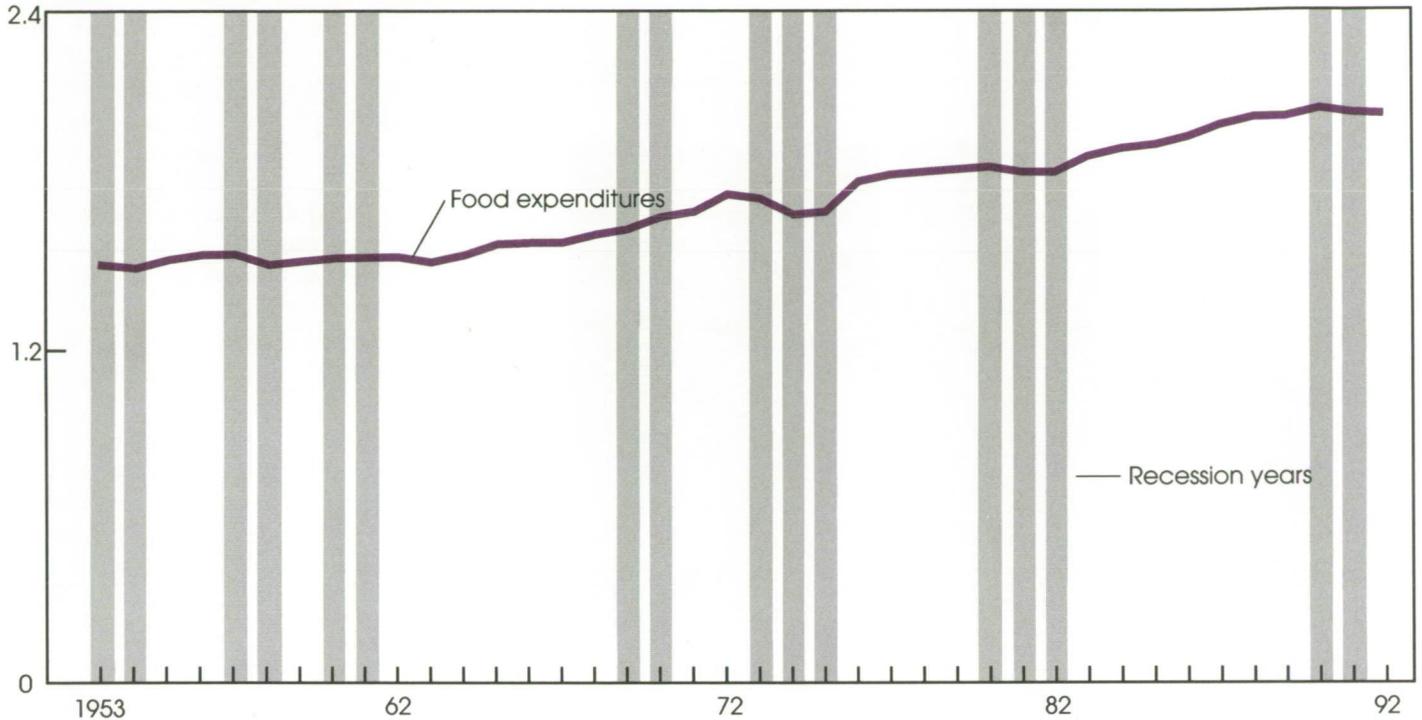
Component	1965	1975	1985	1990	1991	1992
	<i>Billion dollars</i>					
Disposable personal income	491.0	1,150.9	2,943.0	4,042.9	4,209.6	4,430.8
Total personal consumption expenditures	444.6	1,024.9	2,667.4	3,748.4	3,887.7	4,095.8
Food	74.3	161.0	358.9	477.4	492.7	507.5
At home	57.4	115.1	229.5	303.2	315.8	319.9
Away from home	16.9	45.9	129.4	174.2	176.9	183.5
Alcoholic beverages	13.5	28.1	57.5	72.4	72.8	74.3
At home	9.0	19.3	38.2	48.7	50.3	52.2
Away from home	4.5	8.8	19.8	23.7	24.1	24.0
Housing, household operation, supplies, fuel, furniture	127.1	287.3	742.9	998.7	1,033.4	1,074.2
Transportation, cars, gasoline	59.2	131.2	363.3	453.7	433.4	465.8
Medical care, drugs	32.9	100.4	358.2	585.2	610.2	708.8
Clothing, shoes, toiletries, personal care	46.8	94.3	204.5	303.0	302.1	325.1
Recreation, tobacco	17.5	39.8	108.5	160.3	177.0	186.2
Personal business	20.2	52.2	184.9	297.4	315.5	337.9
Other	55.1	130.6	288.7	400.3	403.0	423.2
Savings	34.6	100.3	189.3	175.6	113.7	216.5
Interest and transfer payments to foreigners	11.9	25.7	86.3	118.9	122.2	122.4

Notes: ¹As of April 27, 1993. Data may not total due to rounding. The food expenditures in this table are only those paid for by consumers with cash or food stamps. Source: Food and alcoholic beverage data are from USDA's Economic Research Service. All other data are from Bureau of Economic Analysis, U.S. Department of Commerce.

Figure 1

Real Food Expenditures Dip in Recession

Thousand dollars per person, 1988 prices*



*Adjusted for price changes and population increases.

1991 and 1992, however, real food expenditures per person were down marginally, reflecting the milder recession (fig. 1).

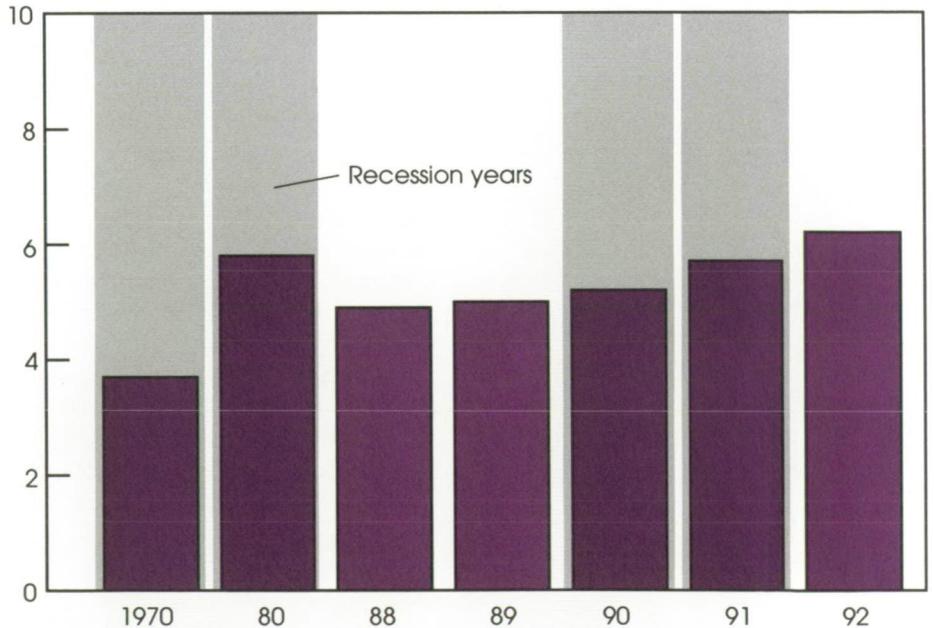
Government's share in total food expenditures rose in 1991 and 1992, as it typically does during a recession when more people are unemployed and receive food stamps. The share of food paid for by Federal, State, and local governments increased from 5.0 percent in 1989 to 5.7 percent in 1991 and 6.2 percent in 1992. (fig. 2).

One of the ways by which people economized during the recession was to cut down on eating out. Despite the long-term trend to more eating out, the share of dollars spent away from home declined in 1990 and again in 1991 before it began to recover in 1992 (fig. 3).

Figure 2

Share of Food Paid for by Federal, State, and Local Governments Goes Up in Recession

Percent

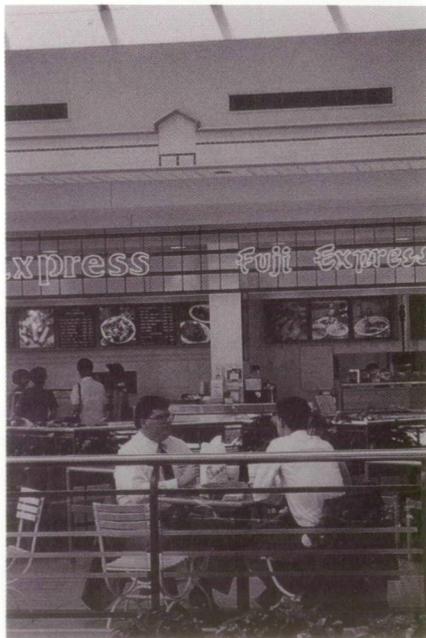
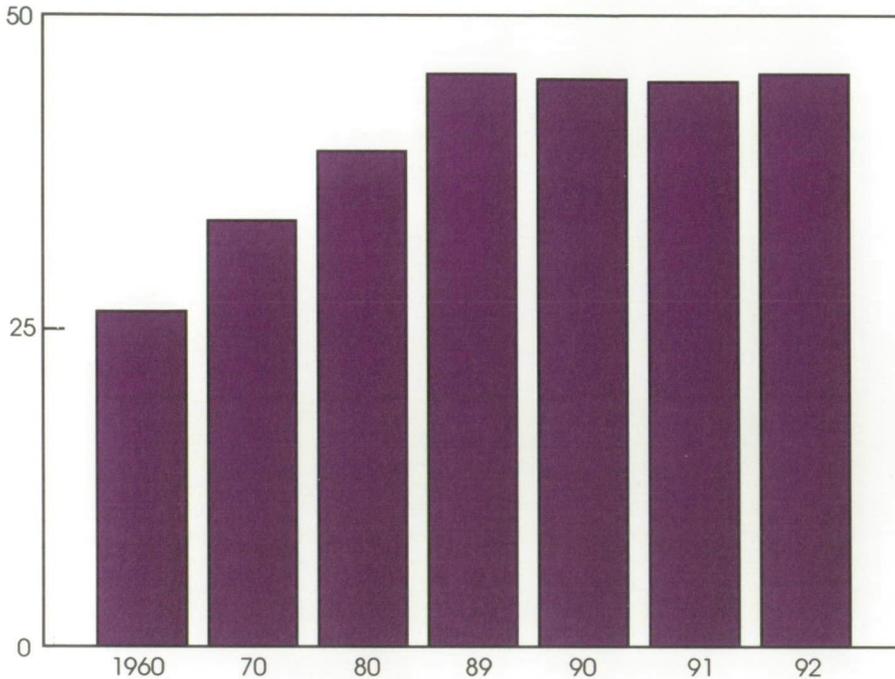


Note: Includes food stamps; Women, Infants, and Children programs; school lunch; elderly feeding; military feeding; and prisoners' meals.

Figure 3

Despite the Long-Term Trend to More Eating Out, the Share of Food Dollars Spent Away From Home Fell in 1990 and 1991 Before Beginning To Recover in 1992

Percent of food expenditures



One of the ways by which people economized during the recession was to cut down on eating out.

Competition Among Sellers of Food Sharpened

Recession-squeezed consumers shopped around for bargains to stretch their food dollars. That paid off through lower spending—and heightened competition for business.

Where consumers buy their food and other groceries has changed drastically in the 1980's and early 1990's. Supermarkets' share peaked in the mid-1980's at almost 65 percent of the sales of food for home use (fig. 4). The remainder comes from other smaller grocery stores, specialty food stores, and a wide variety of other outlets.

In addition, the formats of supermarkets have been rearranged

sharply. Total sales (including non-food) of conventional supermarkets dropped from 73 percent of all supermarket sales in 1980 to 48 percent in 1986 and 30.5 percent in 1991. Superstores and combination food/drug stores increased their share from 22 percent in 1980 to 36 percent in 1986 and 51 percent in 1991. Shares for other formats, which emphasize lower prices (such as warehouse, superwarehouse, and limited assortment stores), increased from 5 percent in 1980 to 16 percent in 1986 and 18 percent in 1991.

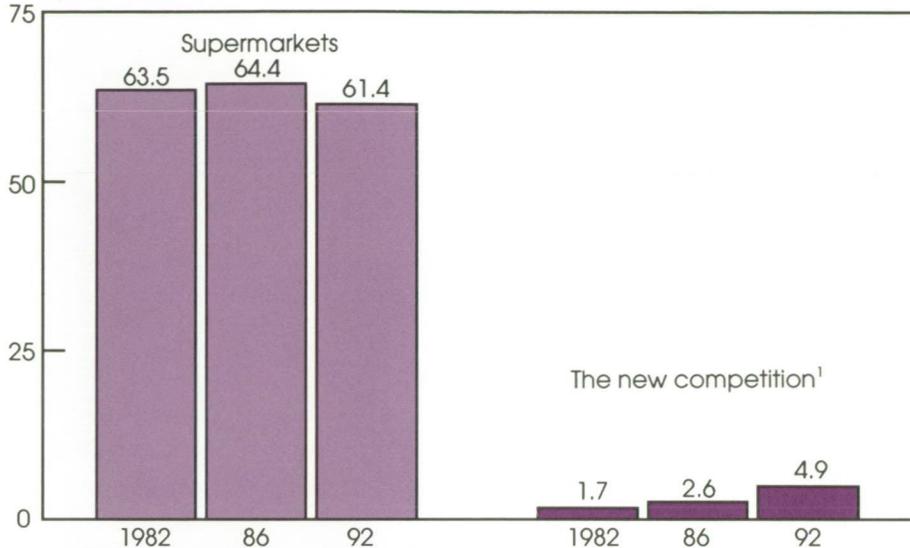
More competitors have come on the scene in recent years, strongly emphasizing low prices. The new competitors increased their combined sales of food to consumers from 1.7 percent in 1982 to 4.9 percent in 1992 (fig. 4).

Warehouse clubs (formerly called wholesale clubs) are hybrids of membership wholesale clubs and retail stores. They carry a wide assortment of general merchandise, groceries in large packs, and perishables, such as meat and some produce. More than 40 percent of their food sales are to operators of small restaurants, institutions, and noncommercial groups, such as churches and clubs. Their share of food sales to consumers has increased from almost nothing in 1982 to 1.5 percent in 1992.

Some mass merchandisers, also called discount department stores, have included a supermarket since the early 1960's, when a number of supermarket chains entered the business. Many such chains left the discount business in the 1970's as the field became crowded. More recently, some—notably Wal-Mart and KMart—have opened very large hypermarkets and superstores (which include a large supermarket). Mass merchandisers' share of food sales to consumers

Figure 4
New Competition Captures an Increasing Share of Sales of Food for Home Use

Percent of sales of food for use at home



Note:¹Includes food sales for home use by warehouse clubs, mass merchandisers, and deep-discount drugstores. Excludes sales by warehouse clubs and supermarkets to food service.

rose from 1.1 percent in 1982 to 2.1 percent in 1992.

The most recent entrant has been super-discount drugstores, which sell dry groceries (no perishables) at a discount. The share of all drugstores (not just deep-discount stores) increased from 0.6 percent of food sales to consumers in 1982 to 1.3 percent in 1992.

