Appendix 1 The fragility fracture prevalence among older Chinese is no more than half that of Caucasians

It has been recognized that the fragility fracture prevalence among older Chinese is no more than half that of Caucasians, both for men and women. Some literature reports have been discussed in a recent article (3). Hereby we summarize a number of additional evidence.

Using Kaiser Permanente Northern California (KPNC) data, Lo *et al.* (4) studied the age-adjusted hip fracture incidence per 100,000 subjects for women aged ≥50 years old, and noted that in the year 2012 it was 288 among Caucasian women and 148 among Asian women. Using KPNC data of women aged 50–85 years with femoral neck BMD measured between 1997 and 2003, Khandelwal *et al.* (5) studied ethnic older South Asians (n=449, defined by Indian, Pakistani, or Sri Lankan ancestry) and age-matched Chinese (n=2245) and Caucasian (White) women (n=4490). It was noted that more South Asian (7.1%) and Caucasian (9.6%) women had prior FF than Chinese women (4.5%). During a median of 8.4 years follow-up, 0.4% of Chinese and 0.7% of Caucasian women experienced a hip fracture. Wrist fracture incidence per 100,000 person-years was similar among South Asian and Caucasian women (n=286 and 303, respectively), but lower among Chinese women (n=130). Chinese women had a significantly lower incidence of humerus fracture (Chinese 0.5%, South Asians: 0.7%, White: 1.6%) and any non-vertebral major FF (Chinese 1.8%, South Asians 2.9%, White: 4.5%). Compared with Caucasian data, much lower hip fracture prevalence has also been reported with data from China Mainland (6).

Compared with US Caucasians, American Asians are noted to have a lower mortality rate following hip fracture. Using data from the California Office of Statewide Health and Planning and Development concerning years from 2000 to 2011, Sullivan *et al.* (7) conducted a study on patients ≥55 years admitted for hip fracture. With a total of 317,677 hospital admissions, Asians had a much lower incidence of hip fracture (odds ratio 0.32 for both men and women) and a lower mortality rate as compared to Caucasians (30-day mortality odds ratio, women: 0.59; men: 0.62). Using KPNC data, Lo *et al.* (8) studied female patients ≥65 years with a hospital discharge diagnosis of a proximal femur fracture between 2000 and 2010. It was noted that the one-year crude mortality rate was higher among Caucasians (23.6%) compared with Asians (15.6%). After adjusting for confounders, Asians were associated with lower odds of death at 1 year compared with Caucasians (odds ratio: 0.64). Using the same data of Lo *et al.* (8), Patel *et al.* (9) conducted additional analyses. Among 615 Asian women, there were 172 Chinese, 153 Japanese, 119 Filipina women, accounting for 72.2% of women with hip fracture identified as 'Asian'. It was noted that one-year overall mortality rates following hip fracture were similar among these three ethics groups (Chinese: 14.0%; Japanese: 15.0%; and Filipina: 14.3%).

Recent evidence suggests that, compared with Caucasians, the relative prevalence of osteoporotic vertebral fracture (OVF) follows the same pattern as other clinical fractures, with both radiographic and clinical OVF prevalences among older Chinese being no more than half of those of older Caucasians [*Figures S1*,*S2* (10-19)]. However, till now this conclusion heavily depends on the data from MrOS(Hong Kong) and MsOS(Hong Kong) studies. Based on our own MsOS(Hong Kong) data and literature reports, we estimated that radiographic OVF prevalence among Hong Kong Chinese women is very similar to those of age-matched Chinese women in Beijing, Japanese women, and Korean women (20). In a preliminary comparative study with a morphometric method, Kwok *et al.* (21) described that the radiographic OVF prevalence was no lower among Hong Kong Chinese men and women than among their counterparts in Thailand, Indonesia, and Japan. Moreover, using the prevalence of lumbar degenerative spondylolisthesis (DS) as a 'biomarker', we did additional testing to see whether the spines of the MrOS(Hong Kong) and MsOS(Hong Kong) study participants are 'unusually healthier'. The prevalence of lumbar DS can be reasonably reliably estimated on radiograph to allow inter-study comparisons. It is noted that the prevalence of lumbar DS among MrOS(Hong Kong) and MsOS(Hong Kong) study participants were no lower than those reported for Japanese and Thai subjects [*Figure S3* (22-31)]. Therefore, it is unlikely that the conclusion that both radiographic and clinical OVF prevalences among older Chinese are no more than half of those of older Caucasians was heavily biased because the MrOS(Hong Kong) and MsOS(Hong Kong) study participants had unusually healthier spine than other Chinese (or other East Asians) populations.

