



**National Institutes of Health
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National Resource Center**

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Osteoporosis: Peak Bone Mass in Women

Bones are the framework for your body. Bone is living tissue that changes constantly, with bits of old bone being removed and replaced by new bone. You can think of bone as a bank account, where you make “deposits” and “withdrawals” of bone tissue.

During childhood and adolescence, much more bone is deposited than withdrawn, so the skeleton grows in both size and density. Up to 90 percent of peak bone mass is acquired by age 18 in girls and by age 20 in boys, which makes youth the best time to “invest” in one’s bone health.

The amount of bone tissue in the skeleton, known as bone mass, can keep growing until around age 30. At that point, bones have reached their maximum strength and density, known as peak bone mass. Women tend to experience minimal change in total bone mass between age 30 and menopause. But in the first few years after menopause, most women go through rapid bone loss, a “withdrawal” from the bone bank account, which then slows but continues throughout the postmenopausal years. This loss of bone mass can lead to osteoporosis. Given the knowledge that high peak bone density reduces osteoporosis risk later in life, it makes sense to pay more attention to those factors that affect peak bone mass.

Factors Affecting Peak Bone Mass

A variety of genetic and environmental factors influence peak bone mass. It has been suggested that genetic factors (those you were born with and cannot change, such as gender and race) may account for up to 75 percent of bone mass, and environmental factors (such as diet and exercise habits) account for the remaining 25 percent.

Gender. Peak bone mass tends to be higher in men than in women. Before puberty, boys and girls acquire bone mass at similar rates. After puberty, however, men tend to acquire greater bone mass than women.

Race. For reasons still not known, African American females tend to achieve higher peak bone mass than Caucasian females. These differences in bone density are seen even during childhood and adolescence.

Hormonal factors. The hormone estrogen has an effect on peak bone mass. For example, women who had their first menstrual cycle at an early age and those who use oral contraceptives, which contain estrogen, often have high bone mineral density. In contrast, young women whose menstrual periods stop because of extremely low body weight or excessive exercise, for example, may lose significant amounts of bone density, which may not be recovered even after their periods return.

Nutrition. Calcium is an essential nutrient for bone health. Calcium deficiencies in young people can account for a 5- to 10-percent difference in peak bone mass and can increase the risk for hip fracture later in life. Surveys indicate that teenage girls in the United States are less likely than teenage boys to get enough calcium. In fact, fewer than 10 percent of girls age 9 to 17 actually get the calcium they need each day.

Physical Activity. Girls and boys and young adults who exercise regularly generally achieve greater peak bone mass than those who do not. Women and men age 30 and older can help prevent bone loss with regular exercise. The best activity for your bones is weight-bearing exercise. This is exercise that forces you to work against gravity, such as walking, hiking, jogging, climbing stairs, playing tennis, dancing, and weight training.

Lifestyle Behaviors. Smoking has been linked to low bone density in adolescents and is associated with other unhealthy behaviors, such as alcohol use and a sedentary lifestyle. People who begin smoking at a younger age are more likely to be heavier smokers later in life. This fact worsens the negative impact of smoking on peak bone mass, and puts older smokers at additional risk for bone loss and fracture.

The impact of alcohol intake on peak bone mass is not clear. The effects of alcohol on bone have been studied more extensively in adults, and the results indicate that high consumption of alcohol has been linked to low bone density. Experts assume that high consumption of alcohol in youth has a similar adverse effect on skeletal health.

For Your Information

This fact sheet contains information about medications used to treat the health condition discussed here. When this fact sheet was printed, we included the most up-to-date (accurate) information available. Occasionally, new information on medication is released.

For updates and for any questions about any medications you are taking, please contact the U.S. Food and Drug Administration at 888-INFO-FDA (888-463-6332, a toll-free call) or visit its Web site at www.fda.gov.

For updates and questions about statistics, please contact the Centers for Disease Control and Prevention's National Center for Health Statistics toll free at 800-232-4636 or visit its Web site at www.cdc.gov/nchs.

Recognizing the National Bone and Joint Decade: 2002–2011