Operators of all kinds of supermarkets feel the hot breath of competition as these newcomers invade their markets. Many supermarkets are fighting back by featuring bulk sales and large club packs at competitive prices. ■

Food Consumption, Prices, and Expenditures, 1970-92

This annual comprehensive report by USDA's Economic Research Service presents historical data on U.S. food consumption, nutrients available for consumption, and retail food prices. Also included are U.S. and world food expenditures, and U.S. income and population.



Some Highlights . . .

- **Food Consumption:** Between 1970 and 1992, each American consumed, on average, 18 pounds less red meat, 26 pounds more poultry, and 3 pounds more fish and shellfish.
- **Food Prices:** As measured by the Consumer Price Index, retail food prices in 1992 averaged 1.2 percent above those in 1991—less than half the 1991 price increase of 2.9 percent. The 1992 increase was the lowest since 1967, when the index rose 0.9 percent.
- **Food Expenditures:** Americans spent over \$600 billion for food in 1992 and another \$87

billion for alcoholic beverages. Away-from-home meals and snacks captured 45 percent of the U.S. food dollar, up from 39 percent in 1980 and 34 percent in 1970. The percentage of disposable income spent on food declined to 11.5 percent in 1992 from 13.9 percent in 1970.

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Food Marketing Costs Rose Little in 1992

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Food marketing costs rose 2.2 percent in 1992 to about \$372 billion—the smallest increase in the last 20 years. This slight rise was the result of only small price increases for most inputs purchased by the food industry. Higher labor costs accounted for most of 1992's increase. Other inputs—such as packaging, energy, and transportation—rose little, while profits dropped.

Marketing Costs the Most Persistent Source of Rising Food Expenditures

Food marketing costs are measured by the "marketing bill," which represents the cost associated with processing, wholesaling, distributing, and retailing of foods produced by U.S. farmers and eaten by U.S. consumers. It is the difference between the amount farmers receive for food and the amount consumers spend for consumption (at and away from home). The marketing bill excludes expenditures for imported foods and seafoods.

The marketing bill has been the driving force behind increases in food expenditures over time (fig. 1). Between 1982 and 1992, the mar-

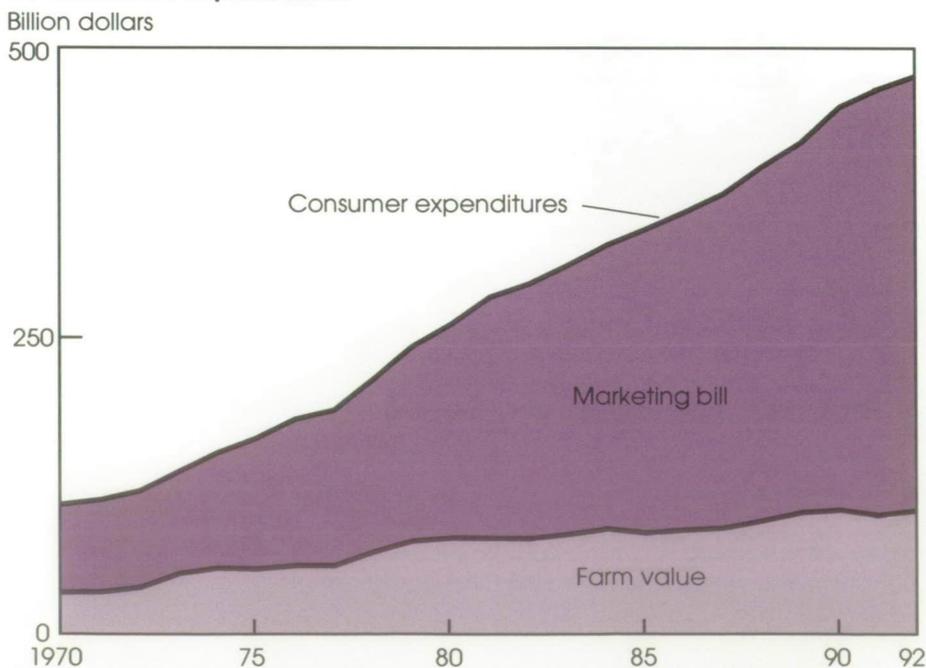
keting bill grew at over twice the rate of the farm value, 70 percent compared with 30 percent. The bill now accounts for 78 percent of the cost of food, the same as in 1991.

There are several major causes underlying the growth in marketing costs. These include higher prices of marketing inputs, larger volume of food purchased by consumers, higher percentage of food

sold through restaurants and fast food outlets, and more value-added processing and packaging.

Costs of the marketing functions performed differ between food bought in foodstores and meals and snacks purchased for consumption away from home. About 26 cents of each dollar spent in foodstores paid for the farm value in 1992. Thus, 74 cents paid the mar-

Figure 1
Marketing Bill Accounted for Over Three-Quarters of 1992 Food Expenditures



Note: Data for foods of U.S. farm origin purchased by or for consumers for consumption both at home and away from home.

The author is an agricultural economist with the Commodity Economics Division, Economic Research Service, USDA.

keting bill for food eaten at home. For each dollar spent for food away from home, 15 cents covered the farm value, with marketing costs taking the remaining 85 cents. The away-from-home farm value is smaller than the corresponding at-home figure because the cost of preparing and serving food is a major part of the cost of food eaten away from home.

The food processing and marketing industry is an important part of the American economy. The \$372 billion the industry received from consumers in 1992 paid the wages and salaries of millions of employees and paid for all the other costs of doing business. This figure represents 6 percent of total gross domestic product.

Labor Costs Largely Responsible for 1992 Marketing Bill Increase

Labor costs overshadow all other costs in the marketing bill, and accounted for 35 percent of food expenditures in 1992 (fig. 2). Rising labor costs have accounted for about 46 percent of the total increase in the marketing bill over the last decade and were the largest single source of the 2.2-percent increase in 1992.

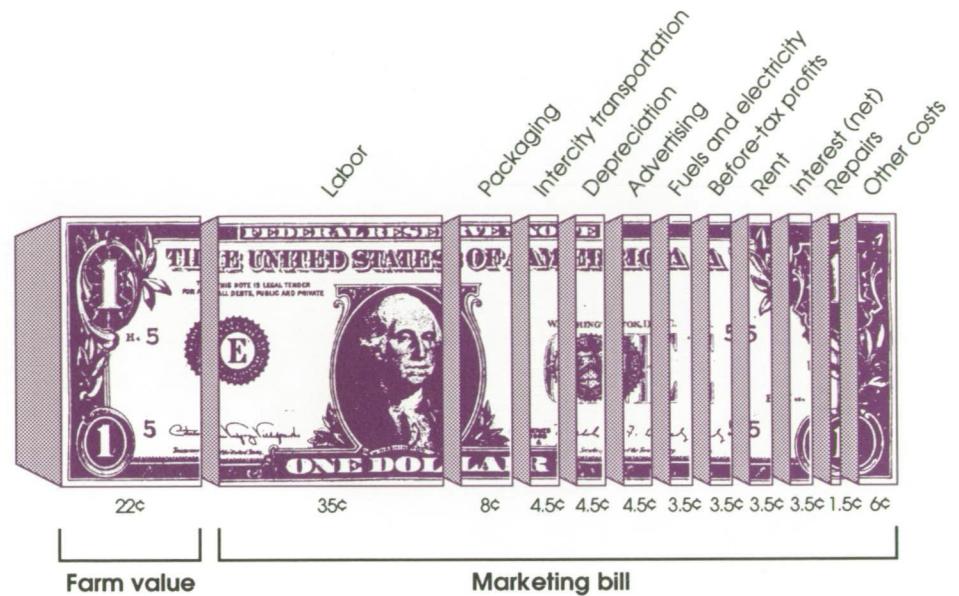
Labor costs grew about 4.3 percent to \$167.8 billion (table 1), primarily reflecting higher wages and benefit costs. This increase, however, was slightly below 1991's increase because of reduced hiring by food industry firms. The 1992 increase also was less than the average annual rise of 5.7 percent recorded during the past 10 years.

1992 Food Industry Employment Declined

Approximately 12.2 million workers were employed in processing and distributing food in 1992. About 53 percent worked in away-from-home eating places, 26 percent in food stores, 14 percent in

Figure 2

About One-Third of Every Dollar Spent for Food in 1992 Went for Labor Costs¹



Note: ¹ Includes food eaten at home and away from home. Other costs include property taxes and insurance, accounting and professional services, promotion, bad debts, and many miscellaneous items.

food processing, and about 7 percent in food wholesaling (fig. 3).

The recession visibly affected food industry employment. The number of people working in the sector fell slightly in 1992, in contrast to an average annual 2.2-percent rise over the last 10 years. The decline was largely attributable to sluggish retail sales growth. In 1992, consumers spent a record

low 11.4 percent of their disposable income on food.

Employment rose only 0.3 percent in eating places and declined 0.1 percent in food manufacturing. Food retailers employed 0.8 percent fewer people in 1992 than in 1991.

The use of part-time workers has helped restrain hiring by food

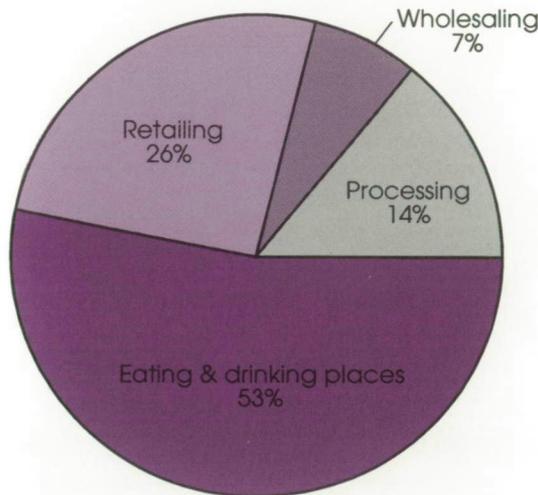
Table 1

Higher Labor Costs Boost 1992 Food Marketing Costs

Component	1975	1980	1985	1990	1991	1992
<i>Billion dollars</i>						
Labor ¹	48.3	81.5	115.6	154.0	160.9	167.8
Packaging materials	13.3	21.0	26.9	36.5	38.1	39.2
Rail and truck transportation ²	8.4	13.0	16.5	19.8	20.4	20.6
Fuels and electricity	4.6	9.0	13.1	15.2	16.3	16.8
Pre-tax corporate profits	7.1	9.9	10.4	15.0	16.1	15.9
Other ³	29.7	48.3	76.5	103.1	111.7	111.2
Total marketing bill	111.4	182.7	259.0	343.6	363.5	371.5

Notes: ¹Includes employees' wages or salaries and health and welfare benefits. ²Excludes local hauling charges. ³Includes depreciation, rent, advertising and promotion, interest, taxes, licenses, insurance, and professional services.

Figure 3

The Food Industry Employed 12.2 Million Workers in 1992

Source: Bureau of Labor Statistics.

retailers. Many food retailing employees work part-time. According to *Progressive Grocer* magazine, part-time employment accounted for 65 percent of retail food chain employment in 1992.

Part-time employees restrain labor cost increases in several ways. They are often paid less and receive fewer benefits than full-time employees. Part-timers also cut labor costs by reducing overtime work by full-time employees. Greater use of part-time workers has likely held down the rise in average hourly earnings in food retailing.

Wages and Benefits Rose

Total labor compensation costs can be broken down into two components: wages and salaries, and employee benefits. Employee benefits include paid leave, insurance benefits, supplemental pay, retirement and savings benefits, and legally required benefits, such as Social Security.

The Employment Cost Index (ECI), a quarterly series published by the Bureau of Labor Statistics,

helps track the relative impact of wages and benefits on labor costs. The ECI includes employers' cost of employee benefits and lump-sum payments to workers. While the ECI is only available for the retail segment of the food industry, it can be used to illustrate developments in employee benefits which affect the entire food industry.

The ECI for foodstores rose 3.8 percent in 1992. This increase included a 3.3-percent gain in wages and salaries. Although not reported separately, the increase in benefit costs was probably about 5.8 percent in 1992, or 1.8 times the rise in the wage rate of foodstore workers. Compensation costs rose more than wages and salaries in 1992 because the increases in the costs of benefits were much greater than the gains in wage rates.

Hourly earnings of workers in food stores increased 2.2 percent, faster than the 1.4-percent rise of 1991. Hourly earnings of workers in food processing grew 2.9 percent in 1992, the same as 1991's increase. Earnings in wholesaling also rose at the same 3.1-percent rate as in 1991. In eating and drink-

ing places, however, hourly earnings rose 2.1 percent—half the rate of increase reported in 1991.

The biggest issue affecting the food industry labor picture is the rising cost of health benefits, which increased due to higher health-insurance premiums and pensions. Health-insurance costs have skyrocketed in recent years along with the rising cost of medical care. The Consumer Price Index for medical services increased 7.6 percent in 1992, roughly equal to the average annual increase of the last 10 years. Spiraling health-care costs and benefits continued to be the most common, and contentious, bargaining issue. (These benefits may take anywhere from 10 to 30 percent of the cash available in union contracts.) In 1990, health benefits became the number one issue in collective bargaining between workers and food companies and in 1992 were rated as the most serious issue affecting foodstore management. In some instances, unions traded all or part of a wage increase to avoid a cut in health-care benefits or a shift of health-insurance costs to their members.

Labor Contracts Postpone Wage Increases

Most major collective bargaining agreements in the food industry—contracts that cover at least 1,000 employees—provided wage increases in 1992. Because the agreements are usually in effect for 3 to 4 years, the terms of the settlements serve as important barometers of future changes in labor costs, even though union memberships may account for as little as one-third of total food industry employment.

There are two types of labor contracts: front-loaded and back-loaded. Front-loaded contracts provide the largest wage adjustment in the first year of the contract. These settlements compound the amount of the percentage in-

crease in the later years of the contract. By contrast, back-loaded contracts provide lower wage increases in the first year, compared with subsequent years. Back-loaded contracts dampen wages by basing increases in the later years of a contract on a lower initial wage. These contracts were prevalent in the mid-1980's, as food industry firms sought to control costs.

The Bureau of Labor Statistics reports that 27 major contracts covering 165,300 workers were negotiated in the foodstore industry in 1992. Average wage adjustments were up 3.4 percent in the first year and 3.2 percent over the life of the contract.

While specific figures are not available, back-loaded contracts were more prevalent than front-loaded contracts in 1992 foodstore bargaining agreements, and provided slightly lower wage adjustments than the contracts they replaced. Negotiators agreed to implement back-loaded wage structures in an effort to control short-term costs by postponing wage increases, because food retailers have been adversely affected by sluggish sales stemming from the weak economy. However, the number of foodstore employees covered by 1992 bargaining agreements were about equally divided between back-loaded and front-loaded contracts.

Food processing firms entered into 17 contract settlements covering 32,113 employees. Average wage adjustments were up 2.5 percent in the first year and 2.6 percent over the life of the contract. Front-loaded contracts were also less prevalent in this sector than has been the case during the last few years. Of the total number of food processing contracts, 9 settlements covering 15,092 employees were front-loaded. These employees received average wage increases of 3.2 percent in the first year and 2.7 percent over the contract term. Five contracts covering

7,421 workers were back-loaded, and called for an average wage increase of 1.0 percent in the first year and 2.2 percent over the life of the contract. The remaining 3 contracts covered 9,600 employees and either provided for no wage change or called for the same increase in the first year as over the contract term.