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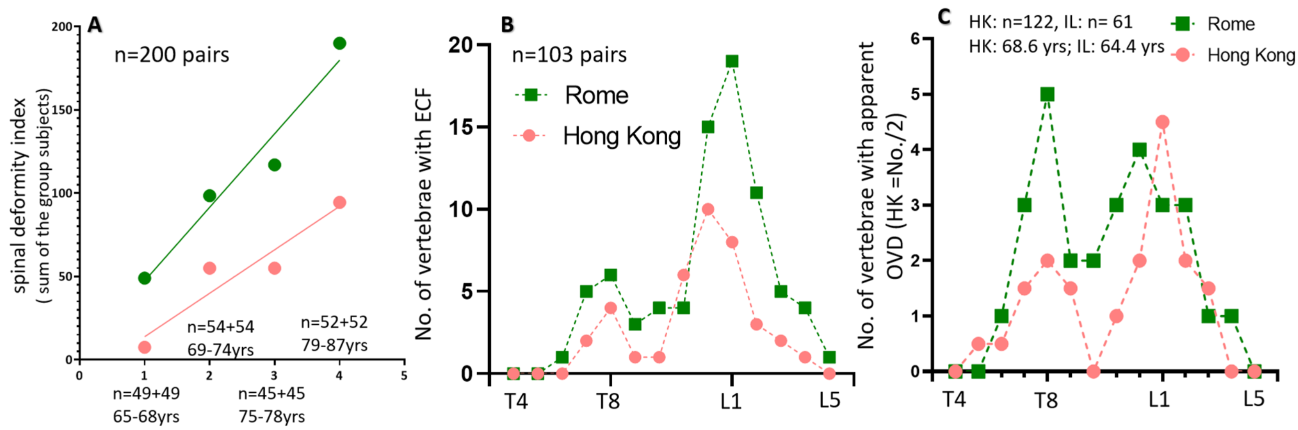

Figure S1 Chinese older women have a much lower radiographic osteoporotic vertebral fracture prevalence than that of Italian older women. (A) Total spinal deformity index score of four different age groups of Chinese women and Italian women (population-based and age-matched data). Spinal deformity index was calculated with each vertebra assigned a score of 0, 0.5, 1, 1.5, 2, 2.5, and 3 for no ROVD or ROVDs of <20%, 20–25%, ≥5%–1/3, ≥1/3–40%, ≥40%–2/3, and ≥2/3 vertebral height loss, respectively. The spinal deformity index for each subject was calculated by summing the scores of all vertebrae from T4 to L5. Light red ball and line indicate Hong Kong subjects and dark green ball and line indicate Italian subjects. Lines denote linear fit of the four values of total spinal deformity index of the four age groups, with the slope steeper for Italian than for Chinese. N = 49 + 49 means there are 49 Chinese subjects and 49 Italian subjects in this age group. (B) A comparison of the distribution of ECF sign positive ROVD among different vertebral levels (103 pairs of age-matched Chinese and Italian older women, population-based data). The data in B is in addition to the data in A. (C) A comparison of the distribution of apparent ROVD (i.e., with ≥20% vertebral height loss) among different vertebral levels. There were 122 population-based Chinese subjects and 61 Italian back pain patients (ROVD number for Chinese data was divided by 2 for presentation). ECF, endplate end/or cortex fracture; ROVD, radiological osteoporotic vertebral deformity (equivalent to radiological vertebral fracture); HK, Hong Kong; IL, Italian. Data are from Wang *et al. Arch Osteoporos*. 2021;16:174, and Wang *et al.*, *Arch Osteoporos.* 2022;17:13. Reused with permission.

