

numbers of electrical and electronic equipment assemblers in 2000 are shown below:

Computer and office equipment	\$11.68
Measuring and controlling devices	11.43
Electrical industrial apparatus	10.61
Communications equipment	10.23
Electronic components and accessories	9.93

Many assemblers and fabricators are members of labor unions. These unions include the International Association of Machinists and Aerospace Workers; the United Electrical, Radio and Machine Workers of America; the United Automobile, Aerospace and Agricultural Implement Workers of America; the International

Brotherhood of Electrical Workers; and the United Steelworkers of America.

Related Occupations

Other occupations that involve operating machines and tools and assembling products include welding, soldering, and brazing workers; ophthalmic laboratory technicians; and machine setters, operators, and tenders—metal and plastic.

Sources of Additional Information

Information about employment opportunities for assemblers is available from local offices of the State employment service and from locals of the unions mentioned earlier.

Food Processing Occupations

(O*NET 51-3011.01, 51-3011.02, 51.3021.00, 51-3022.00, 51-3023.00, 51-3091.00, 51-3092.00, 51-3093.00)

Significant Points

- Workers in meatpacking plants have among the highest incidences of injury and illness of all workers.
- Most employees in manual food processing jobs require little or no training prior to being hired.
- Job growth will be concentrated among lower skilled workers.

Nature of the Work

Food processing occupations include many different types of workers involved in processing raw food products into finished goods ready for sale by grocers or wholesalers, restaurants, or institutional food services. These workers perform a variety of tasks and are responsible for producing many of the food products found in every household.

Butchers and meat, poultry, and fish cutters and trimmers are employed at different stages in the process by which animal carcasses are converted into manageable pieces of meat suitable for sale to wholesales or consumers. Meat, poultry, and fish cutters and trimmers commonly work in meatpacking or fish and poultry processing plants, while butchers and meatcutters usually are employed at the retail level. As a result of this distinction, the nature of these jobs varies significantly.

In meatpacking plants, *slaughterers and meatpackers* slaughter cattle, hogs, goats, and sheep and cut the carcasses into large wholesale cuts, such as rounds, loins, ribs, and chucks, to facilitate the handling, distribution, and marketing of meat. In some of these plants, slaughterers and meatpackers also further process these primal parts into cuts that are ready for retail use. These workers also produce hamburger meat and meat trimmings, which are used to prepare sausages, luncheon meats, and other fabricated meat products. Slaughterers and meatpackers usually work on assembly lines, with each individual responsible for only a few of the many cuts needed to process a carcass. Depending on the type of cut, they use knives, cleavers, meat saws, bandsaws, or other, often dangerous, equipment.

In grocery stores, wholesale establishments that supply meat to restaurants, and institutional food service facilities, *butchers and meatcutters* separate wholesale cuts of meat into retail cuts or individual size servings. They cut meat into steaks and chops, shape

and tie roasts, and grind beef for sale as chopped meat. Boneless cuts are prepared using knives, slicers, or power cutters, while bandsaws are required to carve bone-in pieces. Butchers and meatcutters in retail food stores may also weigh, wrap, and label the cuts of meat, arrange them in refrigerated cases for display, and prepare special cuts of meat to fill unique orders.

Poultry cutters and trimmers slaughter and cut up chickens, turkeys, and other types of poultry. Although the poultry processing industry is becoming increasingly automated, many jobs such as trimming, packing, and deboning are still done manually. As in the meatpacking industry, most poultry cutters and trimmers perform routine cuts on poultry as it moves along production lines.

Unlike some of the occupations listed above, *fish cutters and trimmers*, also called *fish cleaners*, are likely to be employed in both manufacturing and retail establishments. These workers primarily cut, scale, and dress fish by removing the head, scales, and other inedible portions and cutting the fish into steaks or boneless fillets. In retail markets, they may also wait on customers and clean fish to order.

Meat, poultry, and fish cutters and trimmers also prepare ready-to-heat foods. This often entails filleting meat or fish or cutting it into bite-sized pieces, preparing and adding vegetables, or applying sauces or breading.

