

Greater awareness of the importance of early identification and diagnosis of speech, language, and hearing disorders will also increase employment.

The number of speech-language pathologists and audiologists in private practice will rise due to the increasing use of contract services by hospitals, schools, and nursing homes. In addition to job openings stemming from employment growth, some openings for speech-language pathologists and audiologists will arise from the need to replace those who leave the occupation.

Earnings

Median annual earnings of speech-language pathologists were \$46,640 in 2000. The middle 50 percent earned between \$37,670 and \$56,980. The lowest 10 percent earned less than \$30,720, and the highest 10 percent earned more than \$69,980. Median annual earnings in the industries employing the largest numbers of speech-language pathologists in 2000 were as follows:

Hospitals	\$49,960
Offices of other health practitioners	47,170
Elementary and secondary schools	43,710

Median annual earnings of audiologists were \$44,830 in 2000. The middle 50 percent earned between \$37,000 and \$55,290. The lowest 10 percent earned less than \$30,850, and the highest 10 percent earned more than \$68,570.

According to a 2000 survey by the American Speech-Language-Hearing Association, the median annual salary for full-time certified speech-language pathologists who worked 11 or 12 months annually was \$44,000; for audiologists, \$48,000. For those who worked 9 or 10 months annually, the median annual salary for speech-language pathologists was \$41,000; for audiologists, \$45,000. Speech-language pathologists with doctorate degrees who worked 11 or 12 months annually earned \$62,500; and audiologists, \$70,000.

Related Occupations

Speech-language pathologists and audiologists specialize in the prevention, diagnosis, and treatment of speech and language and hearing problems. Workers in related occupations include occupational therapists, optometrists, physical therapists, psychologists, recreational therapists, and rehabilitation counselors.

Sources of Additional Information

State licensing boards can provide information on licensure requirements. State departments of education can supply information on certification requirements for those who wish to work in public schools.

General information on careers in speech-language pathology and audiology is available from:

► American Speech-Language-Hearing Association, 10801 Rockville Pike, Rockville, MD 20852. Internet: <http://professional.asha.org>

Information on a career in audiology is also available from:

► American Academy of Audiology, 8201 Greensboro Dr., Suite 300, McLean, VA 22102.

Veterinarians

(O*NET 29-1131.00)

Significant Points

- Graduation from an accredited college of veterinary medicine and a license to practice are required.
- Competition for admission to veterinary school is keen.

Nature of the Work

Veterinarians play a major role in the healthcare of pets, livestock, and zoo, sporting, and laboratory animals. Some veterinarians use their skills to protect humans against diseases carried by animals and conduct clinical research on human and animal health problems. Others work in basic research, broadening the scope of fundamental theoretical knowledge, and in applied research, developing new ways to use knowledge.

Most veterinarians perform clinical work in private practices. More than one-half of these veterinarians predominately, or exclusively, treat small animals. Small animal practitioners usually care for companion animals, such as dogs and cats, but also treat birds, reptiles, rabbits, and other animals that can be kept as pets. Some veterinarians work in mixed animal practices where they see pigs, goats, sheep, and some nondomestic animals, in addition to companion animals. Veterinarians in clinical practice diagnose animal health problems; vaccinate against diseases, such as distemper and rabies; medicate animals suffering from infections or illnesses; treat and dress wounds; set fractures; perform surgery; and advise owners about animal feeding, behavior, and breeding.

A small number of private practice veterinarians work exclusively with large animals, focusing mostly on horses or cows but may also care for various kinds of food animals. These veterinarians usually drive to farms or ranches to provide veterinary services for herds or individual animals. Much of this work involves preventive care to maintain the health of the food animals. These veterinarians test for



Veterinarians perform a variety of medical services on animals such as cats and dogs.

and vaccinate against diseases and consult with farm or ranch owners and managers on animal production, feeding, and housing issues. They also treat and dress wounds, set fractures, and perform surgery—including cesarean sections on birthing animals. Veterinarians also euthanize animals when necessary. Other veterinarians care for zoo, aquarium, or laboratory animals.