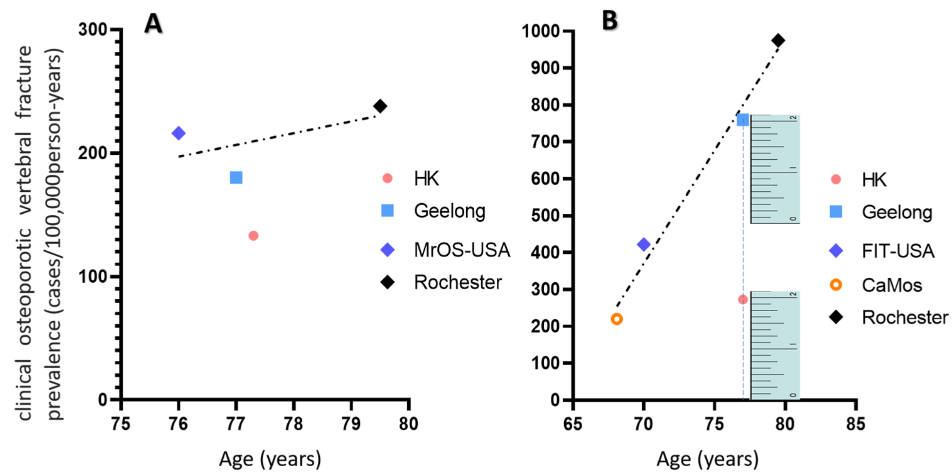

Figure S2 Chinese older men and women have a much lower clinical osteoporotic vertebral fracture prevalence than those of Caucasians. (A) Prevalence of older men. Data are from MrOS(Hong Kong) study, Freitas *et al. Osteoporos Int* 2008;19:615-23 (MrOS USA study), Sanders *et al. Osteoporos Int* 1999;10:240-7 (Geelong study), and Cooper *et al. J Bone Miner Res* 1992;7:221-7 (Rochester study). (B) Prevalence of older women. Data are from MsOS(Hong Kong) study, Sanders *et al. Osteoporos Int* 1999;10:240-7 (Geelong study), Cooper *et al. J Bone Miner Res* 1992;7:221-7 (Rochester study), Fink *et al. J Bone Miner Res* 2005;20:1216-22 (FIT-USA study), and Papaioannou *et al. Osteoporos Int* 2005;16:568-78 (CaMos study).

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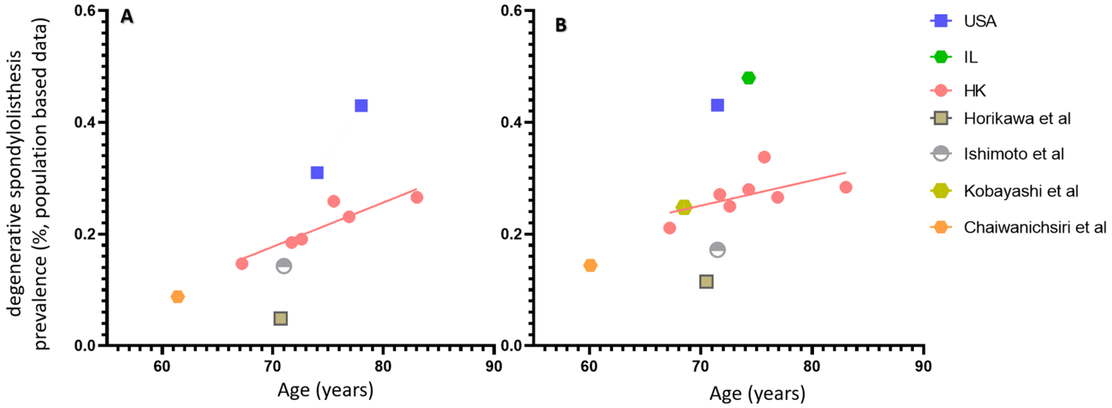

Figure S3 A comparison of lumbar degenerative spondylolisthesis (DS) prevalence among older women of various ethnic groups. The data from the USA and Italy had much higher prevalences than the data from Asia. Despite the relatively small sample size of the Asian studies other than the Hong Kong study, it can be seen that DS prevalence in MsOS(Hong Kong) women subjects is no lower than the results from Japan or Thailand. Taking DS as an example, there is no sign that MsOS(Hong Kong) data are heavily biased toward healthier participants. The Hong Kong data are from MsOS(Hong Kong) study (He *et al. Eur Radiol* 2014;24:441-8; *Wáng et al. Spine* (*Phila Pa* 1976) 2016;41:1096-103; So *et al. 9th FFN global congress*, abstract: FFN21-1200). USA women data are from Vogt *et al. Spine* (*Phila Pa* 1976) 1998;23:2640-7 (total n=788 subjects). Italian women data are from So *et al. 9th FFN global congress*, abstract: FFN21-1200 (total n=130 subjects). Japanese women data are from Horikawa *et al. J Orthop Surg* (*Hong Kong*) 2006;14:9-12 (total n=323 subjects); Ishimoto *et al. BMC Musculoskelet Disord*. 2019;20:618 (total n=477 subjects); Kobayashi *et al. Eur Spine J* 2016;25:2384-9 (total n=289 subjects).Thai women data are from Chaiwanichsiri *et al. J Med Assoc Thai* 2007;90:2477-81 (total n=486 subjects).

