This section of the textbook addresses risk factors for common diseases of women at menopause and beyond, strategies to lower risk, and treatment recommendations. Included are diseases for which some data exist regarding a relationship to ovarian hormones. However, it should not be inferred that menopause or changes in ovarian hormones are responsible for all these diseases.

Osteoporosis

Osteoporosis—the most common bone disorder affecting humans—is a skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture. Postmenopausal osteoporosis is a major health issue in Western countries, especially among thin Caucasian women who are older than age 65. Fractures of the spine and hip are the most significant complications of osteoporosis, but fractures of the distal forearm, pelvis, ribs, and other limb bones are also consequences of osteoporosis (see Section C, page 72, for more).

Bone strength (and hence fracture risk) depends on both bone quality and bone mineral density (BMD). Expressed as grams of mineral per area or volume, BMD at any given age is a function of peak bone mass (reached around age 30) and how much bone is subsequently lost. Qualities of bone other than BMD (including degree of mineralization, hydroxyapatite crystal size, collagen structure, heterogeneity of bone microstructure, connectivity of trabeculae, and microdamage) are difficult or impossible to measure in clinical practice.

To standardize values from different bone densitometry tests, results are reported as either a Z-score or a T-score, with both expressed as standard deviation (SD) units. (For more about Z-scores and T-scores, see Section F, page 193.)

- *T-score* is calculated by comparing current BMD to the mean peak BMD of a normal, young adult population of the same gender. For women, the reference database is Caucasian (non–race-adjusted) women aged 20 to 29 years. Use of T-scores is the preferred choice for postmenopausal women.
- *Z-score* is based on the difference between the woman's BMD and the mean BMD of a reference population of the same gender, age, and ethnicity.

NAMS supports the World Health Organization (WHO) definition of osteoporosis in a postmenopausal woman as a BMD T-score less than or equal to –2.5 at the total hip, femoral neck, or lumbar spine (posterior-anterior, not lateral) (see Table 1). If anatomic factors such as obesity or arthritis make measurements invalid, the distal one-third radius BMD may be considered a diagnostic site. However, the relationship between the T-score at this site and fracture risk has not been systematically examined.

In addition to diagnosis through densitometry, osteoporosis can be diagnosed clinically, regardless of the T-score. Presence of a fragility fracture constitutes the clinical diagnosis of osteoporosis.

Table 1. WHO criteria for defining bone mineral density

- Normal: T-score above –1.0
- Low bone mass (osteopenia): T-score between –1.0 and –2.5
- Osteoporosis: T-score below or equal to –2.5

Source: World Health Organization 1994.

Risk factors. In determining risk factors, it is important to distinguish between risk factors for *osteoporosis as defined by BMD* (both primary and secondary causes) and risk factors for *osteoporotic fracture*. For BMD-defined osteoporosis, major risk factors in postmenopausal women are advanced age, genetics, lifestyle factors (eg, low calcium and vitamin D intake, smoking), thinness, and menopause status. Risk factors for osteoporotic fracture are listed in Table 2; the most common are advanced age, low BMD, and previous fracture (other than skull, facial bone, ankle, finger, and toe) as an adult.

Risk factors for BMD-defined osteoporosis and osteoporotic fracture overlap, given that BMD is a risk factor for fracture. Importantly, however, many fracture risk factors are not related to BMD.

Table 2. Risk factors for osteoporotic fracture

Advanced age
Low BMD
Previous fracture (other than skull, facial bone, ankle, finger, and toe) as an adult
History of hip fracture in a parent
Thinness (body weight <127 lb [57.7 kg] or low BMI [<21 kg/m^2])
Current smoking, any amount
Low calcium or vitamin D intake
More than two alcoholic drinks per day
Oral or intramuscular glucocorticoid use for >3 mo
Increased fall risk
Impaired vision
Dementia
Poor health/frailty
Low physical activity
History of recent falls

BMD, bone mineral density; BMI, body mass index.

BMD and fracture risk. BMD is an important determinant of fracture risk, especially in women aged 65 and older. In general, lower BMD scores indicate more severe osteoporosis and higher risk of fracture. A decrease of 1 SD in BMD represents a 10% to 12% decrease in BMD and an increase in fracture risk by a factor of 1.5 to 2.6. BMD and fracture risk are most closely related when BMD is used to predict the fracture risk at that same site. Risks for spine fracture and hip fracture increase 2.3-fold and 2.6-fold,