Veterinarians who treat animals use medical equipment, such as stethoscopes; surgical instruments; and diagnostic equipment, such as radiographic and ultra-sound equipment. Veterinarians working in research use a full range of sophisticated laboratory equipment.

Veterinarians can contribute to human as well as animal health. A number of veterinarians work with physicians and scientists as they research ways to prevent and treat human health problems, such as cancer, AIDS, and alcohol or drug abuse. Some determine the effects of drug therapies, antibiotics, or new surgical techniques by testing them on animals.

Some veterinarians are involved in food safety at various levels. Veterinarians who are livestock inspectors check animals for transmissible diseases, advise owners on treatment, and may quarantine animals. Veterinarians who are meat, poultry, or egg product inspectors examine slaughtering and processing plants, check live animals and carcasses for disease, and enforce government regulations regarding food purity and sanitation.

Working Conditions

Veterinarians often work long hours, with well over one-third of full-time workers spending 50 or more hours on the job. Those in group practices may take turns being on call for evening, night, or weekend work; and solo practitioners can work extended and weekend hours, responding to emergencies or squeezing in unexpected appointments.

Veterinarians in large animal practice also spend time driving between their office and farms or ranches. They work outdoors in all kinds of weather, and have to treat animals or perform surgery under less-than-sanitary conditions. When working with animals that are frightened or in pain, veterinarians risk being bitten, kicked, or scratched.

Veterinarians working in non-clinical areas, such as public health and research, have working conditions similar to those of other professionals in those lines of work. In these cases, veterinarians enjoy clean, well lit offices or laboratories and spend much of their time dealing with people rather than animals.

Employment

Veterinarians held about 59,000 jobs in 2000. About 28 percent were self-employed in solo or group practices. Most others were employees of another veterinary practice. The Federal Government employed about 800 civilian veterinarians, chiefly in the U.S. Departments of Agriculture and Health and Human Services. Other employers of veterinarians are State and local governments, colleges of veterinary medicine, medical schools, research laboratories, animal food companies, and pharmaceutical companies. A few veterinarians work for zoos; but most veterinarians caring for zoo animals are private practitioners who contract with zoos to provide services, usually on a part-time basis.

Training, Other Qualifications, and Advancement

Prospective veterinarians must graduate from a 4-year program at an accredited college of veterinary medicine with a Doctor of Veterinary Medicine (D.V.M. or V.M.D.) degree and obtain a license to practice. There are 27 colleges in 26 States that meet accreditation standards set by the Council on Education of the American Veterinary Medical Association. The prerequisites for admission vary by veterinary medical college. Many of these colleges do not require a bachelor's degree for entrance; but all require a significant number

of credit hours—ranging from 45 to 90 semester hours—at the undergraduate level. However, most of the students admitted have completed an undergraduate program.

Preveterinary courses emphasize the sciences; and veterinary medical colleges typically require classes in organic and inorganic chemistry, physics, biochemistry, general biology, animal biology, animal nutrition, genetics, vertebrate embryology, cellular biology, microbiology, zoology, and systemic physiology. Some programs require calculus; some require only statistics, college algebra and trigonometry, or precalculus; and others require no math at all. Most veterinary medical colleges also require core courses, including some in English or literature, the social sciences, and the humanities.

Most veterinary medical colleges will only consider applicants who have a minimum grade point average (GPA). The required GPA varies by school, from a low of 2.5 to a high of 3.2, based on a maximum GPA of 4.0. However, the average GPA of candidates at most schools is higher than these minimums. Those who receive offers of admission usually have a GPA of 3.0 or better.

In addition to satisfying preveterinary course requirements, applicants must also submit test scores from the Graduate Record Examination (GRE), the Veterinary College Admission Test (VCAT), or the Medical College Admission Test (MCAT), depending on the preference of each college.

Additionally, in the admissions process, veterinary medical colleges weigh heavily a candidate's veterinary and animal experience. Formal experience, such as work with veterinarians or scientists in clinics, agribusiness, research, or in some area of health science, is particularly advantageous. Less formal experience, such as working with animals on a farm or ranch or at a stable or animal shelter, is also helpful. Students must demonstrate ambition and an eagerness to work with animals.