While less data is available, wrist and/or forearm FFs are also likely to occur less frequently among Asians. By analysing the data from the National Osteoporosis Risk Assessment (NORA) which is an observational study of postmenopausal women in the USA, Barrett-Connor *et al.* (32) reported the baseline characteristics and 1-year fracture incidents in Caucasians and Asians. At baseline, among 179,470 Caucasians, a history of wrist fracture since 45 years old was recorded in 6.3% of cases; among 1,912 Asians, a history of wrist fracture since 45 years old was recorded in 3.7% of the cases. During the follow-up, wrist fracture was recorded in 0.5% of 149,524 Caucasians and in 0.2% of 1,258 Asians. In a Norwegian study, Lofthus *et al.* (33) reported that the relative risk of distal forearm fracture in Asians who immigrated to Oslo was 0.72 (95% CI: 0.53–1.00) compared to ethnic Norwegians living in Oslo.

Footnote

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Appendix 2 Chinese skeleton has microstructural and mechanical advantages

As compared with those of Caucasians, a study reported that the Chinese skeleton has microstructural and mechanical advantages (37). In the Study of Women's Health Across the Nation (SWAN), Finkelstein *et al*. (38) reported that unadjusted aBMD (areal BMD) was lower among Asian American compared to Caucasian women; however, after adjustment for covariates there were no significant differences of lumbar spine and femoral neck BMD between Chinese and Caucasian. When BMD was assessed in a subset of women weighing less than 70 kg and then adjusted for covariates, lumbar spine BMD became higher in Chinese than that in Caucasian women. Nam *et al*. (39) compared femoral neck, total hip, and lumbar spine BMD in older men aged 65 to 78 years. It was noted that, while unadjusted aBMD was lower among Asians, adjustment for weight and height attenuated or reversed the differences in aBMD between US Caucasian and Asian men, including US Asian, Hong Kong Chinese and South Korean men. With QCT (quantitative computed tomography) measurement, Walker *et al*. (40) reported that, among premenopausal American women, compared with Caucasians, Chinese women had greater integral and cortical vBMD (volumetric BMD) at the femoral neck and greater integral vBMD at the total hip. Among postmenopausal women, Chinese women had greater cortical vBMD at the femoral neck and total hip. For American men ≥65 years, Marshall *et al*. (41) reported that Asian and African American men had 6–10% greater integral and 33–36% greater trabecular vBMD, as well as 5% greater mean cortical thickness at the hip compared with Caucasian men. Boutroy *et al*. (42) reported that, compared with Caucasians, both pre- and postmenopausal Chinese women had greater cortical thickness, cortical tissue mineral density and reduced cortical porosity at both the radius and tibia. Using HRpQCT (high-resolution peripheral quantitative computed tomography), Walker *et al*. (43) reported that radius demonstrated greater trabecular and cortical density, trabecular bone to tissue volume, and trabecular and cortical thickness both before and after adjustment for covariates in the Chinese cohort than the Caucasian cohort. Tibia revealed similar findings as well as higher trabecular number, lower trabecular spacing and inhomogeneity in the Chinese cohort after adjustment for covariates (43). With HRpQCT from a cohort of premenopausal women, Liu *et al*. (44) applied ITS (individual trabecular segmentation) and mFEA (micro-finite element analysis) to assess bone properties of Chinese American women and Caucasians. With ITS, the morphology of individual trabeculae is classified as either rod-like or plate-like. More plates and/or a higher plate to rod ratio are associated with greater mechanical competence. mFEA is used to estimate the mechanical competence of bone by simulating bone under deformation conditions. The results of ITS showed that, compared with Caucasians, while Chinese women had a similar number of rod-like trabeculae, they had more trabecular plates, leading to a higher plate-to-rod ratio and greater trabecular connectivity at both the distal radius and tibia. By using mFEA, these differences in trabecular bone microstructure were shown to translate into a greater trabecular mechanical competence (55%–68% at the distal radius and 29%–43% at the distal tibia) among Chinese (as compared with Caucasians). Postmenopausal Chinese women also had a higher trabecular plate-to-rod ratio and greater whole bone stiffness, despite similar trabecular density as compared to Caucasian women (45). These microstructural advantages for Asians/Chinese have also been observed among Asians in Canada and in Australia (46,47).

