injury (23,509 children), and other health impairments (561,028 children). These four areas comprised approximately 13 percent of the students receiving a special education, with a range of .38 percent (traumatic brain injury) to 9.1 percent (other health impairments). Pupils with deaf-blindness (1,592 children) were reported as making up only .02 percent of all individuals receiving a special education. This figure, however, is thought to be underestimated because many children who are deaf-blind are placed in other categories (for example, multiple disabilities) when they have additional physical or intellectual impairments.

Etiology of Physical Disabilities, Health Disabilities, and Related Low-Incidence Disabilities

The etiology (or cause) of physical and health disabilities varies greatly according to the specific disease or disorder. Some of the most common etiologies resulting in physical and health disabilities are genetic and chromosomal defects, teratogenic causes, prematurity and complications of pregnancy, and acquired causes. In some cases, certain physical or health disabilities have multiple etiologies. For example, cerebral palsy can be caused by prenatal abnormalities, biochemical abnormalities, genetic causes, congenital infections, environmental toxins, prematurity-associated complications, or postnatal events (Griffin, Fitch, & Griffin, 2002; Heller & Tumlin-Garrett, 2009). On the other hand, the exact cause of some physical and health disabilities are unknown.

Chromosomal and Genetic Causes

Among the most common causes of physical and health disabilities are hereditary conditions resulting from defects in one or both parents' chromosomes or genes. Several genetic defects are believed to contribute to a range of physical and health disabilities, such as muscular dystrophy, sickle cell anemia, hemophilia, and cystic fibrosis (Heller, 2009b; Heller, Mezei, & Schwartzman, 2009). In some cases, infants may be born with several disabilities resulting from an inherited congenital syndrome (for example, Cockayne syndrome, which can result in mental retardation, dwarfism, deaf-blindness, unsteady gait, and tremors). In these examples, the inherited gene clearly causes the disease or disorder.

Although there are about sixty genetic causes of deaf-blindness (DB-Link, 2007), we have chosen only two illustrative syndromes. Our first example is **CHARGE Association** (syndrome), which represents a collection of physical irregularities present at birth. This syndrome is an extremely complex disorder typically involving extensive medical as well as physical challenges. CHARGE Association is a relatively rare disorder occurring in 1 out of every 9,000–10,000 births. In the vast majority of cases, there is no history of CHARGE syndrome or any other similar condition in the family (CHARGE Syndrome Foundation, 2007). CHARGE is an acronym that stands for

C = coloboma, a congenital condition resulting from an unusually shaped (teardrop) pupil and/or other abnormalities of the eye contributing to difficulties with depth perception, visual acuity, and sensitivity to light

H = heart defects, which may range from minor to life-threatening conditions

A = atresia, complications of the respiratory system

First Person

Virginia

As early as the fourth grade I became aware that I probably didn't see as well as others in the dark. But not being able to see at night just seemed like it should be normal.

However, in seventh grade, in anticipation of our Washington, D.C. school trip, I was a little worried about the whole not being able to see at night thing, so my mom and I went to talk to the school nurse who was also going on the trip. She checked my eyes and said that I just needed glasses (not that that had anything to do with not being able to see in the dark). My mom made an appointment with the eye doctor, and he also said that I needed glasses. My dad told the doctor that the main reason for the appointment was to find out why I couldn't see in the dark. He examined my eyes again and said that I would have to take some additional tests at Emory University.

The summer before eighth grade I discovered the real reason I couldn't see in the dark: I had Usher syndrome. I couldn't believe it, and I didn't want to believe it. I didn't want to lose a sense that was so very precious to me. I used my sight not only to get around but also, because of my hearing loss, for lipreading. At such a young age, I was worried about being "normal." For the next two years I was in a state of denial. I refused to talk about my condition, and if I was forced to talk about it, it only brought pain. How could I, a person who relied so heavily on sight to communicate, lose my vision? It just didn't seem fair, and I felt so alone. No one knew or understood what I was going through. Of course, I had my family and friends supporting me, but I still felt alone.

It wasn't until I was 15 that I began to accept my deaf-blindness. Now I'm OK with my disability. While I have learned to accept my vision as something that has shaped who I am today, I am in no way completely cured of all my emotional pain. No way! I still struggle with adjusting to the changes in my vision. I worry about completing college and what the future holds. There are some days when I get so frustrated that all I want to do is run away and scream. It's hard, but all I can do is take one day at a time and trust that God has an awesome plan for my life.

R = retarded physical growth; in some instances mental retardation is also present

G = genital abnormalities—incomplete or underdeveloped genitals, more common in males

E = ear defects, structural deformities in the outer, middle, or inner ear; hearing loss may range from mild to profound (Alabama Institute for Deaf and Blind, 2007; CHARGE Syndrome Foundation)

In order to make a diagnosis of CHARGE, four of the preceding six characteristics must be present. In addition, children who exhibit this syndrome frequently experience high levels of anxiety while also displaying compulsive behaviors (Silberman, Bruce, & Nelson, 2004).

Our second illustration is **Usher syndrome**. This inherited disorder is one of the leading causes of deaf-blindness after childhood. Approximately 1 in 20,000 individuals is born with this condition (Alabama Institute for Deaf and Blind, 2007). Usher syndrome results in congenital deafness, progressive vision loss (retinitis pigmentosa), and, in some children, mental retardation. Vision difficulties are typically noted in adolescence or early adulthood, eventually leading to night blindness and tunnel vision. Hearing loss is evidenced in both ears and is usually in the moderate (45–55 dB) to severe (71–90 dB) range. Significant balance difficulties are also associated with this syndrome. (See the accompanying First Person feature.)