Competition for admission to veterinary school is keen. The number of accredited veterinary colleges has remained at 27 since 1983, whereas the number of applicants has risen. About 1 in 3 applicants was accepted in 1998. Most veterinary medical colleges are public, State-supported institutions and reserve the majority of their openings for in-state residents. Twenty-one States that do not have a veterinary medical college agree to pay a fee or subsidy to help cover the cost of veterinary education for a limited number of their residents at one or more out-of-state colleges. Nonresident students who are admitted under such a contract may have to pay out-of-state tuition, or they may have to repay their State of residency all, or part, of the subsidy provided to the contracting college. Residents of the remaining 3 States (Connecticut, Maine, and Vermont) and the District of Columbia may apply to any of the 27 veterinary medical colleges as an *at-large* applicant. The number of positions available to at-large applicants is very limited at most schools, making admission difficult.

While in veterinary medical college, students receive additional academic instruction in the basic sciences for the first 2 years. Later in the program, students are exposed to clinical procedures, such as diagnosing and treating animal diseases and performing surgery. They also do laboratory work in anatomy, biochemistry, medicine, and other scientific subjects. At most veterinary medical colleges, students who plan a career in research can earn both a D.V.M. degree and a Doctor of Philosophy (Ph.D.) degree at the same time.

Veterinary graduates who plan to work with specific types of animals or specialize in a clinical area, such as pathology, surgery, radiology, or laboratory animal medicine, usually complete a 1-year internship. Interns receive a small salary but usually find that their internship experience leads to a higher beginning salary, relative to other starting veterinarians. Veterinarians who seek board certification in a specialty must also complete a 2- to 3-year residency program that provides intensive training in specialties, such as

internal medicine, oncology, radiology, surgery, dermatology, anesthesiology, neurology, cardiology, ophthalmology, and exotic small animal medicine.

All States and the District of Columbia require that veterinarians be licensed before they can practice. The only exemptions are for veterinarians working for some Federal agencies and some State governments. Licensing is controlled by the States and is not strictly uniform, although all States require successful completion of the D.V.M. degree—or equivalent education—and passage of a national board examination. The Educational Commission for Foreign Veterinary Graduates (ECFVG) grants certification to individuals trained outside the U.S. who demonstrate that they meet specified requirements for the English language and clinical proficiency. ECFVG certification fulfills the educational requirement for licensure in all States except Nebraska. Applicants for licensure satisfy the examination requirement by passing the North American Veterinary Licensing Exam (NAVLE), which recently replaced the National Board Examination (NBE) and the Clinical Competency Test (CCT). The new NAVLE, administered on computer, takes one day to complete and consists of 360 multiple-choice questions, covering all aspects of veterinary medicine. The NAVLE also includes visual materials designed to test diagnostic skills.

The majority of States also require candidates to pass a State jurisprudence examination covering State laws and regulations. Some States also do additional testing on clinical competency. There are few reciprocal agreements between States, making it difficult for a veterinarian to practice in a different State without first taking another State examination.

Forty-one States have continuing education requirements for licensed veterinarians. Requirements differ by State and may involve attending a class or otherwise demonstrating knowledge of recent medical and veterinary advances.

Most veterinarians begin as employees or partners in established practices. Despite the substantial financial investment in equipment, office space, and staff, many veterinarians with experience set up their own practice or purchase an established one.

Newly trained veterinarians can become U.S. Government meat and poultry inspectors, disease-control workers, epidemiologists, research assistants, or commissioned officers in the U.S. Public Health Service, U.S. Army, or U.S. Air Force. A State license may be required.

Prospective veterinarians must have good manual dexterity. They should have an affinity for animals and the ability to get along with animal owners. Additionally, they should be able to quickly make decisions in emergencies.

Job Outlook

Employment of veterinarians is expected to grow faster than the average for all occupations through the year 2010. Job openings stemming from the need to replace veterinarians who retire or otherwise leave the labor force will be almost as numerous as new jobs resulting from employment growth over the 2000-10 period.