Bakers mix and bake ingredients in accordance with recipes to produce varying quantities of breads, pastries, and other baked goods for consumption. Bakers commonly are employed in grocery stores and specialty shops and produce small quantities of breads, pastries, and other baked goods for consumption on premises or for sale as specialty baked goods. In manufacturing, bakers produce goods in large quantities, using high-volume mixing machines, ovens, and other equipment. Goods produced in large quantities usually are for sale through establishments such as grocery stores.

Other food processing occupations include *food batchmakers*, who set up and operate equipment that mixes, blends, or cooks ingredients used in the manufacturing of food products, according to formulas or recipes; *food cooking machine operators and tenders*, who operate or tend cooking equipment, such as steam cooking vats, deep-fry cookers, pressure cookers, kettles, and boilers, to prepare food products, such as meats, sugar, cheese, and grain; and *food and tobacco roasting, baking, and drying machine operators*, who utilize equipment to reduce moisture content of food or tobacco products or to process food in preparation for canning. Some of the machines used include hearth ovens, kiln driers, roasters, char kilns, steam ovens, and vacuum drying equipment.



Food processing workers are responsible for many of the food products found in every household.

Working Conditions

Working conditions vary by type and size of establishment. In meatpacking plants and large retail food establishments, butchers and meatcutters work in large meatcutting rooms equipped with power machines and conveyors. In small retail markets, the butcher or fish cleaner may work in a space behind the meat counter. To prevent viral and bacterial infections, work areas must be kept clean and sanitary.

Butchers and meatcutters, poultry and fish cutters and trimmers, and slaughterer and meatpackers often work in cold, damp rooms, which are refrigerated to prevent meat from spoiling and are damp because meatcutting generates large amounts of blood, condensation, and fat. Cool damp floors increase the likelihood of slips and falls. In addition, the low temperature, combined with the need to stand for long periods and perform physical tasks, makes the work tiring. As a result, butchers and meat, poultry, and fish cutters are more susceptible to injury than are most other workers. In fact, meatpacking plants had the highest incidence of work-related injury and illness of any industry in 1999. More than 1 in 4 employees experienced a work-related injury or illness during that year.

Injuries include cuts, and even amputations, that occur when knives, cleavers, and power tools are used improperly. Also, repetitive slicing and lifting often lead to cumulative trauma injuries, such as carpal tunnel syndrome. To reduce the incidence of cumulative trauma disorders, some employers have reduced workloads, redesigned jobs and tools, and increased awareness of early warning signs. Nevertheless, workers in this occupation still face the serious threat of disabling injuries.

Most traditional bakers work in bakeries, cakeshops, hot breadshops, hotels, restaurants, cafeterias, and factories. They also may work in the bakery department of supermarkets and on cruise ships. Conditions for bakers may be hot and noisy. Stress is another potential factor in the bakery world, as bakers often work to strict deadlines. Bakers usually work in shifts, and may work early mornings, evenings, weekends, and holidays. While many bakers often work as part of a team, they also may work alone when baking particular items. They may supervise assistants and teach apprentices and trainees. Bakers also may be required to serve customers.

Other food processing workers such as food batchmakers, food and tobacco roasting, baking, and drying machine operators, and food cooking machine operators and tenders typically work in production areas that are specially designed for food preservation or processing. Food batchmakers in particular work in kitchen-type,

assembly-line production facilities. Because this work involves food, work areas must be sanitary and governmental regulations must be met. The ovens, as well as the motors of other equipment, often make work areas very warm. There are some hazards, such as burns, created by the equipment that these workers use. Food batchmakers, food and tobacco roasting, baking, and drying machine operators, and food cooking machine operators and tenders workers spend a great deal of time on their feet and generally work a regular 40-hour week that may include evening and night shifts.