Lump-sum payments, granted in lieu of wage increases or to offset wage decreases, were a popular method of containing labor costs in the mid-1980's. These payments restrain labor cost increases by holding down the wage base used to calculate benefits and pensions. Lump sums have fallen out of favor during the last few years. About 20 percent of food manufacturing workers and 26 percent of food retailing employees covered by 1992 contract negotiations agreed to lump sum payments. The proportion of foodstore workers covered by major contracts containing lump sum provisions has declined to 18 percent from a high of 60 percent in 1987, reflecting the continued decline in the implementation of this contract provision.

Recession Holds Down Packaging Cost Increases

Packaging is the second-largest component of the marketing bill, accounting for 8 cents of the food dollar. Costs of these materials rose only 2.9 percent in 1992, the smallest rise in the last decade.

Consumer purchases of value-added products (such as frozen prepared dinners and other convenience foods requiring specialized packaging) fell in response to the sluggish economy, causing weak growth in aggregate sales of packaging materials. Also helping to hold down costs was a 1.8-percent drop in the price of packaging materials in 1992. Higher packaging costs were largely due to the expanded size of the food industry.

In 1992, the food industry spent approximately \$15.7 billion, or about 40 percent of total packaging expenses, on paper and paperboard products—the largest packaging cost. Cardboard boxes, the primary container used to ship nearly all processed foods, represented about 33 percent of total packaging expenses. Sanitary food containers, including those for such products as fluid milk, margarine, butter, ice cream, and frozen food, were also almost 33 percent of total paperboard packaging expenses. Folding boxes used for such dry foods as cereal and perishable bakery products accounted for about 20 percent.

Prices of paperboard boxes and containers rose 1.4 percent in 1992. The increase, however, was held back as the price of paper bags plummeted 14.5 percent in 1992. Paper bag prices fell in response to excess manufacturing capacity as well as competition from plastic bags.

Metal containers made up about 20 percent of food packaging costs. Prices of metal cans rose 1.6 percent in 1992. Cans have become less important for food packaging because of the increased availability of glass and plastic bottles, the year-round availability of fresh fruit and vegetables, and the increased use of microwavable dishes for frozen foods. The price of glass containers, which are largely used to enhance product image, dropped 0.4 percent in 1992. Glass containers accounted for approximately 15 percent of packaging costs.

Costs of plastic containers and wrapping materials accounted for nearly 20 percent of food packaging costs. Plastic is an important source of trays for meat and produce, bottles for milk and fruit juices, jars and tubs for cottage cheese and other dairy products, and flexible wrapping materials, such as polyethylene film for protective covering of baked goods,

meat, and produce. Plastic is an oil derivative, and became cheaper to produce due to lower crude oil prices, resulting in a 0.3-percent fall in the price of plastic containers in 1992.

Transportation Costs Rose Little

Intercity truck and rail transportation costs for farm foods amounted to \$20.6 billion in 1992, or about 4.5 percent of retail food expenditures. Railroad freight rates for hauling food products advanced only about 0.6 percent in 1992, slower than the 1.7-percent gain in 1991. Most foods shipped by railroad are canned and bottled products. Trucking rates also rose little, reflecting lower operating costs. For example, operating costs of trucks hauling produce fell 2 percent in 1992. Truckers experienced a decrease in fuel costs of 6 percent, while wages remained steady. Fuel and labor account for half of total truck operating costs. Other expenses—such as depreciation and maintenance, overhead, licenses, and insurance—fell an average of 1.7 percent.

Energy Bill Rose Modestly

Energy costs rose 3.1 percent last year to about \$16.8 billion, making up about 3.5 percent of retail food expenditures. While the increase was about the same as some of the other major cost components, it was somewhat smaller than the rise in all other bill components during the last 5 years, except transportation and depreciation. The energy bill includes only the costs of electricity, natural gas, and other fuels used in food processing, wholesaling, retailing, and food-service establishments. Transportation fuel costs, except for intracity transportation costs incurred in food wholesaling, are excluded.

Public eating places and other facilities accounted for nearly 40 per-



Major causes underlying the growth in marketing costs include higher prices of marketing inputs, larger volume of food purchased by consumers, higher percentage of food sold through restaurants and fast food outlets, and more value-added processing and packaging.

cent of the fuel and electricity costs incurred by the food industry. Their energy expenses have risen because of the large growth of the away-from-home food market. Energy costs of retailers accounted for about 26 percent of the energy bill. Food processing was responsible for another 20 percent, with wholesalers taking up the remaining 14 percent.

Higher 1992 energy costs resulted largely from expansion in the food industry. The energy cost of processing and retailing food is primarily affected by natural gas and electricity prices. A 1.1-percent rise in the price of electricity used by food marketing firms was a major cause of the 1992 cost increase. However, natural gas prices dropped slightly due to abundant supplies, which were 2.7 percent higher than in 1991.

Away-from-home foodservice had the highest energy costs per

dollar of sales, about 3.1 percent. About 85 percent of this cost came from the use of electric power. Energy costs of retailers and wholesalers also consisted mostly of electricity. Electric power accounted for 56 percent of food manufacturing energy costs, with natural gas making up the remaining 44 percent.

Profits Squeezed

Before-tax profits dropped 1.2 percent to \$15.9 billion in 1992, accounting for 3 percent of 1992 food expenditures. Profit margins were squeezed, especially in the second and third quarters, by slowed consumer spending and by increased price competition among supermarkets, wholesale clubs, and mass merchandisers. Profit margins increased greatly in the fourth quarter when consumer spending returned, reflected in strong Thanksgiving and Christmas holiday business. However, the larger fourth quarter margins were not sufficient to overcome weaker margins recorded earlier in the year.

The industry mitigated downward pressure on margins by controlling costs. Food retailers continued to achieve greater efficiencies through the increased use of new technology, especially computers, for inventory management and merchandising. Retailers controlled labor costs, their largest operating expense, by using checkout scanners and computer programs that assist in labor scheduling. Efficiencies were also achieved by energy conservation and improved routing of delivery trucks to stores.

Profits were also affected by a change in corporate accounting methods. Corporations are no longer deferring the cost of retirement benefits (such as health insurance), but must take these benefits into account prior to accrual. This adjustment, made in the fourth quarter of 1992, resulted in a large drop in reported profit margins. ■

Population Growth and New Marketing Concepts Fuel Job Growth for the Retail Food Industry

Alex Majchrowicz
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Almost 181,000 retail food establishments—ranging from grocery stores, produce markets, and bakeries to candy stores—provided more than 3.5 million jobs in 1990, or about 2.5 percent of total U.S. employment. That's up 62 percent since 1975.

These retail sales jobs include wage and salary employees who work in large chain stores as well as the self-employed that operate mom-and-pop style shops. These workers complete the linkage between farmers, processors, and consumers.

Grocery Stores by Far the Sector's Major Employer

Grocery stores (including conventional and large-scale supermarkets) provided over 89 percent of all retail food employment (3.1 mil-

lion jobs) in 1990. Concentration of jobs in supermarkets is the result of the food retailing industry's long-term shift in competitive focus from smaller specialty stores to

larger establishments that emphasize greater product choice, lower prices, and one-stop shopping.

Remaining retail food jobs were distributed among meat and fish



Employment in retail food stores rose by over 1.3 million jobs during 1975-90. Grocery stores provided over 89 percent of these jobs in 1990.

The author is an agricultural economist with the Agriculture and Rural Economy Division, Economic Research Service, USDA.

Table 1
Retail Food Jobs Are Concentrated in Grocery Stores and Metro Areas

Type of retail store	United States		Metro		Nonmetro	
	Stores	Jobs	Stores	Jobs	Stores	Jobs
	Number					
Total	180,919	3,519,349	131,158	2,675,707	49,761	843,642
Grocery	132,515	3,138,481	90,845	2,348,001	41,670	790,480
Meat and fish	9,279	60,822	7,338	48,853	1,941	11,969
Fruit and vegetable	2,942	21,725	2,420	18,660	522	3,065
Candy and nut	5,406	31,919	4,617	27,465	789	4,454
Dairy	3,423	20,396	2,845	16,935	578	3,461
Retail bakery	19,897	197,280	16,856	172,924	3,041	24,356
Miscellaneous	7,457	48,726	6,237	42,870	1,220	5,856

markets; fruit and vegetable markets; candy, nut, and confectionery stores; dairy products stores; retail bakeries; and other specialized stores selling such foods as coffee, spices, and vitamins (table 1).

Most Jobs Located in Consumer Markets

Over three-quarters of retail food jobs in 1990 were in metro counties, which serve large consumer markets. Regions with the largest metro populations—led by the Northeast, Pacific, and Corn Belt—contained over half the Nation's retail food jobs.

The Northern Plains, with the smallest metro population among regions, provided slightly more than 2 percent of these jobs.

Large or Growing Populations Help Spawn New Jobs

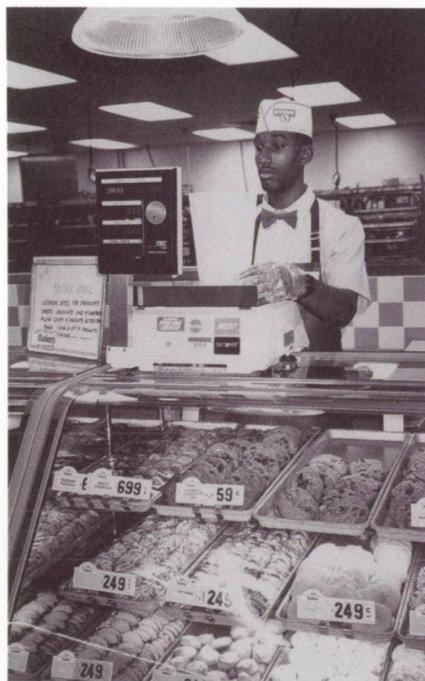
Employment in retail food stores rose by over 1.3 million jobs (62 percent) during 1975-90, the latest period for which county-level industry data are available. Although retail food jobs' share of total U.S. employment increased by only 0.2 percent during this period, the number of retail food jobs per 1,000 people rose more dramatically—increasing from about 10

jobs in 1975 to 14 in 1990. The rise in retail food jobs-to-population ratio is one indicator of the increased demand for retail food services that supply more accessible, ready-to-eat products. Supermarkets ex-

panded their service departments, adding in-store bakeries, delis, and salad bars—all of which require extra labor.

Job growth varied across the Nation, but was concentrated in areas with large or growing populations. Metro counties contained almost 82 percent of the U.S. population growth and around 76 percent of the retail food industry's new jobs during 1975-90. Limited population growth in nonmetro counties generally restricted gains in food jobs in rural areas. But some nonmetro counties that specialize in recreation activities or attract retirees to their pastoral surroundings may have had significant growth in retail food jobs. For example, food jobs leaped five- to sixfold in Washington and Summit Counties, Utah—nonmetro areas that offer skiing and sites for vacation and retirement homes. Jobs in some nonmetro areas of Alaska grew at faster rates, as oil workers (many with their families) moved into the State.

Employment in the retail food industry increased 88 percent in the Mountain States during 1975-90—the fastest growth among regions—as people moved into the area. The Mountain States gained population the quickest, expanding 39 percent, contrasted to population growth of 16 percent for the



Much of the additional labor went to expand store service departments, such as bakeries, delis, and salad bars.

Table 2

Retail Food Jobs More Than Doubled in Some States During 1975-90

State rank		New Jobs	State rank	Growth	
		Number		Percent	
1	California	151,870	1	Nevada	161.4
2	Florida	116,343	2	Alaska	141.3
3	Texas	106,530	3	Florida	120.9
4	Pennsylvania	67,303	4	Vermont	115.1
5	New York	56,530	5	New Hampshire	112.2
6	Georgia	47,278	6	Arizona	112.1
7	Virginia	46,981	7	Washington	104.9
8	North Carolina	46,430	8	Utah	104.3
9	Ohio	43,254	9	Virginia	100.7
10	New Jersey	39,591	10	Georgia	100.3
11	Illinois	39,329	11	North Carolina	89.8
12	Washington	34,957	12	Maine	86.0
13	Tennessee	32,804	13	California	78.8
14	Michigan	31,316	14	Hawaii	77.9
15	Massachusetts	28,788	15	Tennessee	77.7
16	Arizona	27,630	16	South Carolina	77.0
17	Maryland	25,742	17	Texas	76.0
18	Indiana	23,912	18	Colorado	74.6
19	Wisconsin	23,599	19	Delaware	71.9
20	Missouri	22,580	20	Wyoming	68.6
21	South Carolina	22,407	21	New Mexico	66.2
22	Kentucky	21,899	22	Kentucky	65.5
23	Louisiana	21,549	23	Oregon	65.2
24	Alabama	18,928	24	Maryland	64.1
25	Colorado	18,838	25	Mississippi	61.5
26	Minnesota	18,833	26	Arkansas	58.3
27	Iowa	17,112	27	North Dakota	58.1
28	Connecticut	16,976	28	Idaho	57.0
29	Oregon	16,386	29	Alabama	56.9
30	Mississippi	13,639	30	Pennsylvania	55.9
31	Oklahoma	13,038	31	South Dakota	55.3
32	New Hampshire	12,281	32	Louisiana	55.1
33	Utah	11,991	33	Iowa	53.9
34	Arkansas	11,610	34	New Jersey	51.7
35	Maine	10,688	35	Missouri	49.5
36	Nevada	9,810	36	Rhode Island	49.0
37	Kansas	8,960	37	Wisconsin	48.8
38	West Virginia	8,401	38	West Virginia	48.4
39	New Mexico	6,993	39	Connecticut	46.7
40	Hawaii	6,772	40	Minnesota	46.3
41	Nebraska	6,420	41	Oklahoma	45.9
42	Vermont	5,919	42	Indiana	43.6
43	Rhode Island	5,069	43	Montana	42.1
44	Idaho	4,917	44	Massachusetts	39.8
45	Alaska	4,840	45	Ohio	38.3
46	Delaware	4,427	46	Kansas	37.3
47	South Dakota	3,991	47	Illinois	36.4
48	North Dakota	3,442	48	Nebraska	35.5
49	Montana	3,182	49	Michigan	34.7
50	Wyoming	2,470	50	New York	30.9

Nation. Population in Nevada rose over 97 percent, as expansion in the gaming industry attracted new residents. Retirees desiring a warm climate helped fuel a 61-percent population gain in Arizona.

Although the Mountain States rapidly gained residents, based on a ratio of new food jobs to population growth, these States added only 23 retail food jobs per additional 1,000 population. In contrast, about 140 jobs were added per 1,000 new people in the populous Corn Belt and Northeast. This high ratio suggests the entry of new chains and introduction by existing food retailers of new stores and fresh concepts in marketing—warehouse, no-frill, or discount club stores—in established markets to compete for consumer dollars.

