females are about 10% lower than in males due to menopausal loss. The 30% higher spine BMD and 10% higher femoral BMD in males consistent with the 10× and 3× higher fracture rates in females.

The average BMD value in white populations around the world is identical except for small differences due to body weight. Physical activity and calcium intake do not influence BMD values within the white populations. In contrast, there are ethnic differences in BMD. American blacks have values that are approximately 6% higher than American whites. Asians have BMD values that are about 10% lower than American whites, but at least half of this difference is associated with the 10–15 kg group difference in body weight. The absolute BMD value at which patients fracture is constant for sex, age, and race. The average spinal BMD value in patients with spinal osteoporosis is 0.83 ± 0.15 g/cm^2, while the average femoral neck BMD in hip fracture patients is approximately 0.56 ± 0.10 g/cm^2. The femoral neck BMD in osteoporotic patients without femoral fracture is $0.65 + 0.10$ g/cm^2, while normal white controls average 0.75 ± 0.10 g/cm^2. Populations with small body size and a lower BMD, such as Asians, have a greater proportion of the normal population below fracture thresholds or breakpoints (90th or 70th percentile of the fracture group respectively). The lower frequency of hip fractures in Asian populations suggests that protective factors are operative in preventing fractures (absence of falling, falling to the back rather than to the side).

THE EPIDEMIOLOGY OF OSTEOPOROTIC FRACTURE IN AUSTRALIA

Lindy Gulland, Richard Prince and Mathew Knuiman
Department of Medicine, University of Western Australia, and Department of Endocrinology and Diabetes, Sir Charles Gairdner Hospital, Perth, WA, Australia

There are no community based studies of fracture in Australia. To remedy this lack of information a study based on the Busselton population over the age of 65 was undertaken. This population consists of a rural area and small town in the south-west of Australia studied at regular intervals since 1966. Of the 1988 eligible participants 1074 (55%) took part, 575 women and 499 men. The study instrument consisted of a questionnaire relating to previous fracture history and potential causative factors. 42% of men and 37% of women had sustained a fracture at some time in their life. In women 59% of those fractures were atraumatic, that is, sustained following a fall from standing height or less after the age of 40, whereas in men only 15% of fractures were atraumatic. Fractured hip and clinically apparent vertebral fracture only accounted for 1.8% and 2.6% of the total 615 fractures of men and women combined, whereas rib fractures and fractures of the upper and lower limb accounted for 16.7%, 42.4% and 30.2%, respectively. Of the 147 atraumatic fractures occurring in the women there were 9 (6.3%) fractures of the hip and no vertebral fractures. The fracture commonly associated with osteoporosis, the hip and vertebrae, account for a very small amount of the net community morbidity associated with osteoporosis.

Supported by the Sandoz Gerontological Foundation.

A COMPARISON OF ELDERLY PATIENTS WITH PROXIMAL FEMORAL FRACTURES, WITH A NORMAL ELDERLY POPULATION: A CASE CONTROL STUDY

Hugh Hanger, John Elliot, Nigel Gilchrist, Richard Sainsbury, Chris Frampton, William Gillespie and John Turner
Departments of Health Care of the Elderly, Community Medicine, Orthopaedic Surgery and Nuclear Medicine, Christchurch, New Zealand

Proximal femoral fractures occur mainly in the elderly and cause significant morbidity and mortality. Osteoporosis, falls and failure of neuromuscular reflexes all contribute to the aetiology but the relative importance is unclear. In this prospective case control study, 36 patients with femoral fractures were compared with 72 age and sex matched community controls, in order to assess the relative importance of risk factors. Fracture patients were found to have a greater number of previous fractures, lower body mass index (BMI), weaker handgrip strength, smaller muscle mass, reduced mobility and lower blood pressures than the controls. Bone mineral density (BMD), as assessed by dual photon absorptiometry, was significantly reduced ($p < 0.05$), both at the femoral neck and trochanteric regions (0.63 vs 0.71 g/cm^2 and 0.55 vs 0.64 g/cm^2 respectively) in the hip fracture group. Cases had sigaificantly lower dietary calcium intake ($X^2 = 13.37$, df = 1, $p < 0.001$). No differences were found for type, or total amount of medication used, alcohol and cigarette consumption, visual acuity or age at menopause. Using a stepwise logistic regression model to correct for inter-related variables, blood pressure, mobility status, handgrip strength, alcohol consumption, sex, bone mineral density and age (in that ranking) were found to have an independent effect on fracture risk. Thus osteoporosis at the hip, has an independent effect on fracture risk, although of lesser importance than indicators of muscle strength, mobility and blood pressure.