Employment

Food processing workers held 760,000 jobs in 2000. Employment among the various types of food processing occupations was distributed as follows:

Bakers	160,000
Meat, poultry, and fish cutters and trimmers	148,000
Butchers and meatcutters	141,000
Slaughterers and meatpackers	122,000
Food batchmakers	66,000
Food cooking machine operators and tenders	37,000
Food and tobacco roasting, baking, and drying machine operators and tenders	18,000
All other food processing workers	69,000

About 33 percent of all food processing workers were employed in meatpacking or poultry and fish processing plants. Many others in this occupation were employed at the retail level in grocery stores, meat and fish markets, restaurants, or hotels. Highly skilled butchers and meatcutters, and slaughterers and meatpackers, are employed in almost every city and town in the Nation, while lower skilled meat, poultry, and fish cutter and trimmer jobs are concentrated in communities with food processing plants. Bakers and food machine operators are more commonly employed in retail establishments.

Training, Other Qualifications, and Advancement

Training varies widely among food processing occupations. However, most manual food processing workers require little or no training prior to being hired.

Most butchers, poultry, and fish cutters and trimmers acquire their skills on the job through formal and informal training programs. The length of training varies significantly. Simple cutting operations requiring a few days to learn, while more complex tasks, like eviscerating, generally require about a month to learn. On the other hand, the training period for a highly skilled butcher at the retail level may be 1 or 2 years.

Generally, on-the-job trainees begin by doing less difficult jobs, such as simple cuts or removing bones. Under the guidance of experienced workers, trainees learn the proper use of tools and equipment and how to prepare various cuts of meat. After demonstrating skill with various meatcutting tools, they learn to divide carcasses into wholesale cuts and wholesale cuts into retail and individual portions. Trainees also may learn to roll and tie roasts, prepare sausage, and cure meat. Those employed in retail food establishments often are taught operations such as inventory control, meat buying, and record keeping. In addition, growing concern about the safety of meats has led employers to offer extensive training in food safety to employees.

Skills important to meat, poultry, and fish cutters and trimmers include manual dexterity, good depth perception, color discrimination, and good hand-eye coordination. Physical strength often is needed to lift and move heavy pieces of meat. Butchers and fish cleaners who wait on customers should have a pleasant personality, a neat appearance, and the ability to communicate clearly. In some States, a health certificate is required for employment.

Bakers often start off as apprentices or trainees. Apprentice bakers usually start in craft bakeries, while in store bakeries such as supermarkets often employ trainees. Bakers need to be skilled in baking, icing, cake decorating and making calculations. They also need to be able to follow instructions, organize others, have an eye for detail, and communicate well with others. Knowledge of bakery products and ingredients, as well as mechanical mixing and baking equipment, is important. Many apprentice bakers participate in correspondence study and may work towards a certificate in baking. Working as a baker's assistant or at other activities involving handling food also is a useful tool for training. The complexity of the skills required for baker certification often is underestimated. Creating and marketing bakery products requires knowledge of applied chemistry, ingredients and nutrition, government regulations, business concepts, and production processes, including the operation and maintenance of machinery. Modern food plants utilize high-speed, automated machinery that often is operated by computers.

Food machine operators and tenders usually are trained on the job. They learn to run the different types of equipment by watching and helping other workers. Training can last anywhere from 1 month to a year, depending on the complexity of the tasks and the number of products involved. A degree in the appropriate area—dairy processing for those working in dairy product operations, for example—is helpful for advancement to a lead worker or supervisory role. Most food batchmakers participate in on-the-job training. The training period usually is moderate in length, ranging from about a month to a year. Some food batchmakers learn their trade through an approved apprenticeship program.

Food processing workers in retail or wholesale establishments may progress to supervisory jobs, such as department managers in supermarkets. A few of these workers may become buyers for wholesalers or supermarket chains. Some open their own markets or bakeries. In processing plants, workers may advance to supervisory positions or become team leaders.

Job Outlook

Overall employment of the food processing occupations is expected to grow more slowly than the average for all occupations through 2010. Job growth will be concentrated among lower skilled workers, as more meat cutting and processing shifts from retail stores to food processing plants. Nevertheless, job opportunities should be available at all levels of the occupation due to the need to replace experienced workers who transfer to other occupations or leave the labor force.