Some States more than doubled their retail food jobs during 1975-90 (table 2). Nevada's food retailing employment exploded by 161 percent (9,810 jobs). Almost 6,000 of these jobs were concentrated in Las Vegas, Clark County. Food industry jobs increased 141 percent (4,841 jobs) in Alaska, almost entirely in grocery stores. Employment increased 121 percent (116,342 jobs) in Florida, followed by a 115-percent rise (5,919 jobs) in Vermont. Florida gained 4.1 million new residents during 1975-90, stimulating the rapid rise in retail food jobs there. ■

Dramatic Growth in Mass Media Food Advertising in the 1980's

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With about \$7.6 billion spent in the mass media in 1990, food continued its role as one of the most intensely advertised products in the Nation. Between 1980 and 1990, spending on media advertising for food soared 230 percent from \$2.3 billion to \$7.6 billion (table 1), an average annual growth of about 13 percent.

Even after adjusting for rising media costs, food advertising expenditures increased 86 percent between 1980 and 1990, for an annual average growth of about 6 percent (table 1). Several new trends have emerged—the most prominent being the push in promoting dining out. Inflation-adjusted advertising expenditures for food away from home were 11 times greater in 1990 than in 1980, rising from 6 percent of total food media advertising to 35 percent.

Media costs more than doubled between 1980 and 1990. For example, newspaper advertising rates rose 122 percent, and magazine rates more than doubled (as did network television and radio rates). The rate for spot, syndicated, and cable television ads rose 71 percent,

and syndicated radio rates were up only 57 percent (table 2).

Advertising for food at home also expanded, but not as dramatically as advertising of eating

places. Generic advertising of food products doubled (see box for definitions), while promotions for name brands rose at a slower pace. Brand advertising, however, still

Table 1
Food Industry Advertising More, Spending More

Item	1980	1985	1990
	<i>Million dollars</i>		
Mass media advertising expenditures	2,260	5,125	7,640
Food at home	2,138	3,760	5,022
Food away from home	121	1,365	2,618
	<i>Percent (1980 is base year)</i>		
Change in inflation-adjusted advertising expenditures since 1980	100	159.9	185.8
Food at home	100	121.3	128.3
Food away from home	100	797.4	1,133.7

Table 2
In Most Cases, Advertising Costs Doubled in the 1980's

Media	Change in media cost		
	1980	1985	1990
	<i>Index (1980 = 1.00)</i>		
Magazines	1.00	1.62	2.06
Sunday magazines	1.00	1.51	2.00
Newspapers	1.00	1.62	2.22
Outdoor ads	1.00	1.50	1.89
Network television	1.00	1.57	2.10
Spot, syndicated, cable television	1.00	1.28	1.71
Network radio	1.00	1.59	2.04
Syndicated radio	1.00	1.24	1.57

The authors are agricultural economists with the Commodity Economics Division, Economic Research Service, USDA.

dwarfs generic promotions by a 10 to 1 margin.

In 1990, 81 percent of advertising for food at home was done on television and 11 percent in magazines. However, the media mix used by different industry groups varies substantially. For example, the cereal and bakery industry ranks higher among radio and television ads than do other food industries. On the other hand, the fruit and vegetable industry ranks highest among magazine ads.

About 4.5 cents of every food dollar goes toward advertising. Industries that supply a vast array of brand products do the most advertising. In both 1980 and 1990, manufacturers of sugar and sweets (mostly brand products) spent twice as much on media advertising as the entire meat, poultry, fish, and eggs sector (mostly unbranded products), yet consumers spent only about 2 percent of their food budget on sugar and sweets, and over 15 percent on meats and poultry.

Brand Advertising of Food Away From Home Soars

Advertising expenditures for food at home have increased overall, but not for different types of advertising. Generic's share rose, while brand's fell. From 1980 to 1990, inflation-adjusted advertising expenditures for food at home rose 28 percent (table 1). Generic's share of these expenditures grew 2 percentage points to about 5 percent (table 3). However, the share of total food advertising aimed at the at-home market dropped from 94 percent in 1980 to 65 percent in 1990 (fig. 1).

Generic advertising of food away from home grew very little because the food service sector is composed of hundreds of thousands of establishments, making generic promotion of the dining out

Table 3

Generic Advertising Expenditures for Food at Home Rose Slightly

Item	1980		1985		1990	
	Generic Brand		Generic Brand		Generic Brand	
	Percent					
Share of advertising expenditures:						
Food at home	3.01	96.99	3.75	96.25	4.98	95.02
Food away from home	0	100.00	.08	99.92	.05	99.95
Total	2.84	97.16	2.70	97.30	3.26	96.74

Note: Advertising expenditures are deflated by media costs.

experience difficult. By comparison, the share of brand advertising expenditures in this category grew sharply—from 5.9 percent of total food advertising in 1980 to 36 percent in 1990.

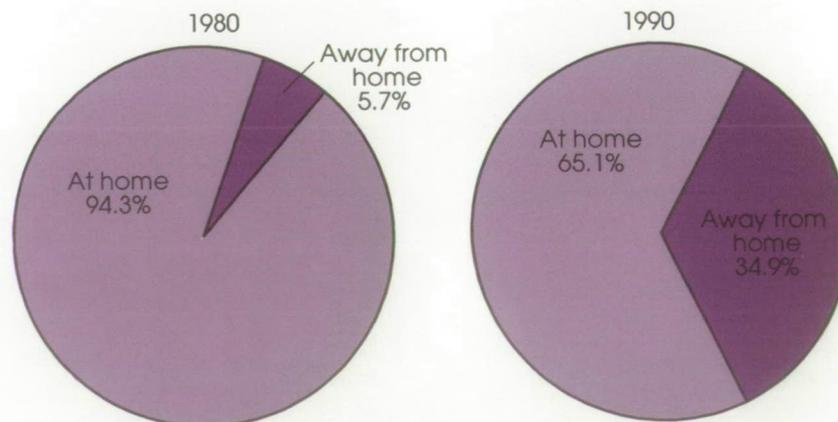
The type of retail outlet a product moves through has a direct influence over the type and the amount of advertising used. It is much more difficult to devise, coordinate, and implement a generic advertising campaign for products and services as diverse as in the food service industry. This probably explains the small amount of food service advertising accounted for by generic-type media ads.

Television the Overwhelming Favorite

Media advertising includes television, radio, magazine, newspaper, and outdoor ads. The distribution of these outlets depends on a food's characteristics and the message to be conveyed. For example, food processors generally are major contributors to mass media advertising. Most of their advertising budget is for television, which can reach a large audience and can be used effectively to create a positive visual image. A significant portion of this advertising is also aimed toward

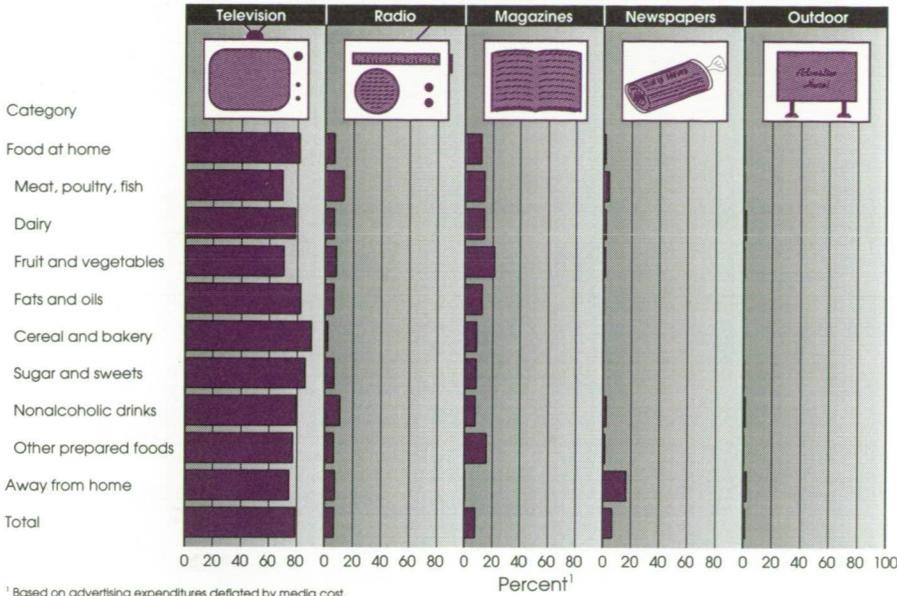
Figure 1

The Share of Food Advertising Aimed at the At-Home Market Falls, But Rises for Food Away From Home



Note: Advertising expenditures are deflated by media costs.

Figure 2
Food Industry Leans Heavily on Television for Advertising



¹ Based on advertising expenditures deflated by media cost.

people who do not read newspapers, such as children. Food retailers, on the other hand, depend more on local newspaper ads to communicate prices for a large number of items.

A significant portion of a way-from-home food sales occurs in the fast food market. Advertising in this market is often aimed at children, so disseminating price information usually is a fairly low priority. Consequently, television and radio are effective modes of advertising fast food. Yet newspapers are being used more for food away from home with the rise in coupon offerings.

About 81 percent of the advertising bill for food at home (excluding beer, wine, and other alcoholic beverages) went to television in 1990, 11 percent to magazines, and 6 percent to radio messages (fig. 2). For food away from home, 74 percent of 1990 advertising expenditures went to television, 16 percent to newspapers, and

7 percent to radio ads.

The importance of generic and brand advertising within each media outlet varies by food product group. With television, for example, generic advertising is mainly used for perishable or relatively unprocessed foods, such as dairy, fruit, vegetables, meat, and poultry. Use of television advertising for generic groups ranges from 9 to 20 percent of their respective total advertising expenditures in 1990. Brand television advertising is mostly used for highly processed

foods, such as cereals, bakery products, sugar and sweets, and prepared foods. Use of television advertising for these groups ranges from 77 to 90 percent of the total advertising expenditures for each group. (As already noted, generic advertising is not widely used for food away from home.)

Relative to Food Spending, Advertising Heavier for Processed Food and Food Away From Home

Research on why some industries advertise more intensely than others and the ultimate effect of advertising has led observers to several conclusions:

- The food groups that are more intensely advertised tend to maintain or increase their share of total value of food marketed,
- The food industries with the highest advertising expenditures tend to be those with the most highly processed and highly packaged products, and
- An increase in advertising in a sector is a sign of increased product differentiation.

To gain further insight into these observations, we use a ratio that compares the relative importance of a product's media advertising to its importance in the household food budget. This measure, called the relative advertising intensity ratio, shows how in-

tensely a product is advertised compared with other foods while also taking into account the share of the food budget it represents.

For example, a relative intensity ratio of 1 indicates



that the proportion of total food advertising expenditures represented by the product equals its share of consumers' food spending. In other words, the product is advertised no more or no less than its importance in the food budget. A ratio greater than 1 indicates that media advertising for that food group is high relative to its budget share.

For food at home, the share of food advertising expenditures decreased 29 percentage points since 1980 (table 4). At the same time, its budget share declined 10 percentage points. The relative advertising intensity ratio for food at home thus declined from 1.4 in 1980 to 1.1 in 1990. Even though they declined, a ratio larger than 1 implies that food at home is still advertised slightly more than its share of the consumer's food budget.

For food away from home, advertising increased more rapidly than its share of the budget, causing the relative advertising intensity ratio to rise from 0.1 in 1980 to almost 0.8 in 1990.

Highly processed foods have higher advertising intensity ratios than do those processed less. In 1990, for example, cereal and bakery products accounted for 8.7 percent of the consumer's budget and 17.5 percent of all food advertising. The corresponding intensity ratio equals 2, implying that cereal and bakery products are advertised twice as much as their budget share.

The most intensely advertised product group is sugar and sweets. In 1990, their 3.2 intensity ratio was significantly higher than the 0.2 for meats, which is composed of many homogeneous, nonbrand products. Sugar and sweets represent 2.2 percent of consumers' food budgets but account for 7 percent of food advertising spending. This product group is composed of many highly processed, differentiated products that are easily advertised.

Advertising Has Specific Goals

Product differentiation, highlighted and maintained through advertising, and economies of scale in advertising are believed to play powerful roles in determining the ultimate structure and performance of the U.S. food industry. The relative efficiency of advertising in the marketing process is related not only to the costs borne by producers but also to changes it induces in market structure and economic welfare.

Advertising is a form of competition that is directed toward existing and potential consumers of a product with the objective of increasing sales.

Brand advertising is sponsored by an individual producer or corporation, and is aimed at a specific audience. The ads promote the particular characteristics of a given brand of food and are often directed toward increasing market share and promoting brand loyalty.

Generic advertising is sponsored mainly by a group of producers of a commodity and is aimed at influencing industry product demand—such as for beef or cheese. The growth in

generic advertising can be linked to the large number of commodities that have received legislative authority for producers to band together to be assessed for the purpose of underwriting advertising and promotion programs.

Both brand and generic advertising may be targeted at consumers from different marketing channels or outlets, such as retail; wholesale-manufacturing; institutions, such as restaurants; and export organizations.

The data are compiled from Leading National Advertisers (LNA)/Arbitron Multi-Media Service. LNA/Arbitron report advertising expenditures in 10 major media: consumer magazines, Sunday magazines, newspapers, outdoor ads, network television, spot television, syndicated television, cable television, network radio, and national spot radio. To make meaningful comparisons, food and nonalcoholic beverage items are grouped to correspond to the consumer price indices. Yearly changes in media costs were taken from selected issues of *Marketing and Media Decisions* (Decisions Publications).

Advertising shares of cereal, sugar, prepared foods, and nonalcoholic drinks decreased from 11-25 percent in 1980 to 7-18 percent in 1990. The shares for processed products remain higher than for perishable items, such as meat, dairy, and fruit and vegetables, which range between 2 and 6 percent.

We can expect many new products and improvements on old products to be introduced. This will lead to further competition for consumers' food dollars and to changes in the advertising mix. Food away from home is expected to continue increasing its share of total food advertising. More generic advertising also will occur, as more producers band together to

Table 4

Higher Advertising Intensity for Food Away From Home

Food product category	Share of advertising	Share of consumer food budget	Advertising intensity
	Percent	Percent	Ratio
1980 total	100.0	1.0	1.0
Food at home	94.3	67.7	1.4
Meat, poultry, fish, eggs	5.3	23.5	.2
Dairy	5.0	8.6	.6
Fruit and vegetables	5.2	10.2	.5
Fats and oils	3.6	2.3	1.6
Cereal and bakery products	20.2	8.6	2.4
Sugar and sweets	10.6	2.5	4.2
Nonalcoholic drinks	24.6	6.2	3.9
Other prepared foods	19.8	5.9	3.4
Food away from home	5.7	32.3	.2
1985 total	100.0	100.0	1.0
Food at home	71.5	63.3	1.1
Meat, poultry, fish, eggs	3.8	18.3	.2
Dairy	5.4	8.0	.7
Fruit and vegetables	5.5	10.3	.5
Fats and oils	2.2	2.1	1.0
Cereal and bakery products	16.8	8.9	1.9
Sugar and sweets	8.3	2.4	3.5
Nonalcoholic drinks	12.5	5.8	2.2
Other prepared foods	17.0	7.4	2.3
Food away from home	28.5	36.7	.8
1990 total	100.0	100.0	1.0
Food at home	65.1	57.5	1.1
Meat, poultry, fish, eggs	3.6	15.7	.2
Dairy	4.8	6.9	.7
Fruit and vegetables	5.5	9.6	.6
Fats and oils	1.8	1.6	1.1
Cereal and bakery products	17.5	8.7	2.0
Sugar and sweets	7.0	2.2	3.2
Nonalcoholic drinks	11.8	5.0	2.4
Other prepared foods	13.0	7.9	1.7
Food away from home	34.9	42.5	.8

Note: Advertising expenditures are deflated by media costs.

promote their products. Television will continue as the medium of choice.

