

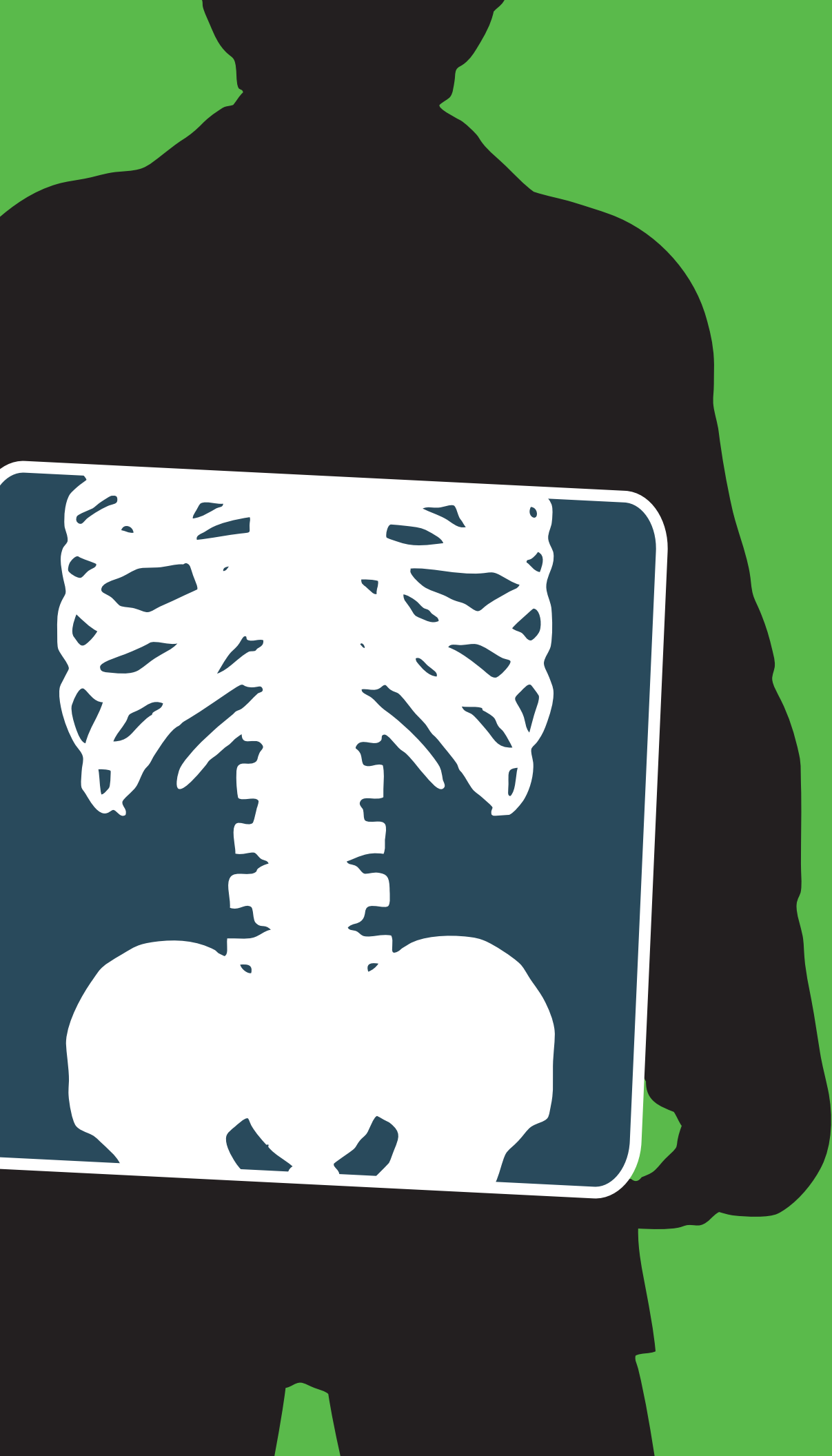
# EARLY INDICATORS OF LATER DISORDERS

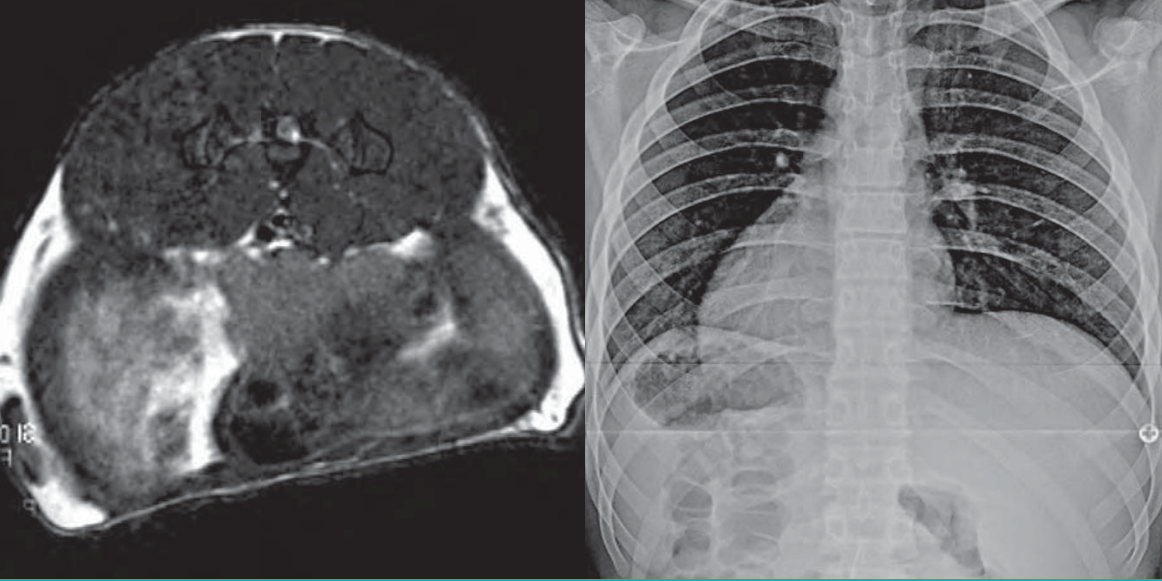
Preventing disease  
rather than simply  
treating it

**I**ncreasingly, common adult diseases are found to have fetal or early childhood origins. Diabetes, cardiovascular disease and obesity have all been associated with biological “memories” of experiences occurring early in life that weaken physiological systems, resulting in disease years later.

“Improving this trajectory begins in early childhood, allowing us the capability to prevent disease rather than treat it,” says Vicente Gilsanz, MD, PhD, director of Clinical Imaging at The Saban Research Institute of Children’s Hospital Los Angeles. Gilsanz recently co-authored a paper in the *Journal of Pediatrics* linking osteoporosis in adults to late-onset puberty in teens.







Gilsanz reports that the onset of puberty was the primary influence on adult bone mineral density, or bone strength.

“We found that, within the normal ranges, those who started puberty earlier had greater bone mass, while those who started later had less.”

Reduced bone mineral density leads to osteoporosis, resulting in bones becoming increasingly brittle and at risk for fracture. With the cost of treatment in 2010 estimated at \$10 billion, osteoporosis is a significant public health issue that affects 55 percent of Americans age 50 and older.

“Puberty is a time of significant bone development,” explains Gilsanz. “During this time, bones grow and increase in density. At the end of puberty, the epiphyseal plates close, terminating the ability of the bones to lengthen. When that occurs, the teenager has reached his or her maximum height and, soon after, peak bone mass.”

The 2000 National Institutes of Health Consensus Development Conference on Osteoporosis Prevention, Diagnosis, and Therapy identified bone mineral deposition during adolescence as a critical determinant of osteoporosis risk later in life. The care of patients with osteoporosis is difficult, and most therapies increase bone density by small amounts, yet require long periods of treatment. In contrast, during puberty large increases in bone density occur over a short period of time.