Footnote

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Appendix 3 An example of calculation of lumbar spine T-score and cutoff BMD value for defining osteoporosis in US Chinese older women

The data is from: Walker MD, Babbar R, Opotowsky AR, Rohira A, Nabizadeh F, Badia MD, Chung W, Chiang J, Mediratta A, McMahon D, Liu G, Bilezikian JP. A referent bone mineral density database for Chinese American women. *Osteoporos Int*. 2006;17:878-87.

Step 1. Based on the table-3 of the article of Walker *et al.*, the mean BMD for women aged 50–89 years (four age bands grouped together) is calculated according to:

$$BMD_{mean} = \frac{\sum_1^n n_i * M_i}{\sum_1^n n_i} \quad [1]$$

(M_i: mean BMD value of different age groups; n_i: subject number of different age groups)

Thus, mean BMD value of 0.837 g/cm^2 is derived for US Chinese older women group (i.e., BMD_{old}).

From table-3, the mean BMD value for aged 20–29 years is 0.994 g/cm^2 (i.e., BMD_{young}).

Step 2. From the standard deviation (SD) calculation formula:

$$SD = \sqrt{\frac{\sum_1^n (n_i - 1) * s_i^2 + \sum_1^n n_i * (M_i - BMD_{mean})^2}{\sum_1^n n_i - 1}} \quad [2]$$

(s_i: standard deviation of different age groups)

BMD SD value (i.e., SD_{old}) of 0.137 is derived for US Chinese older women group (50–89 years, four age bands grouped together).

From table-3, the BMD SD value for aged 20-29 yrs is 0.110 (i.e., SD_{young}).

Step 3. T-score is calculated according to

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

With BMD_{young}=0.994 and SD_{young}= 0.110 of young women.

If T-score for defining osteoporosis is ≤−2.5, then the cutoff value of measured BMD for older group is 0.719 g/cm^2.

Step 4. For older US Chinese women, as shown above the mean BMD_{old} is 0.837 g/cm^2 and SD_{old} is 0.137. Based on the assumption of the BMD values follow Gaussian distribution and these two values, the Gaussian distribution curve is plotted and shown in *Figure S4*. if osteoporosis cutpoint T-score is ≤−2.5, then in older women this T-score correspond to measured BMD of ≤0.719 g/cm^2, then from *Figure S4* the osteoporosis prevalence is 19.48%. On the other hand, if we assume the osteoporosis prevalence among older US Chinese women is 7.5% (half of the prevalence of US Caucasian), based on the area under the curve of the Gaussian distribution, this corresponds to BMD ≤0.640 g/cm^2. To satisfy this, from the formula in step 3, we can get the cutpoint T-score ≤−3.221.

Calculation of T-score and BMD cutoff values for defining osteopenia follow the same steps as those for defining osteoporosis (values shown in *Table 1* of the main text).

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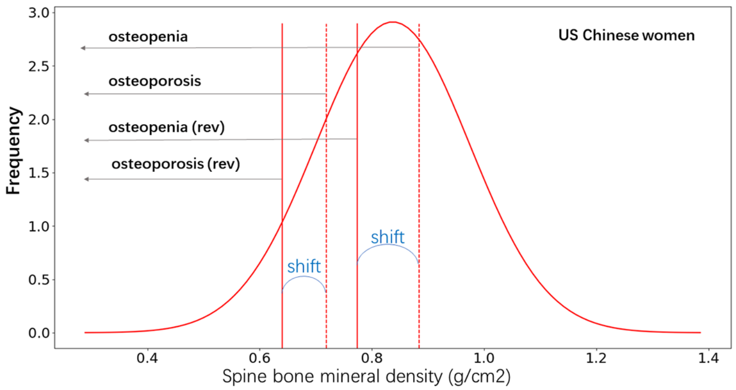

Figure S4 Frequency Gaussian distribution of bone mineral density of older US Chinese women, with mean bone mineral density of 0.837 g/cm^2 and standard deviation of 0.137. The original cutpoints for osteoporosis and osteopenia are T score ≤–2.5 and ≤–1, and these correspond to a prevalence of 19.48% for osteoporosis and a prevalence of 63.48% for osteopenia. If prevalence for osteoporosis and osteopenia is assumed to be 7.5% and 25% respectively, then cutpoints BMD for osteoporosis (revised) and osteopenia (revised) are ≤0.640 g/cm^2 and ≤0.774 g/cm^2 respectively, correspond to T-score of ≤–3.221 and ≤–2.269 respectively. (rev): revised.