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Efforts Are Expanding the School Breakfast Program

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The School Breakfast Program provides cash assistance to initiate and maintain a breakfast program in eligible schools and child care institutions. The program has grown from serving 80,000 children at a cost of \$573,000 in fiscal 1967 to an average of 4.92 million children a day in 50,000 schools and institutions at a cost of \$787 million in fiscal 1992. The growth reflects concentrated efforts to encourage more schools to participate in order to reach more needy children.

To provide this food, the U.S. Government spent \$787 million in fiscal 1992, up 16.2 percent from \$677.2 million in fiscal 1991. Over 850 million breakfasts were served during fiscal 1992—a 50-percent increase from a decade earlier. About 87 percent of the breakfasts are served free or reduced price—remaining relatively stable since the program's inception.

Program Expanded Along With Need

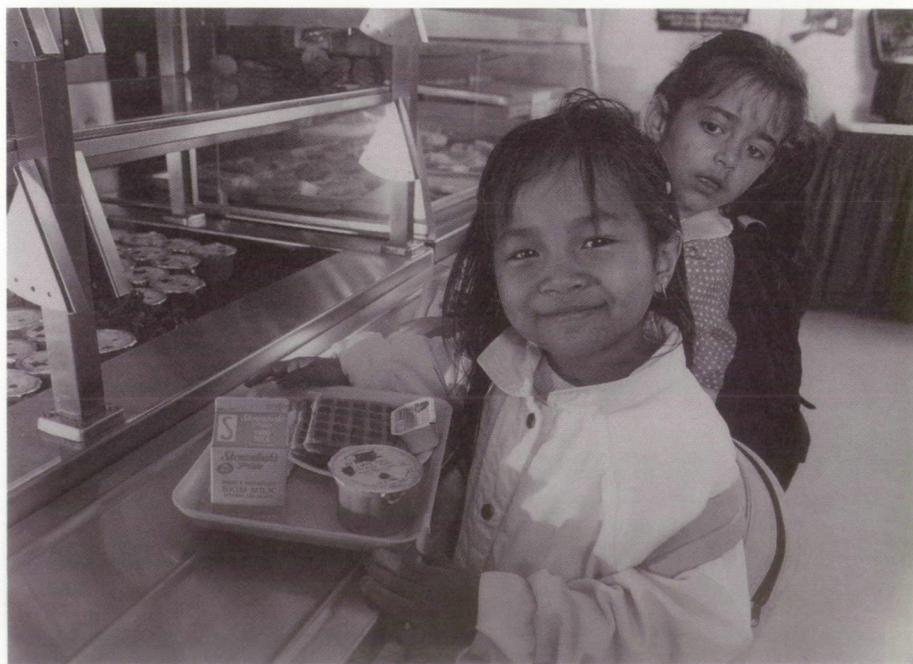
Initially authorized as a 2-year pilot program under the Child Nutrition Act of 1966, the program is now open to all schools, public and nonprofit private, as well as public and private nonprofit residential

child care institutions. Participating schools and institutions must serve meals that meet Federal nutrition guidelines and must provide all eligible children with free or reduced-price meals.

At its inception, the School Breakfast Program was targeted toward "nutritionally needy" children in low-income school districts. In 1971, the program was expanded to give priority consid-

eration to schools that demonstrated a special need to improve the nutrition of children from low-income families.

A determination of "severe need" for the School Breakfast Program is based on the School Lunch Program. That is, a participating school qualifies as being in "severe need" if at least 40 percent of school lunches have been served free or reduced price 2 years prior,



The School Breakfast Program is available to more than half of all elementary and secondary school students. About 5 million children are served a school breakfast on an average school day.

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and if the current reimbursement rates do not cover the operating costs for breakfasts. Such schools then may receive additional funding. About 62 percent of all free and reduced-price breakfasts are served in schools with severe need.

Low-Income Children Receive Free Breakfasts

Amendments to the Child Nutrition Act in 1975 made the School Breakfast Program permanent and extended eligibility to all public and nonprofit private schools and residential child care institutions wishing to participate. Today the breakfast program is available to more than half of all elementary and secondary school students. About 5 million children are served a school breakfast on an average school day (table 1).

The School Breakfast Program offers free, reduced-price, and full-price breakfasts. Eligibility for free and reduced-price breakfasts are based on the same criteria as for the National School Lunch Pro-

gram. For the 1993-94 school year, a child from a family of four with an annual income under \$18,655 is eligible for a free breakfast. If the household's income is between \$18,655 and \$26,548, the child may receive reduced-price meals. More than 85 percent of the program's breakfasts are served to students whose family income is below 185 percent of poverty (\$26,548 for a family of four in 1993-94).

Students who are eligible for free breakfasts may not be charged under Federal law. Schools may charge students a maximum of 30 cents for reduced-price breakfasts. The average price for a reduced-price breakfast was 28 cents in 1991-92. There is no maximum limit on the price schools may charge for a full-price meal. In school year 1991-92, the average price charged for a full-price breakfast was about 60 cents.

For the 1993-94 school year, the reimbursement rate for free breakfasts is 96 cents per breakfast served (114.25 cents in severe-need schools). The Government reim-

burses 66 cents for reduced-price meals (84.25 cents in severe-need schools). The reimbursement rate for full-price meals in 1993-94 is 19 cents. Higher reimbursement rates for all breakfasts are paid to schools in Alaska and Hawaii because of higher food costs. Reimbursement rates are adjusted annually to reflect changes in the Consumer Price Index for food away from home.

In addition to the cash funding, the program originally received donated commodities worth about 3 cents per meal. Most schools, however, did not use a large share of the commodities because they were not suitable for the types of breakfasts being served. For example, products that required extensive preparation, such as grains and flour, could not be efficiently used in most school breakfast operations. As a result, commodity donations for the program were discontinued in 1980.

Meals Must Meet Nutritional Guidelines

Breakfasts served in the program must comply with nutritious meal pattern requirements in order to be eligible for Federal reimbursements.

The breakfasts should provide 25 percent of the Recommended Daily Allowance (RDA) for nutrients. The current requirements, issued in March 1989, specify the types of foods to be included in the program's meals as well as the quantities or minimum portions (table 2). Requirements were adapted to improve the nutritional quality of the program's meals, specifically to increase the content of vitamin A, vitamin B6, and iron.

A study conducted by USDA's Food and Nutrition Service (FNS) in 1992 found that school break-

Table 1
School Breakfast Program Serves Almost 5 Million Children in 50,000 Schools

Fiscal year	Number of schools* <i>Thousand</i>	Daily participation			
		Free	Reduced price	Full price	Total
		<i>Million children</i>			
1982	34.3	2.80	0.16	0.36	3.32
1983	33.5	2.87	.15	.34	3.36
1984	33.8	2.91	.15	.37	3.43
1985	34.8	2.88	.16	.40	3.44
1986	35.2	2.93	.16	.41	3.50
1987	37.2	3.01	.17	.43	3.61
1988	38.8	3.03	.18	.47	3.68
1989	40.0	3.10	.20	.51	3.81
1990	42.8	3.30	.22	.55	4.07
1991	46.1	3.61	.25	.58	4.44
1992	50.2	4.05	.26	.60	4.92

*Includes schools and residential childcare institutions.

Table 2

The School Breakfast Program Requires Nutritious Meals

<i>Food component/item*</i>	<i>Serving</i>
One serving from each of the following components	
Fluid milk: As a beverage, on cereal, or both	1/2 pint
Juice, fruit, vegetables: Fruit and/or vegetable or full-strength fruit juice or vegetable juice (it is recommended that a citrus fruit or juice or a fruit or vegetable or juice that is a good source of vitamin C be offered daily)	1/2 cup
And, one serving from each of the following components or two servings from one component	
Bread products: Whole-grain or enriched bread	1 slice
Whole-grain or enriched biscuit, roll, muffin, cornbread, etc.	1 unit
Whole-grain, enriched, or fortified cereal	1/4 cup or 1 ounce
Meat products: Lean meat, poultry, or fish	1 ounce
Cheese	1 ounce
Large egg	1/2 egg
Peanut butter or other nut or seed butter	1-1/2 tablespoons
Cooked dry beans or peas	4 tablespoons
Nuts or seeds	1 ounce

fasts offered in elementary and secondary schools were high in nutritional quality and balanced across a number of key nutrients. While the overall caloric value of the program's meals was 24 percent, supplying slightly less than the program's goal of 25 percent of daily calorie needs, the meals were high in nutrient density, supplying over 25 percent of the RDA for most nutrients examined.

However, the breakfasts are currently high in fat and saturated fat. The breakfasts offered contained 31 percent of calories from fat and 14 percent of calories from saturated fat. In comparison, the U.S. Dietary Guidelines suggest that no more than 30 percent of calories come

from fat, and less than 10 percent of total calories should come from saturated fat. The breakfasts also exceed the National Research Council's recommendation for sodium. The meals offered provided 673 milligrams of sodium, compared with the 600 milligrams that would be equivalent to 25 percent of the National Research Council's daily recommendation.

At the beginning of this school year, USDA announced that school meals should meet the Federal Dietary Guidelines for fat, saturated fats, cholesterol, and sodium so that students will get nutritious, healthful meals.

USDA has launched a long-term nutrition initiative to reduce the

level of fats and to increase the amount of fruit and vegetables in both school breakfasts and school lunches. The initiative offers lower fat meat and dairy products on a test basis in some schools. USDA plans to double the amount of fresh fruit and vegetables offered to schools through the commodity distribution program—a substantial increase over the 8.8 million pounds distributed last year.

In addition, USDA held public hearings in the fall of 1993 to seek public comment about ways to further improve the nutrition quality of meals children eat at school.

Participation Up, But Aim Is To Reach More

To increase local flexibility in implementing the program and thereby encourage more schools to participate, Congress authorized "offer versus serve." Under this option, schools must offer all four meal components (one from each of the components/groups in table 2), but if a child refuses one of the four food items, the breakfast would still qualify as a reimbursable meal.

In the early years of the breakfast program, growth was initially slow. However, State and Federal outreach efforts have generated significant interest in the program. Additionally, in 1989, Public Law 101-147 established a 5-year series of grants to expand the number of participating schools. To date, FNS has awarded grants to 44 States targeting over 4,000 schools that serve nearly 800,000 needy children.

The results of these efforts have been evident in the significant increase in the number of participating schools as well as the substantial increase in student participation in the past 4 years. ■

drinks—represent 60-75 percent of total U.S. consumption of high-intensity sweeteners, tabletop sweeteners use 20-35 percent, and commercially prepared foods 5-15 percent. Industry sources indicate the market for tabletop sweeteners has limited growth. There seems to be more potential for growth in

What To Call the New Sweeteners

Various terms have been used for high-intensity sweeteners over the years. Artificial sweetener was an early favorite and used virtually interchangeably with synthetic sweetener. Because there is some difference of opinion as to what is natural, what constitutes artificial, and what is synthetic, there has been a tendency to shy away from calling saccharin, and more recently aspartame, an artificial or synthetic sweetener.

After World War II, non-caloric or non-nutritive sweeteners became a more widely acceptable term to describe saccharin and cyclamate. When aspartame became popular in the mid-1980's, noncaloric was changed to low-calorie, since aspartame has the same number of calories as a caloric sweetener, except on the average, only around 180th as much aspartame as sugar is needed to sweeten foods and beverages. Today, high-intensity sweeteners is the more acceptable generic term to describe saccharin, aspartame, and Ace-K, though low-calorie is also considered acceptable.

commercially prepared foods, but it is not yet fully clear if this potential can be realized.

One hindrance to growth may be the physical properties of high-intensity sweeteners themselves. Unlike sugar and corn sweeteners, sweetness is the only property high-intensity sweeteners can impart to food and beverages. The major problem in replacing sugar in commercially prepared foods—particularly confections and bakery products—is replacing the bulk. Since soft drink bottlers use liquid sweeteners, it is the liquid that provides the needed bulk. Intense sweeteners are judged solely on their ability to impart sweetness. Moreover, removing the caloric sweetener from baked goods—particularly yeast-leavened bread, rolls, buns, and doughnuts—removes food for yeasts to produce carbon dioxide and alcohol, which improves the palatability of the

products. Similarly, without caloric sweeteners, ice cream would get a very limited reduction in the caloric content since most of the calories are in the butterfat and not the sweetener.

Soft Drinks

The U.S. carbonated soft drink industry is the largest single commercial user of high-intensity sweeteners. In 1992, total U.S. soft drink consumption reached an estimated 12.4 billion gallons. Diet soft drinks accounted for 3.6 billion gallons, or about 29 percent of the total. Aspartame was the leading sweetener for diet soft drinks in bottles and cans, sometimes mixed with saccharin for diet fountain syrups in a 1 to 4 blend (sugar sweetness equivalent). More saccharin is used in fountain syrups because aspartame tends to lose its sweetness when kept in a liquid solution for a long period (see box).