Given that the rate of decline of bone mass in adulthood is approximately 1 to 2 percent each year, a 10 to 20 percent increase in bone density resulting from a naturally occurring early puberty corresponds to an additional 10 to 20 years of protection against the normal, age-related decline in bone strength.

“People think that regardless of whether puberty begins early or late, your bone health is unaffected,” Gilsanz says. “We now know that is not always true.”

For example, in the past, adolescents with short stature sometimes underwent medical intervention to delay puberty in an effort to achieve greater height. The study suggests that adolescents considering this step, along with their parents, need to be aware of the effect that delaying puberty can have on their later life. They may end up taller, but their bones will have less density, resulting in increased risk for osteoporosis years earlier.

By employing sensitive instruments for measuring bone mass at the beginning of puberty, Gilsanz and his colleagues can extrapolate what a teenager’s peak bone mass will be at the end of puberty.

Using this information, they can potentially identify adolescents at risk for decreased bone density at the beginning of puberty, when there is still time to intervene and take advantage of the tremendous deposition of bone that occurs before puberty ends.

Gilsanz, a professor of Pediatrics at the Keck School of Medicine of the University of Southern California, also is looking at how variations in body composition affect bone gains, hypothesizing that all types of fat are not created equal when it comes to building bone. The accumulation of fat, especially inside the abdomen, is bad for bone, whereas increases in fat in other areas, similar to lean muscle, are beneficial. Gilsanz’s research is supported by the Associate groups, who raise money and good will for Children’s Hospital Los Angeles.

“If visceral fat in adolescents results in reduced bone density, early lifestyle changes not only improve the strength of the child’s skeleton, but also allow that child to develop into a healthy adult,” says Gilsanz.

His study of the relation between the onset of puberty and bone accretion illustrates how early-life experiences can influence later-occurring events. And with time to intervene, the path toward preventing disease—rather than simply treating it—may have just become easier to navigate.



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