As the Nation's population grows, the demand for meat, poultry, and seafood should continue to increase. Successful marketing by the poultry industry is likely to increase demand for rotisserie chicken and ready-to-heat products. Similarly, the development of lower fat and ready-to-heat products promises to stimulate the consumption of red meat. Although per capita consumption of fish and other seafood has been constant over the last decade, population growth is expected to push consumption to record levels in coming years.

Employment growth of lower skilled meat, poultry, and fish cutters—who work primarily in meatpacking, poultry, and fish processing plants—is expected to increase about as fast as the average for all occupations in coming years. Although the growing popularity of labor-intensive, ready-to-heat goods promises to spur demand for poultry workers, much of the production of poultry and fabricated poultry products is performed by machines. Meat and fish cutters also will be in demand, as the task of preparing ready-to-heat meat and fish goods slowly shifts from retail stores to processing plants. Also, advances in fish farming, or "aquaculture," should help meet the growing demand for fish and produce ample opportunities for fish cutters.

Employment of more highly skilled butchers and meatcutters, who work primarily in retail stores, is expected to gradually decline. New automation and the consolidation of the meatpacking and poultry processing industries are enabling employers to transfer employment from higher paid butchers to lower wage slaughterers and meatpackers in meatpacking plants. At present, most red meat arrives at grocery stores partially cut up, but a growing share of meat is being delivered prepackaged, with additional fat removed, to wholesalers and retailers. This trend is resulting in less work and, thus, fewer jobs for retail butchers.

While high-volume production equipment limits the demand for bakers in manufacturing, overall employment of bakers is expected to increase due to growing numbers of large wholesale bakers, in store and specialty shops, and traditional bakeries. In addition to those of cookie, muffin, and cinnamon roll bakeries, the numbers of specialty bread and bagel shops also have been growing, spurring demand for bread and pastry bakers.

Employment of food batchmakers, food and tobacco cooking and roasting machine operators and tenders, and all other food processing workers is expected to show little or no change or decline. Although more of this work is being done at the manufacturing level rather than at the retail level, increasingly automated cooking and roasting equipment appears to be leading to reductions in employment levels.

Earnings

Earnings vary by industry, skill, geographic region, and educational level. Median annual earnings of butchers and meatcutters were \$24,120 in 2000. The middle 50 percent earned between \$18,170 and \$32,440. The highest paid 10 percent earned more than \$40,240 annually, while the lowest 10 percent earned less than \$14,340. Butchers and meatcutters employed at the retail level typically earn more than do those in manufacturing. Median annual earnings in the industries employing the largest numbers of butchers and meatcutters in 2000 were:

Grocery stores	\$25,680
Groceries and related products	22,090
Meat and fish markets	20,820
Meat products	17,980

Meat, poultry, and fish cutters and trimmers typically earn less than butchers and meat cutters. In 2000, median annual earnings for these lower skilled workers were \$16,760. The middle 50 percent earned between \$14,920 and \$19,900. The highest 10 percent earned more than \$23,490, while the lowest 10 percent earned less than \$13,310. Median annual earnings in the industries employing the largest numbers of meat, poultry, and fish cutters and trimmers in 2000 are shown below:

Grocery stores	\$18,540
Groceries and related products	18,060
Meat products	16,750
Miscellaneous food and kindred products	14,370

Median annual earnings of bakers were \$19,710 in 2000. The middle 50 percent earned between \$15,630 and \$25,570. The highest 10 percent earned more than \$31,720, and the lowest 10 percent earned less than \$13,170. Median annual earnings in the industries employing the largest numbers of bakers in 2000 are shown below:

Bakery products	\$23,010
Department stores	21,320
Grocery stores	19,220
Eating and drinking places	18,710
Retail bakeries	18,060

Median annual earnings of food batchmakers were \$20,990 in 2000. The middle 50 percent earned between \$15,980 and \$27,600. The highest 10 percent earned more than \$33,660, and the lowest 10 percent earned less than \$13,250. Median annual earnings in the industries employing the largest numbers of food batchmakers in 2000 are shown below:

Bakery products	\$24,660
Preserved fruits and vegetables	21,070
Sugar and confectionary products	20,510
Meat products	20,100
Miscellaneous food and kindred products	19,170

In 2000, median annual earnings for slaughterers and meatpackers were \$19,410. The middle 50 percent earned between \$16,620 and \$21,790. The highest 10 percent earned more than \$24,690, and the lowest 10 percent earned less than \$14,690. Median annual earnings in meat products, the industry employing the largest number of slaughters and meatpackers, were \$19,460 in 2000.