Figure 1
U.S. Soft Drink Consumption on the Rise

Gallons per capita

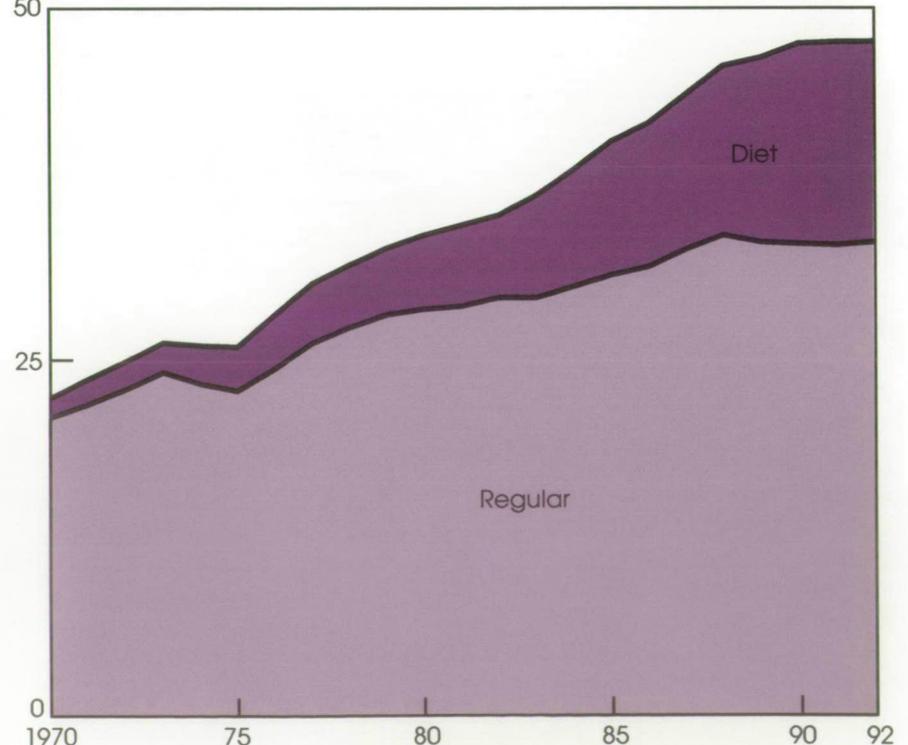


Table 1

High-Intensity Sweeteners' Share of U.S. Soft Drinks Fell Slightly for the First Time in 1992 Since the Uptrend Began in 1983

Year	Regular soft drinks		Diet soft drinks		Total consumption	Change from previous year	Diet's share of total	Total per capita consumption
	Consumption	Change from previous year	Consumption	Change from previous year				
	Billion cases*	Percent	Billion cases*	Percent	Billion cases*	Percent	Percent	Gallons
1970	2.79	8.6	0.18	-14.3	2.97	6.9	6.1	22.7
1971	2.94	5.4	.24	33.3	3.18	7.1	7.5	24.0
1972	3.13	6.5	.27	12.5	3.40	6.9	7.9	25.3
1973	3.32	6.1	.29	7.4	3.61	6.2	8.0	26.6
1974	3.24	-2.4	.37	27.6	3.61	0	10.2	26.4
1975	3.20	-1.2	.43	16.2	3.63	.6	11.8	26.3
1976	3.47	8.4	.53	23.3	4.00	10.2	13.3	28.6
1977	3.75	8.1	.59	11.3	4.34	8.5	13.6	30.8
1978	3.93	4.8	.63	6.8	4.56	5.1	13.8	32.1
1979	4.09	4.1	.67	6.3	4.76	4.4	14.1	33.3
1980	4.18	2.2	.75	11.9	4.93	3.6	15.2	34.2
1981	4.24	1.4	.83	10.7	5.07	2.8	16.4	34.9
1982	4.36	2.8	.84	1.2	5.20	2.6	16.2	35.6
1983	4.65	6.7	1.13	34.5	5.78	11.2	19.6	37.0
1984	4.83	3.9	1.30	15.0	6.13	6.1	21.2	38.8
1985	5.00	3.5	1.50	15.4	6.50	6.0	23.1	40.8
1986	5.15	3.0	1.62	8.0	6.77	4.2	23.9	42.1
1987	5.39	4.7	1.77	9.3	7.16	5.8	24.7	44.1
1988	5.58	3.5	1.95	10.2	7.53	5.2	25.9	46.1
1989	5.54	-7	2.14	9.7	7.68	2.0	27.9	46.7
1990	5.57	.5	2.34	9.3	7.91	3.0	29.6	47.7
1991	5.64	1.3	2.40	2.6	8.04	1.6	29.9	47.8
1992	5.76	2.1	2.40	0	8.16	1.5	29.4	48.0

Notes: These consumption estimates are 10-30 percent higher than Census of Manufactures figures published by the U.S. Department of Commerce. *A case is equal to 24 8-ounce containers totaling 192 ounces, fountain drinks included. Source: Wheat First Securities.

U.S. soft drink consumption has jumped over two-fold from 22.7 gallons per person in 1970 to 48.0 gallons in 1992 (table 1). But there was not much growth in high-intensity sweetener use in soft drinks in the 1970's, and into the early 1980's, with saccharin the only high-intensity sweetener approved for such use.

Following FDA's approval for aspartame use in soft drinks in 1983, which coincided with increasing consumer demand for diet foods, high-intensity sweetener use in soft drinks grew rapidly. These

"diet" drinks grew from 19.5 percent of U.S. soft drinks in 1983 to 29.8 percent in 1991, while per capita soft drink consumption grew from 37 gallons to 47.5 gallons.

In 1992, however, high-intensity sweetener's share of U.S. soft drinks declined slightly for the first time since the uptrend began in 1983.

Analysts attribute the 1992 decline to the coolest summer in over a decade, the lingering recession, and expansion in consumption of so-called "new-age" beverages. These are nonalcoholic drinks containing natural ingredients without preservatives that consumers perceive as healthy alternatives to tra-

ditional soft drinks. The most popular are sparkling or still waters—not flavored or flavored with fruit essence or juice. Others include tea and herbal tea. Industry sources indicate the new-age segment grew 10 percent in 1992.

The softening in demand for diet soft drinks in 1992 followed a 4.9-percent average annual growth. Some analysts believe that diet soft drinks are at a saturation point and could lose incremental market share to new-age beverages in the years to come. The summer of 1993 may well prove a turning point.

Table 2

Ten Brands Hold Over 80 Percent of the U.S. Diet Soft Drink Market

Rank and brand	Consumption	Market share	Diet share	1992 growth	5-year growth
	Million gallons	Percent	Percent	Percent	Percent
1 Diet Coke	1,211.4	9.8	33.4	-0.8	+40.3
2 Diet Pepsi	764.2	6.2	21.1	+1.9	+51.8
3 Caffeine-Free Diet Coke	272.6	2.2	7.5	-2.8	+65.3
4 Caffeine-Free Diet Pepsi	166.2	1.3	4.6	-1.5	+57.1
5 Diet Dr Pepper	123.3	1.0	3.4	+16.8	+184.1
6 Diet Sprite	105.3	.9	2.9	-1.5	+36.9
7 Diet 7-Up	102.0	.8	2.8	+1.0	-2.6
8 Diet Mountain Dew	78.2	.6	2.2	+18.5	+77.3*
9 Diet Rite	69.0	.6	1.9	-7.5	-40.4
10 Diet Minute Maid	43.7	.4	1.2	-2.2	+16.5
Top 10 diet soft drinks	2,935.9	23.8	81.0	+6	+40.3
All other diet soft drinks	690.9	5.6	19.0	-5.1	-13.5
Total diet soft drinks	3,626.8	29.3	100.0	-5	+25.4

*Notes: Diet Mountain Dew commenced production in 1988. Growth reflects last 4 years. Source: Beverage Marketing Corporation.

Given their high level of total use in diet soft drinks, high-intensity sweeteners—particularly aspartame—will be affected by what drives the soft drink market.

Tabletop Sweeteners

U.S. consumers have a full range of sweeteners to choose from at the restaurant or dinner table at home—sugar, crystalline fructose, and all three high-intensity sweeteners. The leader in market share among high-intensity sweeteners is the saccharin-based Sweet-N-Low, maintaining over 40 percent of the diet tabletop market. NutraSweet's aspartame-based Equal comes in second, with about 30 percent of the market. The remaining share is taken by the Ace-K-based Sunette product.

The newest tabletop product is NutraSweet's Spoonful, an aspartame product which was granted approval in early 1992. Unlike other high-intensity tabletop sweeteners, Spoonful replaces sugar gram for gram, with the mass provided by maltodextrin, a corn-starch-based bulking agent. The product reportedly contains 2 calo-

ries per teaspoon, compared with 16 calories in a teaspoon of sugar.



Tabletop use appears likely to trend upward in the years ahead—with a wide array of sweetener choices. This new tabletop product replaces sugar gram for gram.

Confectionery and Baked Goods

Aside from chewing gum, high-intensity sweeteners have made little headway in gaining market share in confectionery and baked goods. However, this may be changing due to recent FDA approvals and introduction of new bulking agents. For example, American Hoechst Corporation received approval for Ace-K's use in confections in late 1992, and NutraSweet received approval for encapsulated aspartame's use in baked goods.

The potential for development of low-calorie confections hinges on introduction of suitable bulking agents to replace sugar's density. Caloric sweeteners, including sugar, supply other desirable functions along with sweetness, including bulk. When confectionery is made without sugar, over half the bulk supplied by sugar must be replaced. Bulk replacers, such as sorbitol, mannitol, polydextrose, and others, are more expensive than sugar. And, the resulting confectionery—particularly the taste—is frequently less acceptable than a similar product containing sugar.

The Leading High-Intensity Sweeteners: How Sweet They Are

Aspartame

Aspartame, now the leading high-intensity sweetener, is 180 to 200 times as sweet as sugar. It was discovered by G.D. Searle and Company in 1965 and is composed of two amino acids: phenylalanine and aspartic acid. Like all other proteins, it provides 4 calories per gram. But since its sweetness is so potent, only small amounts are needed to achieve a sweetening effect equivalent to much larger amounts of sugar. Aspartame has been approved by the Food and Drug Administration (FDA) for use as a tabletop sweetener (direct sugar substitute) and in soft drinks, dry beverage mixes, chewing gum, puddings, yogurt, fruit juice beverages, and many others. Its largest current use in the United States is in diet soft drinks.

Aspartame gradually loses its sweetness in liquids as a function of time, temperature, and pH. It also loses its sweetness when exposed to high heat, as in baking. A new encapsulated form of aspartame was recently approved by FDA for baking. Encapsulation protects aspartame under high heat and releases the sweetener only during the final stage of baking.

While aspartame is priced much higher than saccharin (\$35-\$40 a pound versus \$3-\$4 a pound), aspartame's price by itself has not restricted its use. Similarly, the U.S. aspartame-using industry has learned to cope with limitations on aspartame losing sweetness when kept in liquids for considerable time, and in baking. Also, reports from a significant number of people consuming aspartame who have experienced dizziness, head-

aches, and others with allergic reactions have not been sufficiently verified by the FDA to consider limiting its use.

Saccharin

Saccharin has a sugar sweetness equivalent of 300. First discovered over 100 years ago, it is currently approved by FDA in a variety of uses, most notably as a tabletop sweetener, and in fountain diet syrups. Saccharin is not metabolized, so it has no calories. Its major drawback is a bitter aftertaste, but that can be removed by blending with other sweeteners. Saccharin has a synergistic reaction with aspartame, and the combination is used in fountain drinks. In this synergistic example, the sweetness of both sweeteners are additive, but the aftertastes cancel out each other.

Saccharin is manufactured by PMC Specialty Products. In 1977, FDA proposed to ban saccharin because research indicated that it was an animal carcinogen (caused cancer in certain laboratory animals), but Congress imposed a moratorium on the ban. Although saccharin still is somewhat stigmatized by the moratorium, it is the second most widely used high-intensity sweetener in the United States.

Acesulfame-K

Called Ace-K, Acesulfame-K is a synthetic sweetener developed by Hoechst AG. It has a sugar sweetness equivalent of 200. Ace-K also is not metabolized and so has no calories. It is stable even at cooking temperatures. It has some bitter and astringent aftertastes, but these can be masked when combined with other sweeteners.

FDA has approved Ace-K for tabletop use, chewing gum, dry bases for beverages, instant coffee and tea, gelatins, puddings, and dairy product analogs (imitation dairy products). Soft drink use has been requested, but has not yet been approved by FDA. Its main uses are in a large number of relatively small markets, such as certain flavors of chewing gum.

Several other high-intensity sweeteners are pending approval. Among these are sucralose, 600 times the sweetness of sugar and noncaloric, and alitame, 2,000 times the sweetness of sugar. Like aspartame, alitame is composed of two naturally occurring amino acids: aspartic acid and alanine. As such it is caloric, but contributes few calories because only small amounts are used due to its very intense sweetness. The sucralose and alitame petitions are for use in baked goods, beverages, chewing gum, various dessert products, sauces and syrups, and as a direct sugar substitute.

Another sweetener, cyclamate—sugar sweetness equivalent of 30—has been petitioned for reapproval. Widely used in the United States in the late 1960's in the first wave of diet beverages, cyclamate was banned in 1970 due to studies claiming it was carcinogenic. In June 1985, however, the National Academy of Sciences said cyclamate was not a carcinogen. Cyclamate is considered a high-quality sweetener with limited discernible aftertaste. And since it is water soluble, it is useful in blending and formulating sweetened foods and beverages. (Before the ban, cyclamate was frequently blended with saccharin in a 50-50 mix in soft drinks.)

Table 3

On a Sugar-Sweetness-Equivalent Basis, High-Intensity Sweeteners Are Less Expensive Than Sugar

High-intensity sweetener	Sugar sweetness equivalent (Sugar = 1)	U.S. average wholesale price Dollars per pound	Equivalent price to sugar	Estimated domestic food use Million pounds
Saccharin	300	2.50-2.85	0.01	4.0
Aspartame	180	20.00-35.00	.17	17.0
Acesulfame-K	200	20.00-35.00	.17	NA
Cyclamate	30	NA	NA	NA
Sucralose	600	NA	NA	NA
Allitame	2,000	NA	NA	NA

Note: NA = Not available. Source: Estimates from Wheat First Securities.

However, both M&M Mars and Hershey, which together command 55 percent of the U.S. confectionery market, are currently test-marketing reduced-calorie and reduced-fat candy bars. Both candies rely upon two major ingredient changes: they replace much of their fat with caprenin, a cocoa-butter substitute, and use the polydextrose product Lituse II as a bulking agent, but they do not use high-intensity sweeteners. Hershey's new 1.37-ounce candy bar contains only 150 calories and 9 grams of fat, a 25-percent reduction compared with 1.37 ounces of Hershey's milk chocolate, which has 200 calories and 12 grams of fat.

Interestingly, the sugar content of these products is actually higher than that of the traditional chocolate bar, because sugar has only 4 calories per gram versus 9 calories per gram of fat. As such, sugar acts as a relatively cheap bulking agent in the replacement of some of the fat in cocoa butter. With refined sugar costing around 25 to 30 cents per pound, and cocoa butter normally selling for over \$1 per pound, sugar costs about one-fourth the price of cocoa butter.

Regarding baked goods, FDA's approval in April 1993 of an encapsulated form of aspartame in commercial baking applications opens the way for the development and

commercialization of new types of no-sugar and reduced-calorie baked goods. However, to compensate, a baker will need to add "low-calorie" bulking agents to compensate for the smaller amount of high-intensity sweetener used.

Future Growth of High-Intensity Sweeteners May Not Be as Sweet as in Recent Years

Prospects for high-intensity sweetener use in the United States may be at a turning point. The slight decline in high-intensity sweetener use in soft drinks in 1992 shows such use does not have unlimited growth. Also, with the more rapid growth of alternative new age beverages expected in the future, prospects for greatly increasing high-intensity sweetener use in beverages are uncertain.

The outlook for high-intensity use in beverages differs greatly from that not too long ago, when forecasts of diet soft drinks rising 3-5 percent annually were not uncommon. At that time, several analysts believed diet soft drinks would eventually account for at least half of total U.S. soft drink consumption. In light of the 1992 decline, limited growth at worst,

perhaps 3-percent annual growth at best, seems to be more on target than earlier projections. Recent trends suggest per capita soft drink consumption, particularly for diet soft drinks, is reaching maturation.

Tabletop use appears likely to trend upward in the years ahead. This trend reflects population growth and the increasing trend toward eating away from home. At these eating places, consumers will have a wide array of tabletop sweetener choices—high-intensity ones as well as sugar and crystalline corn sweeteners.

High-intensity sweeteners in commercially prepared foods could be a significant growth category. Industry sources indicate that both aspartame manufacturers and high-intensity sweetener users are developing/adapting successful recipes and/or formulas for high-intensity sweetener use.

Success of these endeavors will depend on a few factors:

- How retail prices of low-calorie sweetened foods compare with similar caloric sweetened products.
- How the taste and acceptability of low-calorie sweetened foods compares with similar caloric sweetened products.
- How consumers weigh the tradeoff in consuming products containing high-intensity sweeteners compared with perceived health and safety risks.
- How much effort is put forth by the manufacturers to develop better tasting low-calorie sweetened foods, and
- How large and successful promotion and advertising budgets will be in introducing potential new consumers to newly developed and reformulated high-intensity sweetened foods.