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Appendix 4 Hip fracture prevalence of US Chinese is close to that of US Blacks

Hip fracture typically requires hospitalization, making hip fracture incidence ascertainment more reliable than for other types of fractures. Evidence suggests that the hip fracture prevalence of US Asians is close to that of US Blacks (71-74).

With a database of all hospitalizations for the State of California, Silverman and Madison (71) examined the incidence of hip fracture for the years 1983 and 1984. They reported that the rate ratio of hip fracture relative to Caucasians was 0.41 and 0.61 for Black women and Asian women, respectively; and 0.79 and 0.54 for Black men and Asian men, respectively.

Zingmond *et al.* (72) evaluated the change in hip fracture incidence from 1983 through 2000 in California for patients of 55 years of age and older. The data showed hip fracture prevalence of California Asians was close to that of California Blacks (*Figure S5*).

Fang *et al.* (73) analysed the hip fracture hospitalization rates for Asian and Caucasian patients aged 50 and older in New York City from 1988 to 2002. They reported the annual age-adjusted hip fracture hospitalization rates per 100,000 were 459, 137, and 174 for Caucasian women, Black women, and Asian women respectively (ratio relative to Caucasians was 0.30 for Black and 0.38 for Asians); and the corresponding rates for men were 230, 109, and 104 respectively (ratio relative to Caucasians was 0.48 for Black and 0.45 for Asians).

Wright *et al.* (74) investigated hip fracture incidence trends in ethnic subgroups of older Medicare beneficiaries (≥65 years old) and analysed annual hip fracture incidence rates from 2000 through 2009. The data showed hip fracture prevalence of US Asians was close to that of US Blacks (*Figure S6*).

By analysing the data from the National Osteoporosis Risk Assessment (NORA) which was an observational study of postmenopausal women in the USA, in 2005 Barrett-Connor *et al.* (32) reported the baseline characteristics and 1-year fracture incidents in Caucasians, Blacks, and Asians. At baseline, 23.3%, 7.2% and 11.6% of Caucasians, Blacks, and Asians had a maternal history of fracture, and a history of any fracture at age 45 years or older was recorded in 1.4%, 1.2% and 0.8% of the Caucasians, Blacks, and Asian. During the follow-up, a fracture at any location was recorded in 1.5%, 0.8% and 0.7% of Caucasians, Blacks, and Asians.

Note the data of Silverman and Madison (71), Zingmond *et al.* (72), Fang *et al.* (73), Wright *et al.* (74) all showed that, while hip fracture rate was slightly lower among American Black women as compared with Asian American women, hip fracture rate was even lower among Asian American men than among American Black men. Moreover, within the Asian ethnic group, it is likely that older Chinese have a lower FF prevalence than that of older South Asians (5).

Footnote

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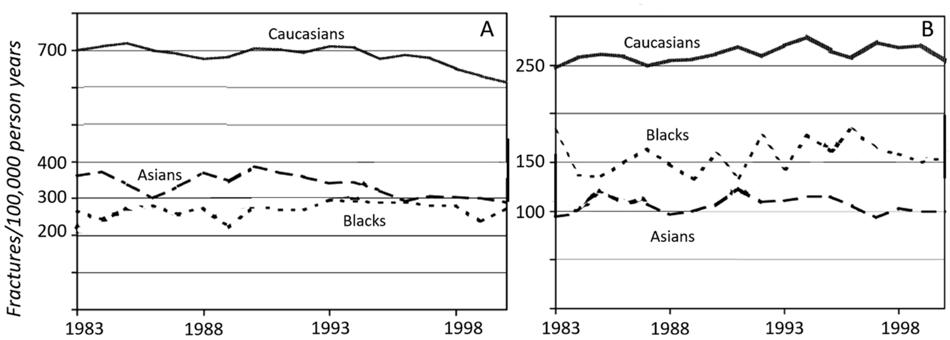

Figure S5 Hip fracture incidence by ethnicity among women (A) and men (B) 55 years of age and older in California, 1983 to 2000. Modified from Zingmond *et al. Osteoporos Int* 2004;15:603-10.