Most veterinarians practice in animal hospitals or clinics and care primarily for companion animals. The number of dogs as pets is expected to increase more slowly during the projection period than in the previous decade. However, faster growth of the cat population is expected to increase the demand for feline medicine and veterinary services, offsetting any reduced demand for veterinary care for dogs. Also, as non-necessity income generally increases with age, those who own pets may be more inclined to seek veterinary services. Small increases in the total number of household pets, coupled with the movement of baby boomers into the 34 to 59 year age group, means that the willingness by pet owners to pay for veterinary services should continue. In addition, pet owners are

becoming more aware of the availability of advanced care and may increasingly take advantage of nontraditional veterinary services, such as preventive dental care, and may more willingly pay for intensive care than in the past. Finally, new technologies and medical advancements should permit veterinarians to offer better care to animals.

New graduates continue to be attracted to small animal medicine because they prefer to deal with pets and to live and work near highly populated areas. This situation will not necessarily limit the ability of veterinarians to find employment or to set up and maintain a practice in a particular area. Rather, beginning veterinarians may take positions requiring evening or weekend work to accommodate the extended hours of operation that many practices are offering. Some veterinarians take salaried positions in retail stores offering veterinary services. Self-employed veterinarians usually have to work hard and long to build a sufficient client base.

The number of jobs for large animal veterinarians is expected to grow slowly, because productivity gains in the agricultural production industry mean demand for fewer veterinarians than before to treat food animals. Nevertheless, job prospects may be better for veterinarians who specialize in farm animals than for small animal practitioners, because most veterinary medical college graduates do not have the desire to work in rural or isolated areas.

Continued support for public health and food safety, international and national disease control programs, and biomedical research on human health problems will contribute to the demand for veterinarians, although such positions are few in number. However, anticipated budget tightening in the Federal Government may lead to low funding levels for some programs, limiting job growth. Veterinarians with training in public health and epidemiology should have the best opportunities for a career in the Federal Government.

Earnings

Median annual earnings of veterinarians were \$60,910 in 2000. The middle 50 percent earned between \$47,020 and \$84,220. The lowest 10 percent earned less than \$36,670, and the highest 10 percent earned more than \$128,720.

According to a survey by the American Veterinary Medical Association, average starting salaries of 2000 veterinary medical college graduates varied by type of practice as follows:

Small animal, predominant	\$42,918
Small animal, exclusive	42,640
Large animal, exclusive	41,629
Large animal, predominant	41,439
Mixed animal	40,358
Equine	28,526

New veterinary medical college graduates who enter the Federal Government usually start at \$35,808. Beginning salaries were slightly higher in selected areas where the prevailing local pay level was higher. The average annual salary for veterinarians in the Federal Government in nonsupervisory, supervisory, and managerial positions was \$ 67,482 in 2001.

Related Occupations

Veterinarians prevent, diagnose, and treat diseases, disorders, and injuries in animals. Those who do similar work for humans include chiropractors, dentists, optometrists, physicians and surgeons, and podiatrists. Veterinarians have extensive training in physical and life sciences, and some do scientific and medical research, closely paralleling occupation biological and medical scientists.

Animal care and service workers and veterinary technologists, technicians and assistants work extensively with animals. Like veterinarians, they must have patience and feel comfortable with

animals. However, the level of training required for these occupations is substantially less than that needed by veterinarians.

Sources of Additional Information

For additional information on careers in veterinary medicine and a list of U.S. schools and colleges of veterinary medicine and accreditation policies, send a letter-size, self-addressed, stamped envelope to:

► American Veterinary Medical Association, 1931 N. Meacham Rd., Suite 100, Schaumburg, IL 60173-4360. Internet: <http://www.avma.org>

For information on veterinary education, write to:

► Association of American Veterinary Medical Colleges, 1101 Vermont Ave. NW., Suite 710, Washington, DC 20005. Internet:

<http://www.aavmc.org>

For information on scholarships, grants, and loans, contact the financial aid officer at the veterinary schools to which you wish to apply.

Health Technologists and Technicians

Cardiovascular Technologists and Technicians

(O*NET 29-2031.00)

Significant Points

- Employment will grow faster than the average, but the number of job openings created will be low, because the occupation is small.
- Job prospects will be good due to an aging population and increased need for vascular technology and sonography as an alternative for more costly and invasive heart surgery.
- About 7 out of 10 jobs are in hospitals, in both inpatient and outpatient settings.