Consumers—especially older people, an increasingly larger share

of the U.S. population—are more diet conscious and are more likely to try to consume fewer calories in the future. Over the long run, this trend of a growing population of older Americans is likely to be the basis for continued opportunities for growth in high-intensity sweeteners.

The number of new food and beverage applications is expected to continue expanding, as is the development of new and improved high-intensity sweeteners. For example, the NutraSweet Company is developing a new high-intensity sweetener called Sweetener 2000, which it hopes FDA will approve by the end of the decade. Sweetener 2000 is 10,000 times sweeter than sugar, tastes like sugar, and promises excellent stability in a variety of applications.

There is also an opportunity to make more use of blending of different high-intensity sweeteners to achieve synergies of use. For example, aspartame and Ace-K are being successfully mixed (in a 1 to 10 ratio) in beverages in Europe. Moreover, there is commercial interest in blending high-intensity, low-calorie sweeteners with the higher calorie sucrose and fructose. These blends could translate into fewer calories than sucrose and/or fructose alone, sweeter taste, and economic advantages for both food and beverage processors and consumers. These potential high-intensity caloric sweetener blends may have more applications. ■

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News from the last issue...

- World sugar production and consumption for 1993/94 is forecast at 112.4 and 114.2 million metric tons, respectively—with consumption expected to outpace production for the second straight year. Global stocks are forecast to fall, putting upward pressure on prices.
- U.S. sugar production for fiscal 1994 is forecast at 7.40 million short tons, down over 400,00 tons from last season's record. The downturn is largely due to a sharp contraction in sugarbeet production in the upper Midwest.
- U.S. consumption is forecast at 9.23 million tons, and the gap between domestically produced supplies and use will be made up from a drawdown in stocks and imports under USDA's tariff rate quota system.

Don't miss another issue!

E. coli O157:H7 Ranks as the Fourth Most Costly Foodborne Disease

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The tragedy of deaths of children linked to undercooked hamburgers in Washington State in January 1993 once again puts the spotlight on food safety. State epidemiologists and the Centers for Disease Control and Prevention (CDC) identified the illnesses in Washington, along with others in California, Nevada, and Idaho, as caused by *Escherichia coli* (known as *E. coli*) O157:H7. This bacterium has been linked to a variety of reservoirs including, as in this outbreak, undercooked ground beef. More than 500 laboratory-confirmed illnesses and 4 deaths occurred during this outbreak.

The January 1993 *E. coli* outbreak in the Western States demonstrates the difficulty of identifying the incidence of foodborne disease and the need for mandatory reporting or new data collection systems. The CDC reported: "Despite the magnitude of this outbreak, the problem may not have been recognized in three States if the epidemiological link had not been established in Washington (State)."

The authors are agricultural economists with the Commodity Economics Division, Economic Research Service, USDA.

E. coli O157:H7 Estimated To Afflict 3-8 of Every 100,000 People...

Human illnesses from *E. coli* O157:H7 are greatly underreported, as are other bacterial foodborne diseases. Beef (primarily ground beef) has been linked as the vehicle for about half the outbreaks of *E. coli* O157:H7 reported to CDC in the last decade. Unpasteurized

apple cider, unpasteurized milk, water, raw potatoes, turkey roll, and mayonnaise have also been associated with *E. coli* O157:H7 outbreaks.

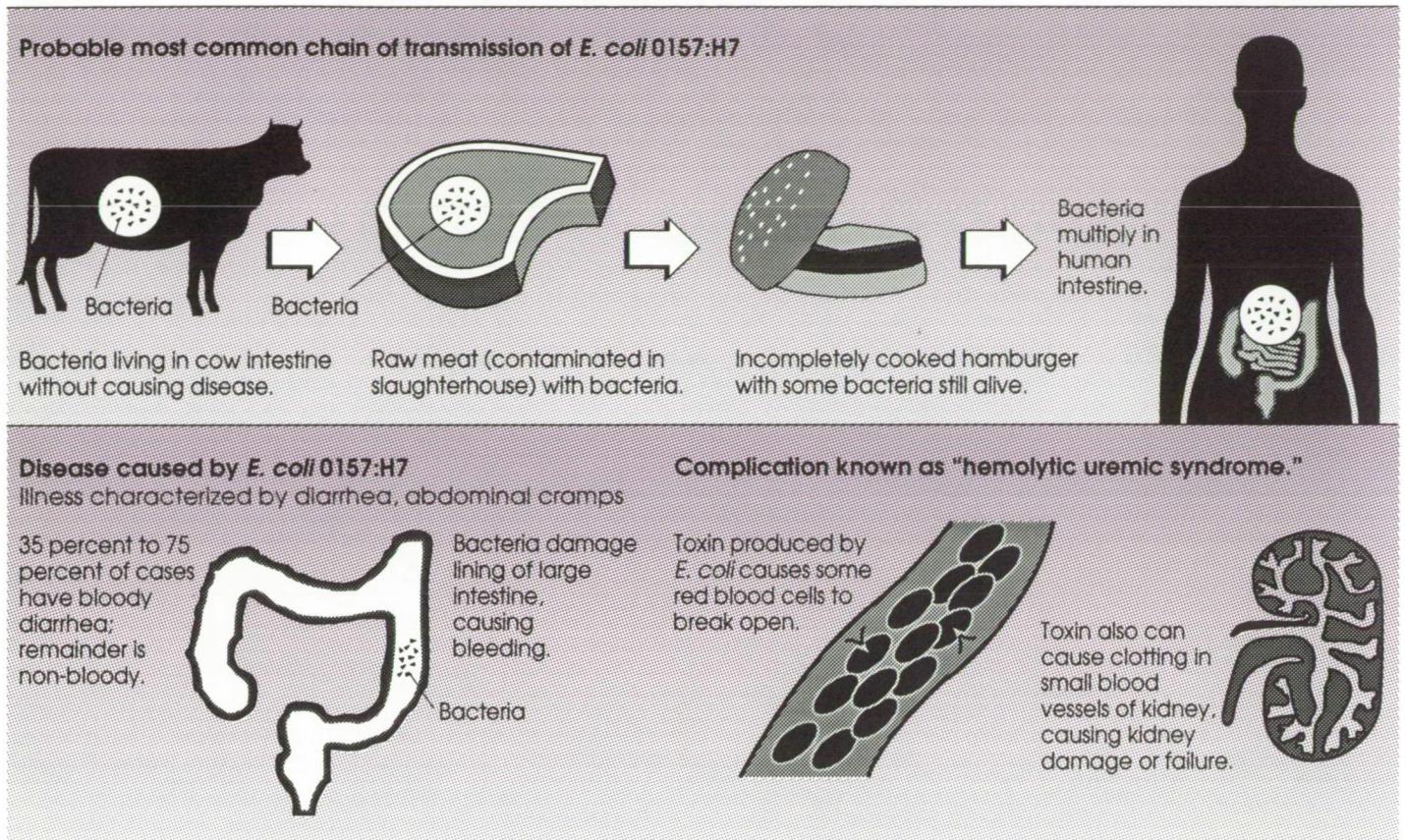
This article analyzes the costs associated with this condition. The study is based on a CDC survey of the medical literature on the history of infections caused by *E. coli* O157:H7 during the last decade. These studies have found the inci-



In the wake of 1993 E. coli outbreaks associated with raw and undercooked hamburgers, the Federal Government has tightened meat inspections and cooking requirements and is proposing labels.

Figure 1

Anatomy of a Disease Outbreak



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dence to be 3 to 8 per 100,000 Americans annually (table 1). Multiplied by the U.S. population of 255.6 million in 1992, this incidence results in 7,668 to 20,448 people annually with *E. coli* O157:H7 caused illnesses.

In addition to the tragedy of the illnesses, there are economic costs or losses associated with all foodborne diseases. Estimating the costs is technically difficult for many reasons, but is necessary to allow targeting of pathogen reduction efforts and to find the most cost-effective way of dealing with the pathogens.

USDA's Economic Research Service (ERS) has estimated the medical costs and productivity losses that can be expected to occur from *E. coli* O157:H7 infection. The estimates range from \$216 million

annually for the low estimate of cases to \$580 million annually for the high estimate (table 2). This places it as the fourth most costly foodborne disease for which ERS has estimated costs, behind one parasite (*Toxoplasma gondii*) and two bacteria (*Salmonella* and *Campylobacter*).

...With a Range of Illness Severity

E. coli O157:H7 infection especially strikes the very young or very old—those with immature or weak immune systems. Most are mild to moderate cases of diarrhea lasting 6-8 days, with bloody diarrhea occurring in about half the cases. But, the severity of illness for the estimated 7,668 to 20,448 cases varies widely.

Griffin and Tauxe, CDC researchers, reviewed the literature and estimated 18 percent of all cases are hospitalized (1,380 to 3,681 cases), 3.6 percent develop short-run kidney failure (276 to 736 cases), 1.9 percent die (145 to 389 people), and a few develop chronic kidney failure (24 to 63 cases).

The remaining 82 percent of those not hospitalized either see a physician (but are not hospitalized) or are ill but do not visit a physician. We assume that half of all cases do not seek any medical attention (3,834 to 10,224 cases) and that the remainder of the milder cases, 32 percent, do visit a physician (2,454 to 6,543 cases). This is a higher rate of physician visits than for salmonellosis, but *E. coli* O157:H7's bloody diarrhea is likely to compel people to see a physician.

Table 1
***E. coli* O157:H7 Afflicts 7,000-20,000 People in the United States Each Year—With a Range of Severity**

Severity of illness	Share of reported cases	Estimated number of cases	
		Low	High
	Percent	Number	
No physician visit	50.0	3,834	10,224
Visited physician	32.00	2,454	6,543
Hospitalized:	18.00	1,380	3,681
Hemorrhagic colitis	14.40	1,104	2,945
Recover	14.02	1,075	2,867
Acute illness deaths	.38	29	78
Hemolytic uremic syndrome (HUS)	3.60	276	736
Recover	1.77	136	362
Chronic illness	.31	24	63
Acute illness deaths	1.52	116	311
Total incidence per year	100.00	7,668	20,448

Note: Numbers may not total due to rounding.

Table 2
***E. coli* O157:H7 Causes \$216 Million to \$580 Million in Medical Costs and Productivity Losses**

Cost category	Estimated cost	
	Low	High
	Million dollars	
Medical costs	29.0	77.6
Acute illness	21.5	58.5
No physician visit	0	0
Visited physician	.4	2.0
Hospitalized		
With hemorrhagic colitis	11.7	31.3
With hemolytic uremic syndrome (HUS)	9.4	25.2
Chronic illness:		
Chronic HUS cases (present value)	7.5	19.1
Productivity losses	187.3	502.8
Acute illness	174.3	467.7
No physician visit	.6	1.7
Visited physician	.8	2.2
Hospitalized		
With hemorrhagic colitis	1.3	3.5
With HUS	.7	2.0
Deaths (present value)	170.9	458.3
Chronic illness	13.0	35.1
Chronic HUS survivors (present value)	1.9	4.8
Chronic HUS subsequent deaths (present value)	11.1	30.3
Total costs	216.3	580.4

Notes: Data may not total due to rounding. Medical costs for deaths during the acute illness are included in the hospitalization charges.

For analysis of the economic costs, we assumed that all cases that die or develop severe or chronic illness were 4 years old at the onset of the illness—the average in a Minnesota study of 117 children under age 18 with severe or chronic illness due to *E. coli* O157:H7. Others also cite several studies which identify age under 5 years as a risk factor for *E. coli* disease.

Acute Illness Medical Costs Are 10 Percent of Total Costs

E. coli O157:H7 disease syndromes range from mild abdominal discomfort to severe, often bloody, diarrhea to kidney failure and sometimes death. Medical costs range between \$21 million and \$58 million annually for these acute illnesses. The estimated cases are grouped into three disease severity levels—no physician visited, visited a physician, and hospitalized.

No Physician Visited

Mild disease includes abdominal discomfort or diarrhea with no visible signs of blood. These cases are assumed to not visit a physician or miss work. Therefore, no medical costs are computed for these 3,834 to 10,224 persons.

Physician Visit Only

These cases include moderate cases of diarrhea, often bloody, lasting several days. Medical costs for the 2,454 to 6,543 persons with moderate illness who visit a physician (at a cost of \$101 per visit for one to two visits), receive lab tests (at \$50 each), but are not hospitalized range from \$0.4 million to \$2.0 million annually (table 3).

Hospitalized

Eighty percent of hospitalizations for *E. coli* O157:H7 are for hemorrhagic colitis, typified by bloody diarrhea and severe ab-

Table 3

Hospitalized Cases Cause Most Medical Costs During the Acute Illness Associated With *E. coli* O157:H7

Medical cost by disease severity	Unit cost	Service per case	Rate per case	Estimated cases		Estimated total costs	
	Dollars	Number	Dollars	Low	High	Low	High
No physician visit	0	0	0	3,834	10,224	0	0
Visited physician:							
Physician visits	101/visit	1-2	101-202	N/A	N/A	N/A	N/A
Laboratory tests	50/case	1-2	50-100	N/A	N/A	N/A	N/A
Costs per case	N/A	N/A	151-302	2,454	6,543	0.4	2.0
Hospitalized:							
Hemorrhagic colitis—							
Hospital room	817/day	6.5	5,313	N/A	N/A	N/A	N/A
Physician fees, lab tests, etc.	817/day	6.5	5,313	N/A	N/A	N/A	N/A
Costs per case	N/A	N/A	10,627	1,104	2,945	11.7	31.3
Hemolytic uremic syndrome (HUS)—							
Hospital room	1,090/day	15	16,349	N/A	N/A	N/A	N/A
Physician fees, lab tests, etc.	1,090/day	15	16,349	N/A	N/A	N/A	N/A
Dialysis and medication	123/day	12	1,478	N/A	N/A	N/A	N/A
Costs per case	N/A	N/A	34,176	276	736	9.4	25.2
Total medical costs of acute illness from <i>E. coli</i> O157:H7	N/A	N/A	N/A	N/A	N/A	21.5	58.5

Notes: Data may not total due to rounding. N/A = Not applicable.

dominal cramps. The costs—including a regular hospital room (\$817 a day for an average of 6.5 days), physician fees, lab tests, and others (assumed to be comparable to the hospitalization fee)—for these estimated 1,104 to 2,945 cases range from \$11.7 to \$31.3 million (table 3). Since most people fully recover from hemorrhagic colitis, we assumed no chronic conditions resulted, but less than 2 percent of all cases die during the acute illness (fig. 1).

Twenty percent of hospitalizations for *E. coli* O157:H7 (276-736 cases) are assumed to develop hemolytic uremic syndrome (HUS), a severe disease characterized by kidney failure and perhaps neurological impairment. Some cases recover fully, some cases die, and a few develop chronic kidney failure—requiring lifelong dialysis or a kidney transplant. Neurological complications, such as seizures, deterioration of the central nervous system, blind-

ness, or partial paralysis, may also result.

A study of 117 HUS cases in Minnesota provided estimates of average length of stay in the hospital (15 days), average duration of dialysis in the hospital (12 days), number of cases resulting in kidney failure (8.6 percent), and the amount with neurological complications (15 percent). We estimated costs for kidney-related disease, but did not estimate costs for the neurological complications or intestinal operations (such as laparotomies or colostomies), which often occur.

