when Michael entered the world 55 years ago, 6 weeks premature and weighing only 4 pounds, the doctor delivering him wasn’t sure he would make it. Michael not only survived but enjoyed good health until his mid-forties, when, during a routine medical checkup, he was diagnosed with high blood pressure and type 2 diabetes. Michael had no apparent risk factors for these conditions.

Could the roots of Michael’s health problems date back to his prenatal development? Increasing evidence suggests that prenatal environmental factors—ones that are not toxic (as are tobacco or alcohol) but rather fairly subtle, such as the flow of nutrients and hormones across the placenta—can affect an individual’s health decades later.

**Low Birth Weight and Heart Disease, Stroke, and Diabetes**

Carefully controlled animal experiments reveal that a poorly nourished, underweight fetus experiences changes in body structure and function that greatly increase the risk of cardiovascular disease in adulthood (Franco et al., 2002). To explore this relationship in humans, researchers tapped public records, gathering information on the birth weights of thousands of British men and women and the occurrence of disease in middle adulthood. Those weighing less than 5 pounds at birth had a 50 percent greater chance of dying of heart disease and stroke, even after SES and a variety of other health risks were controlled (Barker, 2009; Godfrey & Barker, 2000). The connection between birth weight and cardiovascular disease was strongest for people whose weight-to-length ratio at birth was very low—a sign of prenatal growth stunting.

In other large-scale studies, a consistent link between low birth weight and high blood pressure, heart disease, stroke, and diabetes in middle adulthood emerged—for both sexes and in diverse countries (see Figure 3.5) (Barker, 2009; Johnson & Schoeni, 2011). Researchers believe that complex factors associated with underweight are involved.

Some speculate that a poorly nourished fetus diverts large amounts of blood to the brain, causing organs in the abdomen, such as the liver and kidneys (involved in controlling cholesterol and blood pressure), to be undersized (Hales & Ozanne, 2003). The result is heightened later risk of heart disease and stroke. In the case of diabetes, inadequate prenatal nutrition may permanently impair the pancreas, leading glucose intolerance to rise as the person ages (Wu et al., 2004). Yet another hypothesis is that the malfunctioning placentas of some expectant mothers permit high levels of stress hormones to reach the fetus, which slows fetal growth, increases fetal blood pressure, and promotes excess glucose, predisposing the developing person to later disease (Barker & Thornberg, 2013).

Finally, prenatally growth-stunted babies often gain excessive weight in childhood, once they have access to plentiful food (Ojha et al., 2013). This excess weight usually persists, greatly increasing the risk of diabetes and heart disease.

**High Birth Weight and Cancer**

The other prenatal growth extreme—high birth weight—is linked to breast cancer, the most common malignancy in adult women (Barker et al., 2008). In a study of more than 2,000 British women, high birth weight—especially weight above 8.8 pounds—was associated with a greatly increased incidence of breast cancer, even after other cancer risks were controlled (dos Santos Silva et al., 2004). The likely culprit is excessive maternal estrogen in the overweight expectant mother, which promotes large fetal size and alters the makeup of beginning breast tissue so that it responds to estrogen in adulthood by becoming malignant.

High birth weight is also associated with increases in prostate cancer in men and digestive, blood, and lymphatic cancers in both genders (Caughey & Michels, 2009; Cnattingius et al., 2009; McCormack et al., 2005). As yet, the reasons are unclear.

**Prevention**

The relationships between prenatal development and later-life illnesses do not mean that the illnesses are inevitable. Rather, the steps we take to protect our health can prevent prenatal risks from becoming reality. Researchers advise individuals who were low-weight or high-weight at birth to get regular medical checkups and screening tests that increase the odds of early disease detection. They also recommend consistent attention to diet, weight, fitness, and stress—controllable factors that contribute to cardiovascular disease, adult-onset diabetes, and cancer.