Nature of the Work

Cardiovascular technologists and technicians assist physicians in diagnosing and treating cardiac (heart) and peripheral vascular (blood vessel) ailments. Cardiovascular technologists may specialize in three areas of practice: Invasive cardiology, echocardiography, and vascular technology. Cardiovascular technicians who specialize in electrocardiograms (EKGs), stress testing, and Holter monitors are known as *cardiographic* or *EKG technicians*.

Cardiovascular technologists specializing in invasive procedures are called *cardiology technologists*. They assist physicians with cardiac catheterization procedures in which a small tube, or catheter, is wound through a patient's blood vessel from a spot on the patient's leg into the heart. The procedure can determine if a blockage exists in the blood vessels that supply the heart muscle and help diagnose other problems. Part of the procedure may involve balloon angioplasty, which can be used to treat blockages of blood vessels or heart valves, without the need for heart surgery. Cardiology technologists assist physicians as they insert a catheter with a balloon on the end to the point of the obstruction.

Technologists prepare patients for cardiac catheterization and balloon angioplasty by first positioning them on an examining table and then shaving, cleaning, and administering anesthesia to the top of the patient's leg near the groin. During the procedures, they monitor patients' blood pressure and heart rate using EKG equipment and notify the physician if something appears wrong. Technologists also may prepare and monitor patients during open-heart surgery and the implantation of pacemakers.

Cardiovascular technologists who specialize in echocardiography or vascular technology often run noninvasive tests using ultrasound instrumentation, such as doppler ultrasound. Tests are called

"noninvasive" if they do not require the insertion of probes or other instruments into the patient's body. The ultrasound instrumentation transmits high frequency sound waves into areas of the patient's body and then processes reflected echoes of the sound waves to form an image. Technologists view the ultrasound image on a screen that may be recorded on videotape or photographed for interpretation and diagnosis by a physician. While performing the scan, technologists check the image on the screen for subtle differences between healthy and diseased areas, decide which images to include, and judge if the images are satisfactory for diagnostic purposes. They also explain the procedure to patients, record additional medical history, select appropriate equipment settings, and change the patient's position as necessary. (See the statement on diagnostic medical sonographers elsewhere in the *Handbook* to learn more about other sonographers.)

Those who assist physicians in the diagnosis of disorders affecting circulation are known as *vascular technologists* or *vascular sonographers*. They perform a medical history and evaluate pulses by listening to the sounds of the arteries for abnormalities. Then they perform a noninvasive procedure using ultrasound instrumentation to record vascular information, such as vascular blood flow, blood pressure, limb volume changes, oxygen saturation, cerebral circulation, peripheral circulation, and abdominal circulation. Many of these tests are performed during or immediately after surgery.

Technologists who use ultrasound to examine the heart chambers, valves, and vessels are referred to as *cardiac sonographers*, or *echocardiographers*. They use ultrasound instrumentation to create images called echocardiograms. This may be done while the patient is either resting or physically active. Technologists may administer medication to a physically active patient to assess their heart function. Cardiac sonographers may also assist physicians who perform transesophageal echocardiography, which involves placing a tube in the patient's esophagus to obtain ultrasound images.

Cardiovascular technicians who obtain EKGs are known as *electrocardiograph* (or *EKG*) *technicians*. To take a basic EKG, which traces electrical impulses transmitted by the heart, technicians attach electrodes to the patient's chest, arms, and legs, and then manipulate switches on an EKG machine to obtain a reading. A printout is made for interpretation by the physician. This test is done before most kinds of surgery and as part of a routine physical examination, especially for persons who have reached middle age or have a history of cardiovascular problems.

EKG technicians with advanced training perform Holter monitor and stress testing. For Holter monitoring, technicians place electrodes on the patient's chest and attach a portable EKG monitor to the patient's belt. Following 24 or more hours of normal activity for the patient, the technician removes a tape from the monitor and places it in a scanner. After checking the quality of the recorded impulses on an electronic screen, the technician usually prints the