Nationally, approximately 3 percent of students exhibit deaf-blindness as a result of Usher syndrome (Gallaudet Research Institute, 2005). Interestingly, in parts of south Louisiana the Acadian French (Cajuns) have a much higher prevalence rate. In fact, some 30 percent of the deaf population in three parishes (counties) exhibit Usher syndrome, while an estimated 15 to 20 percent of the students enrolled in the Louisiana School for the Deaf have this disorder (Melancon, 2000). This phenomenon is most likely the consequence of years of intermarriage in this close-knit ethnic community.

Finally, some 17 percent of children who are deaf-blind evidence this disability at birth or within the first five years of life. The overwhelming majority of students with deaf-blindness, however, are adventitiously deaf-blind, that is, they are born with both vision and hearing but lose some or all of these senses as a result of illness or injury (Miles, 2005; National Consortium on Deaf-Blindness, 2007). How deaf-blindness impacts a child's development depends on several key variables, including age of onset, the degree and type of hearing and vision loss, the stability of each sensory loss, and, perhaps most important, the educational interventions provided (Alabama Institute for Deaf and Blind, 2007).

Teratogenic Causes

Many physical and health disabilities are caused by teratogenic agents that affect the developing fetus. **Teratogens** are outside causes, such as infections, drugs, chemicals, or environmental agents, that can produce fetal abnormalities.

Certain congenital infections can result in severe multiple disabilities in the unborn child. Infections are acquired by the mother and then passed on to the developing fetus. Several prenatal infections that may result in severe birth defects are referred to by the acronym STORCH—syphilis, toxoplasmosis, other, rubella, cytomegalovirus, and herpes. The effects of these infections on the fetus can vary from no adverse effect to severe disabilities or death. A baby who contracts one of these infections during gestation may be born with cerebral palsy, blindness, deafness, mental retardation, and several other abnormalities, including heart defects, kidney defects, brain abnormalities, and deaf-blindness (Best & Heller, 2009b).

The fetus is also at risk of developing physical and health disabilities when exposed to certain drugs, chemicals, or environmental agents. Maternal abuse of alcohol, for example, has been linked to a range of physical, cognitive, and behavioral abnormalities that can result in lifelong damage (Merrick, Merrick, Morad, & Kandel, 2006; Tsai, Floyd, Green, & Boyle, 2007). Serious fetal abnormalities can also occur as a result of prescription medications taken for maternal illness or disease (for example, certain antibiotics and seizure medications). Environmental toxins such as radiation have been linked to birth defects, as have dietary deficiencies. Certain maternal diseases, such as diabetes, have also been associated with a higher risk of fetal disability. Maternal trauma from falls or car accidents can cause bleeding in the fetus's brain, resulting in neurological impairments (Akman, 2000).

Prematurity and Complications of Pregnancy

Infants are usually born at approximately 40 weeks of gestation, weighing approximately 7½ pounds (Kliegman, Behrman, Jensen, & Stanton, 2007). An infant born before 37 weeks is considered premature.

Infants who are premature and born with very low birth weight (less than 1,500 grams) are at risk of having disabilities. These infants can develop neurological problems resulting

in cerebral palsy, epilepsy, vision loss, hearing loss, deaf-blindness, and/or psychosis (Valcamonico et al., 2007). Cognitive functioning can be affected, resulting in mental retardation or learning disabilities, which can lead to future educational difficulties (Hille et al., 2007).

In some instances, babies that are born on time and with average weight encounter complications during the perinatal period. The most common cause of brain injury during the perinatal period is asphyxia—a decrease of oxygen in the blood. Among infants who survive an episode of asphyxia, several disabilities may occur such as cerebral palsy, epilepsy, and cognitive deficits (Rennie, Hagmann, & Robertson, 2007).

Acquired Causes

Many physical and health disabilities in addition to related low-incidence disabilities, are acquired after birth by infants, children, and adults. These acquired causes include trauma, child abuse, infections, environmental toxins, and disease. For example, deaf-blindness may be caused by meningitis. Traumatic brain injury is usually due to an acquired cause resulting from some type of trauma (for example, falls, accidents, child abuse). The extent of disability will depend on the cause and its severity.

Characteristics of Individuals with Physical Disabilities, Health Disabilities, and Related Low-Incidence Disabilities

The specific characteristics of an individual who has a physical or health disability will depend on the specific disease, its severity, and individual factors. Two individuals with identical diagnoses may be quite different in terms of their capabilities. Also, it is important to remember that students who have severe physical disabilities (even individuals who are unable to talk, walk, or feed themselves) may have normal or gifted intelligence. No one should judge a person's intellectual ability based on physical appearance.

A multitude of physical and health disabilities may be encountered at school. Each of them has differing characteristics, treatments, and prognoses. To illustrate the range of conditions included under physical and health disabilities, this section describes a number of sample conditions across the four IDEA categories of orthopedic impairments, multiple disabilities, traumatic brain injury, and other health impairments. Table 13.2 gives an outline of the categories, subcategories, and sample conditions that will be discussed. Characteristics of individuals with deaf-blindness will also be reviewed.

Characteristics of Students with Orthopedic Impairments

The IDEA category of orthopedic impairments contains a wide variety of disorders. These can be divided into three main areas: neuromotor impairments, degenerative diseases, and musculoskeletal disorders. Each of these areas has unique characteristics and contains many different disabilities. Following is a sampling of some of the most commonly found orthopedic impairments in the school-age population.

NEUROMOTOR IMPAIRMENTS A **neuromotor impairment** is an abnormality of, or damage to, the brain, spinal cord, or nerves that send impulses to the muscles of the body.