Appendix 1 An example of calculation of T-score and cutoff BMD value for osteoporosis in Japanese

elderly women

The data is from: Iki M, Kagamimori S, Kagawa Y, Matsuzaki T, Yoneshima H, Marumo F. Bone mineral density of the spine, hip and distal forearm in representative samples of the Japanese female population: Japanese Population-Based Osteoporosis (JPOS) Study. Osteoporos Int 2001;12:529-37.

1. Based on table-2 of the article, the mean BMD for women aged 50-79 yrs is calculated according to:

$$BMD_{mean} = \frac{\sum_{i=1}^{6} n_{i}^{*} M_{i}}{\sum_{i=1}^{6} n_{i}}$$
[1]

(M_i : mean BMD value of different age groups; n_i : subject number of different age groups) and 0.6569 is derived for Japanese old women.

2. The standard deviation (SD) is calculated according to:

$$SD = \sqrt{\frac{\sum_{i=1}^{6} (n_i - 1)^* s_i^2}{\sum_{i=1}^{6} n_i - 6}}$$
[2]

(*s_i*: standard deviation of different age groups) and 0.0913 is derived for Japanese old women.

3. T-score is calculated according to

$$T - score = \frac{BMD_{measured} - BMD_{peak}}{SD_{peak}}$$
[3]

According to table-4, BMD_{peak}=0.801, SD_{peak}=0.106.

If T-score for defining osteoporosis is ≤ -2.5 , then the cutoff value of measured BMD is 0.5360.

4. For elderly Japanese women, with mean BMD of 0.6569 and SD of 0.0913, a Gaussian distribution is shown in Figure S1.



 $Z=(BMD_{measured} - age-matched population mean BMD)/age-matched population SD =(BMD_{measured} - 0.6569)/0.0913.$ If the hip fracture reference is approximately 6.43% (i.e., 40% of the Caucasian rate), then Z=-1.52 (based on *Figure S1*), and BMD_{measured} =0.5291. This is the BMD cutoff point for defining osteoporosis, and the corresponding T-score is -2.5651.