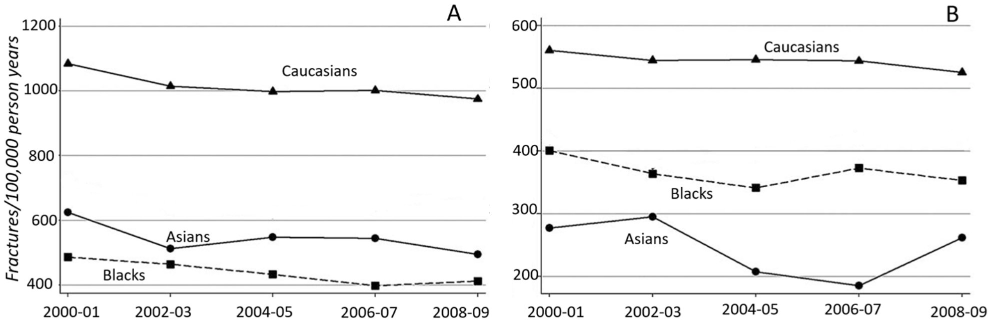

Figure S6 Age-standardized hip fracture incidence in women (A) and in men (B) from 2000 to 2009 by ethnicity for US Medicare beneficiaries (≥65 years old). Modified from Wright *et al. J Bone Miner Res* 2012;27:2325-32.

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Table S1 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: women's spine

Studies	No. in young group	Age: old group	No. in old group	Instrument manufacturer
US White (2012) (52)[#]	236	≥50	840	Hologic QDR 4500A
		≥60	559	Hologic QDR 4500A
US Black (2012) (52)	127	≥50	344	Hologic QDR 4500A
		≥60	213	Hologic QDR 4500A
Italian (2003) (53)	203	50-79	1031	Most on Hologic QDR 4500; 27 subjects were on QDR 1000 and 15 on QDR 2000
		60-79	533	Most on Hologic QDR 4500; 27 subjects were on QDR 1000 and 15 on QDR 2000
Finnish (1992) (54)	143	50-70	219	GE Lunar DPX
		60-70	54	GE Lunar DPX
Austrian (2003) (55)	243	46-76	200	GE Lunar DPX or Hologic QDR 1000 and 4500
		56-76	55	GE Lunar DPX or Hologic QDR 1000 and 4500
Canadian (2000) (56)	95	≥50		Hologic QDR 1000 or 2000 or GE Lunar DPX
Spanish (1997) (57)	235	50-79	607	Hologic QDR 1000
British (1996) (58)	91	50-89	387	GE Lunar DPX
Swedish (2000) (59)	198	≥70	210	Hologic 4500
Chinese meta (2013) (60)	5213	≥50	43277	Meta analysis (Hologic, GE Lunar, Norland)
US Chinese (2006) (61)	79	50-89	120	Hologic QDR 4500C
Hong Kong (2005) (51)	188^	≥60	1431	Hologic QDR 2000 or QDR 4500
Singapore (2020) (62)	31	≥51	131	Hologic Discovery Wi
Japan (2001) (63)	548	50-79	1383	Hologic QDR 4500A
ML Chinese (2007) (64)	342	50-89	5083	GE Lunar
Korea (2008) (65)	75	50-79	1086	GE Lunar DPX Bravo
Korea (2014) (66)	1786	≥50	5787	Hologic Discovery-W
Taiwan (2011) (67)	28	>50	108	GE Lunar Prodigy

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. Chinese meta: meta-analysis results. ML, mainland.

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Table S2 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: men's spine

Studies	No. in young group	Age: old group	No. in old group	Instrument manufacturer
US White (2012) (52)[#]	281	≥50	867	Hologic QDR 4500A
		≥60	562	Hologic QDR 4500A
US Black (2012) (52)	157	≥50	322	Hologic QDR 4500A
Chinese meta (2013) (60)	3970	≥50	27026	Meta analysis (Hologic, GE Lunar, Norland)
ML Chinese (2008) (68)	209	≥50	766	Hologic Delphi A
ML Chinese (2006) (69)	102	≥50	1084	Hologic QDR 2000
Hong Kong (2005) (51)	93^	≥60	1336	Hologic QDR 2000 or QDR 4500
Singapore (2020) (62)	24	≥50	127	Hologic Discovery Wi
Taiwan (2004) (70)	72	50-89	292	Hologic QDR 2000
Taiwan (2011) (67)	31	≥50	128	GE Lunar DXA Prodigy
Korea (2008) (65)	58	50-79	1424	GE Lunar DPX Bravo
Korea (2014) (66)	1551	≥50	5355	Hologic Discovery-W

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. ML, mainland.