Acute illness costs for the 276-736 annual hospitalized HUS cases are estimated at between \$9.4 million and \$25.2 million annually (table 3). For an individual case, 5 of the 15 days in the hospital would be in intensive care (at double the normal hospital room charge, or \$1,634 per day) and 10 days would be in a regular room (at \$817 per

day). The physician fees, laboratory tests, and other charges during hospitalization were assumed to be the same as the hospital fee. In addition, we estimated that 47 percent of these cases required dialysis at a cost of \$123 per day for an average of 12 days (the Medicare reimbursement rate for anyone on hemodialysis in a hospital).

Chronic Medical Costs Low, But High Per Case

Patients diagnosed with chronic kidney failure (approximately 24-63 cases annually) either continue hemodialysis at the hospital on an outpatient basis, receive a transplant, or switch to peritoneal dialysis for a total cost of \$7.5 million to \$19.1 million (discounted at 3 percent annually over the remaining lifetime to bring all costs to 1992 dollars—see box) (table 2).

During hemodialysis, blood is removed from the patient, sent through a machine that balances its

water and mineral content and removes toxic waste products, and then is returned to the patient. While the patient has the option to continue hemodialysis at the hospital, most (especially children) receive a kidney transplant or eventually switch to some form of peritoneal dialysis (performed within the abdominal cavity) since it allows greater freedom. Statistics for pediatric patients suffering from kidney failure show that by the end of the first year of treatment, 24 percent were undergoing hemodialysis in a facility, 29 percent were undergoing peritoneal dialysis at home, and 47 percent received a kidney transplant.

Since most individuals with chronic kidney failure receive treatment paid by the Medicare End-Stage Renal Disease Program, the societal costs are the Government reimbursements, which are equal for in-facility or at-home dialysis (\$44,958 annually). Assuming the onset of illness occurs halfway through the year (requiring 6 months of dialysis minus 12 days in the hospital that were accounted for in the acute illness phase), and

the patient has not yet received a transplant, medical costs for the initial year of treating chronic illness total \$21,001 per case.

Survival data on those receiving medical benefits under Medicare for kidney failure were used to determine HUS dialysis and kidney-transplant patient survival. Transplant costs of \$104,625 are based on Medicare reimbursement data (updated to 1992 dollars). Patients surviving the transplant require continuing drug therapy, at an annual rate of \$4,000.

High Productivity Losses Due to Loss of Lifetime Earnings

Acute illness productivity losses for the various disease severity categories are estimated to total between \$174.3 and \$467.7 million annually (table 2). Productivity losses include reduced lifetime earnings of children who die or have chronic kidney failure, the time lost from work by parents/guardians during their child's illness, and the cost of paid caretakers (see box). We assume working and daycare

arrangements are affected, because the sick child is infectious and must be cared for at home. Furthermore, we assume that the value of all parents' time is the same as that of parents working outside the home.

No Physician Visit

For the 3,834 to 10,224 children with mild illness who did not visit a physician, we estimate lost productivity for 2 work days missed by a parent or caretaker of the child. (If the average diarrheal illness lasts from 6 to 8 days, mild cases experience perhaps 4 days of illness, resulting in 2 days of work missed.) Evaluated at the average private sector wage rate (including benefits) of \$84 per day, this productivity loss totals \$0.6 to 1.7 million annually (table 4).

Physician Visit Only

For the 2,454 to 6,543 children who visit a physician but are not hospitalized, the illness requires a parent or caretaker to miss perhaps 4 work days. Evaluated at the average private sector wage rate of \$84 per day, the productivity loss totals

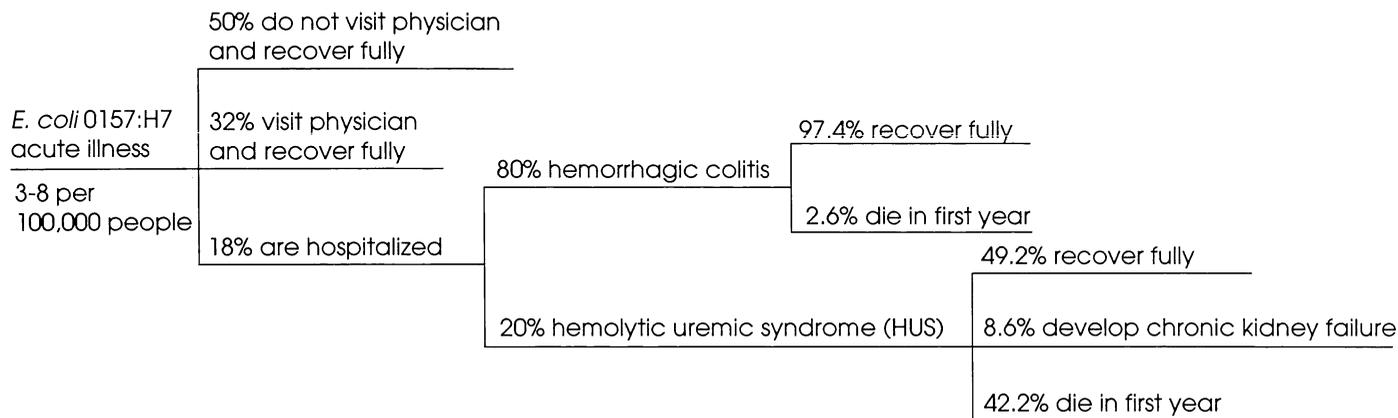
Table 4
Death Causes the Large Productivity Loss During Acute Illness From *E. coli* 0157:H7

Severity category	Average wage per case ¹	Work days missed	Estimated cases ²		Estimated costs	
			Low	High	Low	High
	Dollars	Number	Number		Million dollars	
No physician visit	84/day	2	3,834	10,224	0.6	1.7
Visited physician	84/day	4	2,454	6,543	.8	2.2
Hospitalized:						
Hemorrhagic colitis	84/day	14	1,104	2,945	1.3	3.5
Hemolytic uremic syndrome (HUS)	84/day	32	276	736	.7	2.0
Death during acute illness ³	1,178,280 per life	All	145	389	170.9	458.3
Total productivity loss for acute illness	N/A	N/A	7,668	20,448	174.3	467.7

Notes: Data may not total due to rounding. N/A = Not applicable. ¹Average weekly earnings for all private nonagricultural jobs plus fringe benefits, divided by 5 days and adjusted to 1992 prices. ²Estimated cases may not total because cases who die are also included in the hospitalization numbers. ³Present value of lifetime earnings for 4-year-olds. For those who died, the productivity lost during hospitalization is included in the hospitalization estimate.

Figure 2

While 98 Percent Survive an *E. coli* 0157:H7 Infection, It Can Cause Severe Outcomes



between \$0.8 and \$2.2 million annually (table 4).

Hemorrhagic Colitis Hospitalizations

We assumed that time spent at home recovering from illness was twice as long as the hospitalization, for a total of 19.5 days (13 days at home, 6.5 in the hospital). A parent is assumed to be with the child in the hospital and stay home with the child until he/she is well. Adjusting for weekends, the average time lost from work would be 14 days evaluated at the average wage. For the estimated 1,104 to 2,945 cases of hemorrhagic colitis, total productivity losses range from \$1.3 to \$3.5 million (table 4).

Hospitalized Cases Developing HUS

Productivity losses were estimated like those hospitalized for hemorrhagic colitis, where recuperation at home is estimated to be twice the time spent in the hospital (30 days at home, 15 days in the hospital). Adjusting for weekends, lost workdays by parents caring for children are estimated to be 32 days per case. The total acute illness productivity losses for caretakers of cases developing HUS are estimated to range from \$0.7 to \$2.0 million (table 4).

Deaths

Between 145 and 389 people infected by *E. coli* 0157:H7 die each year from acute illness, at a productivity loss of between \$171 million and \$458 million annually. Each death is valued at approximately \$1.2 million in 1992 dollars, an average of the values given for male and female children 4 years old (see box).

Chronic Productivity Costs Low, But High Per Case

The total productivity loss due to chronic illness caused by *E. coli* 0157:H7 ranges from \$13.0 to \$35.1 million annually (table 2). These productivity losses represent the sum of the economic value of those who died during the chronic illness phase, the value of lost productivity for a caretaker/parent until the child is age 16, and reduced lifetime earnings of the person with chronic kidney failure after they reach age 16.

Deaths

Over an average lifespan of 77 years, 17-42 chronic HUS patients who acquired the disease from *E. coli* 0157:H7 infection are estimated to die from complications of either

kidney dialysis or transplants, at a cost of \$11.1 million to \$30.3 million (table 2). About 7-16 of these die before the age of 16.

Survivors' Productivity Loss

A caretaker or one parent spends approximately 45 percent of his/her work day caring for a child on hemodialysis because of numerous hospital visits for the procedure. Later, when the child is able to have dialysis at home, only 1 percent of parents' or caretakers' productivity is assumed to be lost. This 1 percent continues to be lost until the child is age 16. Assuming the parent was age 25-29 years old when the child was born (the average age for a first birth), an average age of 31 is assumed for the parent of a child age 4. The value of annual productivity lost is computed at the above percentages times the average weekly earnings for the parent/caretaker and multiplied by the labor force participation rate by age group.

At age 16 and after, the HUS patient loses productivity because of reduced likelihood of working, which varies by age. Transplant recipients 16 to 40 years of age have a 23-percent productivity loss from what they would have earned without any illness, those 40-64 years old a 39-percent loss, and those 65

Determining the Dollar Value of Illness

The costs of foodborne illness are actually societal benefits foregone. That is, foodborne illness redirects societal resources away from other choices by increasing expenditures on medical services and by decreasing workers' productivity. Extra medical procedures, physician services, hospital care, and drugs are purchased. Ill workers spend time at home or in the hospital instead of at the workplace. People may also have reduced long-term productivity because of resultant chronic illness. Once these benefits are calculated, they are then balanced with the costs of foodborne disease-control methods, such as improved production practices, to determine the most cost beneficial methods to reduce or eliminate foodborne disease.

Cost of illness (COI) estimates generally include observable direct costs of medical services for illness and the indirect costs of productivity losses. Chronic illness is increasingly found to result from foodborne infection. Chronic illness estimates and its costs should also be included in COI estimates when possible.

Medical costs are estimated using nationwide databases, such as the published Medicare reimbursement rates and per capita expenditures on physicians' services from the Health Care Financing Administration, the National Center for Health Statistics' National Hospital Discharge Survey, the American Hospital Association's Hospital Statistics, or

health insurance company reimbursements.

Productivity loss measures the reduction in production because workers were ill and either missed work or performed poorly at work. The daily wage of an individual is frequently used as a proxy for the value of output produced in a day's work. The U.S. Department of Labor's Bureau of Labor Statistics reports average weekly earnings by age group, labor force participation by age and sex, and fringe benefits provided to workers. If data are not collected about time lost from work due to illness, the lost time is estimated by assuming a typical ratio of time spent in the hospital to time lost from work. Time spent by parents caring for children, as well as paid caretakers, is included in the estimates.

Lives lost due to disease are valued economically as productivity losses. We used Landefeld and Seskin's human capital/willingness to pay method, which generates the present value of expected lifetime after-tax income and housekeeping services at a 3-percent real rate of return, adjusted for an annual 1-percent increase in labor productivity, and a risk aversion premium of 60 percent.

We used Landefeld and Seskin's estimates of these values by gender and by age group. While this method includes some nonlabor income and improves upon the standard human capital

method, it still underestimates income for women and the elderly whose income is disproportionately from nonlabor sources. Consequently, we averaged the values of life across gender. However, we did not make any adjustments for the elderly.

About 85 percent of the estimated costs of illness for *E. coli* O157:H7 is for lost earnings of the people who die during the acute and chronic phases. Instead of using Landefeld and Seskin's formula that values a 4-year old at approximately \$1.2 million in 1992 dollars, alternative methods of valuing lost lives could be used. Fisher, Chestnut, and Violette's survey of the wage-risk-premium literature on the willingness to pay to prevent death concluded that reasonably consistent results of the value of a statistical life range from \$1.6 to \$8.5 million dollars (1986 dollars). These values are based on a generic value of life for the working population. Updated to 1992 dollars using the change in average weekly earnings, the range becomes \$1.9 to \$10.2 million dollars for each statistical-life lost. Substituting these estimates for the previous estimates of *E. coli* deaths increases the total estimated range for this foodborne disease from a low of \$216 million to a new low range of \$344 million to \$1,697 million annually for the low-case estimate and increases the high-case estimate of \$580 million to \$910 million to \$4,487 million annually.

years and over a 13-percent loss. Dialysis patients aged 16-40 are hit with a 37-percent loss, those aged

40-64 years a 46-percent loss, and those aged 65 and over a 5-percent loss. By the time the patients reach

age 16, 88 percent of all survivors have received transplants and 12 percent remain on dialysis.

Implications of the Costs

Estimated costs for *E. coli* O157:H7 disease total \$216 million to \$580 million a year. These estimates exclude the following costs and consequently underestimate the true value to society: 1) additional transplant operations, other operations, or treatment for neurological disease; 2) pain, suffering, and lost leisure time of the patient and her/his family; 3) lost business and lawsuits affecting the meat and restaurant industry; 4) the value of self-protective behaviors undertaken by industry and consumers; and 5) resources spent by Federal, State, and local governments to investigate the source and epidemiology of the outbreaks.

USDA has announced plans to overhaul the current meat and poultry inspection system and replace it with one that is more scientifically based. To adequately assess the true incidence of microbial foodborne disease, existing databases need to be expanded and improved. Better identification of pathogens would, for example, pinpoint which ones could be targeted for control on the farm, during processing, or during marketing. It would also enable regulatory programs to be tailored for consumers at high risk of foodborne disease.

Our research on microbial data needs shows that building an adequate foodborne disease surveillance database estimating annual incidence rates for pathogens may cost \$8 million or more a year. Such a database would include selecting a representative sample of hospitals and clinics, studying all patients with diarrheal disease, determining the incidence of causative pathogens, and identifying which are caused by food. Information from these cases—their number, severity, and economic costs—would help us to set priorities for pathogen control efforts from the farm to the fork.

Safe Handling Instructions

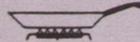
This product was prepared from inspected and passed meat and/or poultry. Some food products may contain bacteria that could cause illness if the product is mishandled or cooked improperly. For your protection, follow these safe handling instructions.



Keep refrigerated or frozen.
Thaw in refrigerator or microwave.



Keep raw meat and poultry separate from other foods.
Wash working surfaces (including cutting boards), utensils, and hands after touching raw meat or poultry.



Cook thoroughly.



Keep hot foods hot. Refrigerate leftovers immediately or discard.

USDA's labeling initiative proposes that these safe food handling instructions appear on raw meat and poultry by late spring 1994.

But the \$8-million cost for this type of surveillance database is small compared to the \$5 billion to \$6 billion in medical costs and productivity losses society is already paying for current levels of foodborne disease, and is small compared to the \$700-million annual food-inspection budget.

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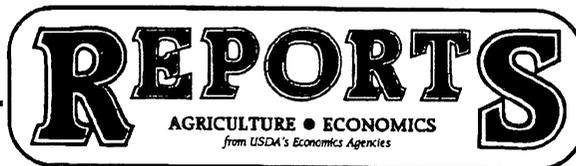
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