Median annual earnings for food cooking machine operators and tenders were \$20,630 in 2000. The middle 50 percent earned between \$16,000 and \$26,750. The highest 10 percent earned more than \$32,780 and the lowest 10 percent earned less than \$13,420. Median annual earnings in preserved fruits and vegetables, the industry employing the largest number of food cooking machine operators and tenders, were \$21,700 in 2000.

In 2000, median annual earnings for food and tobacco roasting, baking, and drying machine operators and tenders were \$22,690, and for all other food processing workers, \$18,170.

Food processing workers generally received typical benefits, including pension plans for union members or those employed by grocery stores. However, poultry workers rarely earned substantial benefits. In 2000, more than a third of all butchers and meatcutters were union members or covered by a union contract. Fifteen percent of all bakers and 19 percent of all food batchmakers also were union members or were covered by a union contract. Many food processing workers are members of the United Food and Commercial Workers International Union.

Related Occupations

Food processing workers must be skilled at both hand- and machine-work and must have some knowledge of processes and techniques involved in handling and preparing food. Other occupations that require similar skills and knowledge include chefs, cooks, and food preparation workers.

Sources of Additional Information

Information about work opportunities can be obtained from local employers or local offices of the State employment service. For information on training and other aspects of this trade, contact:

► United Food and Commercial Workers International Union, 1775 K St. NW., Washington, DC 20006.

Metal Workers and Plastic Workers

Computer-Control Programmers and Operators

(O*NET 51-4011.01, 51-4012.00)

Significant Points

- Workers learn in apprenticeship programs, informally on the job, and in secondary, vocational, or postsecondary schools; many entrants have previously worked as machinists or machine setters, operators, and tenders.
- Job opportunities will be excellent, as employers are expected to continue to have difficulty finding qualified workers.

Nature of the Work

Computer-control programmers and operators use computer numerically controlled (CNC) machines to cut and shape precision products, such as automobile parts, machine parts, and compressors. CNC machines include metal-machining tools such as lathes, multi-axis spindles, and milling machines, but the functions formerly performed by human operators are performed by a computer-control module. CNC machines cut away material from a solid block of metal, plastic, or glass—known as a workpiece—to form a finished part. Computer-control programmers and operators normally produce large quantities of one part, although they may produce small batches or one-of-a-kind items. They use their knowledge of the working properties of metals and their skill with

CNC programming to design and carry out the operations needed to make machined products that meet precise specifications.

Before CNC programmers—also referred to as numerical tool and process control programmers—machine a part, they must carefully plan and prepare the operation. First, these workers review three-dimensional computerized engineering diagrams (blueprints) of the part. Next, they calculate where to cut or bore into the workpiece, how fast to feed the metal into the machine, and how much metal to remove. They then select tools and materials for the job and plan the sequence of cutting and finishing operations.

Next, computer-control programmers turn the planned machining operations into a set of instructions. These instructions are translated into a computer program containing a set of commands for the machine to follow. The program is then saved onto a computer, which functions as a server. Computer-control programmers and operators check new programs to ensure that the machinery will function properly and that the output will meet specifications. Because a problem with the program could damage costly machinery and cutting tools, computer simulations may be used to check the program instead of a trial run. If errors are found, the program must be changed and retested until the problem is resolved. In addition, growing connectivity between computer-aided design (CAD) software and CNC machine tools is raising productivity by automatically translating designs into instructions for the computer controller on the machine tool. These new computer-automated manufacturing (CAM) technologies enable programs to be easily modified for use on other jobs with similar specifications, thereby reducing time and effort.

After the programming work is completed, computer-controlled machine tool operators, metal and plastic (CNC operators), perform the necessary machining operations. The CNC operators transfer