Table S3 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: women's femoral neck

Studies	No. in young group	Age: old group	No. in old group	Instrument manufacturer
US White (2012) (52)[#]	262	≥50	1042	Hologic QDR 4500A
		≥60	751	Hologic QDR 4500A
US Black (2012) (52)	136	≥50	372	Hologic QDR 4500A
Italian (2018) (75)		≥50	3247	Hologic QDR 4500C or GE Lunar Prodigy
Spain (2010) (76)		≥50	806	Norland or Hologic
Australia (2011) (77)		≥50 (median: 54.0)	1494	GE Lunar
Chinese meta (2013) (60)	4412	≥50	43869	Meta analysis (Hologic, GE Lunar, Norland)
US Chinese (2006) (61)	79	50-89	120	Hologic QDR 4500C
Hong Kong (2005) (51)	188^	≥60	1431	Hologic QDR 2000 or QDR 4500
Japan (2001) (63)	547	50-79	1506	Hologic QDR 4500A
Korea (2008) (65)	75	50-79	1086	GE Lunar DPX Bravo
Taiwan (2011) (67)	28	>50	108	GE Lunar Prodigy

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. Chinese meta: meta-analysis results.

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Table S4 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: men's femoral neck

Studies	No. in young group	Age: old group (years)	No. in old group	Instrument manufacturer
US Black (2012) (52)[#]	285	≥50	1194	Hologic QDR 4500A
		≥60	853	Hologic QDR 4500A
Spanish (1997) (57)	231	50-79	468	Hologic QDR 1000
Australia (2011) (77)		≥50 (median: 56.0)	1467	GE Lunar
ML Chinese (2006) (69)	102	50-89	1084	Hologic QDR 2000
ML Chinese (2008) (68)	209	≥50	766	Hologic Delphi A
Chinese meta (2013) (60)	3511	≥50	23479	Meta analysis (Hologic, GE Lunar, Norland)
Hong Kong (2005) (51)	93^	≥60	1336	Hologic QDR 2000 or QDR 4500
Korea (2008) (65)	58	50-79	1424	GE Lunar DPX Bravo
Korea (2014) (66)	1786	≥50	5787	Hologic Discovery-W
Taiwan (2011) (67)	31	>50	128	GE Lunar Prodigy

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. Chinese meta: meta-analysis results. ML, mainland.

Table S5 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: women's total hip

Studies	No. in young group	Age: old group	No. in old group	Instrument manufacturer
US White (2012) (52)[#]	262	≥50	1042	Hologic QDR 4500A
		≥60	751	Hologic QDR 4500A
US Black (2012) (52)	136	≥50	372	Hologic QDR 4500A
Canada white (2008) (79)		≥50	16205	GE Lunar Prodigy or Lunar DPX
Argentina (2016) (80)		≥50	5448	GE Lunar Prodigy
US Amerindian (2016) (81)		50-79	230	Hologic Discovery-W
ML Chinese (2007) (64)	342	50-89	5083	GE Lunar
US Chinese (2006) (61)	79	50-89	120	Hologic QDR 4500C
Hong Kong (2005) (51)	188^	≥60	1431	Hologic QDR 2000 or QDR 4500
Japan (2001) (63)	547	50-79	1506	Hologic QDR4500A
Korea (2014) (66)	1786	≥50	5787	Hologic Discovery-W

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. ML, mainland.

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Table S6 Study participant number of the young and older groups, and the instruments for bone mineral density measurement: men's total hip

Studies	No. in young group	Age: old group	No. in old group	Instrument manufacturer
US White (2012) (52)[#]	285	≥50	1194	Hologic QDR 4500A
		≥60	853	Hologic QDR 4500A
US Black (2012) (52)	160	≥50	408	Hologic QDR 4500A
Hong Kong (2005) (51)	93^	≥60	1336	Hologic QDR 2000 or QDR 4500
Korea (2014) (66)	1551	≥50	5355	Hologic Discovery-W
ML Chinese (2006) (69)	102	≥50	1084	Hologic QDR 2000
ML Chinese (2008) (68)	209	≥50	766	Hologic Delphi A

[#]: cited reference and the year of publication (see main document reference list). ^: number estimated from a graph. ML, mainland.

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