

Supplementary Table S1. ORs and 95% CIs for bone loss, excluding participants with baseline history of taking anti-osteoporosis, corticosteroid, and estrogenic drugs.

	Osteopenia vs Normal	Osteoporosis vs Normal
Flavones		
Q1	1 (Reference)	1 (Reference)
Q2	0.97 (0.75,1.26)	1.13 (0.76,1.66)
Q3	1.11 (0.84,1.47)	0.66 (0.48,0.90)
Q4	1.02 (0.76,1.36)	0.51 (0.37,0.72)
Q5	0.81 (0.63,1.05)	0.41 (0.25,0.66)
Continuous	0.97 (0.89,1.05)	0.72 (0.61,0.84)
Isoflavones		
Q1	1 (Reference)	1 (Reference)
Q2	1.18 (0.81,1.71)	0.79 (0.51,1.22)
Q3	1.36 (1.13,1.64)	0.91 (0.68,1.22)
Q4	1.19 (0.84,1.67)	0.86 (0.53,1.40)
Q5	1.23 (0.95,1.59)	0.43 (0.32,0.59)
Continuous	1.09 (0.97,1.22)	0.75 (0.66,0.85)
Flavanones		
Q1	1 (Reference)	1 (Reference)
Q2	0.82 (0.57,1.17)	0.98 (0.60,1.62)
Q3	0.99 (0.76,1.30)	0.94 (0.65,1.65)
Q4	0.90 (0.66,1.23)	0.73 (0.46,1.14)
Q5	0.82 (0.63,1.08)	0.68 (0.46,0.99)
Continuous	0.96 (0.88,1.04)	0.85 (0.74,0.97)

Note: Fully adjusted model: age, sex, and ethnicity, education, marital status, PIR, BMI, smoking status, physical exercise, hypertension, T2DM, CKD, cancer, and history of fracture. Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval. Anti-osteoporosis drugs: Etidronate; Alendronate; Risedronate; Ibandronate; Zoledronic acid; Alendronate; Risedronate; Denosumab. Corticosteroid drugs: prednisone; cortisone. Estrogenic drugs: Conjugated estrogens Estrone; Ethinyl estradiol; Estradiol; Esterified estrogens; Estropipate estriol. Data with *P* values below 0.05 are presented in bold type.

Supplementary Table S2. ORs and 95% CIs for bone loss, additionally adjusting for menopausal status.

	Osteopenia vs Normal	Osteoporosis vs Normal
Flavones		
Q1	1 (Reference)	1 (Reference)
Q2	1.01 (0.81,1.27)	1.38 (0.94,2.02)
Q3	1.10 (0.86,1.41)	0.64 (0.46,0.89)
Q4	1.01 (0.77,1.34)	0.53 (0.37,0.74)
Q5	0.81 (0.61,1.07)	0.45 (0.31,0.65)
Continuous	0.96 (0.88,1.04)	0.75 (0.67,0.84)
Isoflavones		
Q1	1 (Reference)	1 (Reference)
Q2	1.15 (0.83,1.60)	0.75 (0.49,1.15)
Q3	1.31 (1.06,1.60)	0.91 (0.67,1.24)
Q4	1.13 (0.81,1.59)	0.94 (0.62,1.41)
Q5	1.18 (0.93,1.49)	0.50 (0.34,0.72)
Continuous	1.07 (0.97,1.19)	0.79 (0.69,0.92)
Flavanones		
Q1	1 (Reference)	1 (Reference)
Q2	0.90 (0.67,1.21)	1.07 (0.68,1.67)
Q3	1.01 (0.80,1.28)	0.94 (0.63,1.39)
Q4	0.95 (0.71,1.27)	0.69 (0.44,1.08)
Q5	0.84 (0.67,1.05)	0.67 (0.46,0.99)
Continuous	0.96 (0.90,1.03)	0.84 (0.73,0.96)

Note: Fully adjusted model: age, sex, and ethnicity, education, marital status, PIR, BMI, smoking status, physical exercise, hypertension, T2DM, CKD, cancer, and history of fracture. This multivariable model was additionally adjusted for menopausal status. Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval. Data with *P* values below 0.05 are presented in bold type.

Supplementary Table S3. ORs and 95% CIs for bone loss, additionally adjusting for dietary supplements (vitamin D and calcium).

	Osteopenia vs Normal	Osteoporosis vs Normal
Flavones		
Q1	1 (Reference)	1 (Reference)
Q2	0.96 (0.76,1.20)	1.25 (0.86,1.81)
Q3	1.10 (0.86,1.40)	0.63 (0.46,0.86)
Q4	1.01 (0.77,1.31)	0.52 (0.38,0.70)
Q5	0.81 (0.62,1.05)	0.46 (0.32,0.64)
Continuous	0.97 (0.89,1.05)	0.76 (0.68,0.85)
Isoflavones		
Q1	1 (Reference)	1 (Reference)
Q2	1.16 (0.84,1.60)	0.78 (0.52,1.16)
Q3	1.31 (1.07,1.60)	0.92 (0.67,1.26)
Q4	1.13 (0.81,1.56)	0.86 (0.58,1.29)
Q5	1.23 (0.98,1.54)	0.52 (0.36,0.75)
Continuous	1.08 (0.98,1.20)	0.79 (0.69,0.91)
Flavanones		
Q1	1 (Reference)	1 (Reference)
Q2	0.89 (0.66,1.20)	1.00 (0.64,1.56)
Q3	1.01 (0.80,1.28)	0.93 (0.63,1.38)
Q4	0.94 (0.71,1.24)	0.65 (0.42,1.02)
Q5	0.84 (0.68,1.05)	0.65 (0.44,0.97)
Continuous	0.96 (0.90,1.03)	0.83 (0.72,0.95)

Note: Fully adjusted model: age, sex, and ethnicity, education, marital status, PIR, BMI, smoking status, physical exercise, hypertension, T2DM, CKD, cancer, and history of fracture. This multivariable model was additionally adjusted for vitamin D and calcium supplements. Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval. Data with *P* values below 0.05 are presented in bold type.

Supplementary Table S4. E-values for the effect of three flavonoid subclasses on bone loss (and its upper limit of 95% CI) in fully adjusted model.

E-Value for OR Estimate	E-Value for upper limit of 95%CI	Variable	Level	Group	OR (95% CI)
2.72	1.67	Flavones	Q3 vs Q1	Osteoporosis vs Normal	0.60 (0.43,0.84)
3.41	2.21	Flavones	Q4 vs Q1	Osteoporosis vs Normal	0.50 (0.36,0.70)
3.97	2.50	Flavones	Q5 vs Q1	Osteoporosis vs Normal	0.44 (0.30,0.64)
2.00	1.67	Flavones	Continuous	Osteoporosis vs Normal	0.75 (0.67,0.84)
3.18	1.92	Isoflavones	Q5 vs Q1	Osteoporosis vs Normal	0.53 (0.37,0.77)
1.77	1.36	Isoflavones	Continuous	Osteoporosis vs Normal	0.81 (0.70,0.93)
2.40	1.21	Flavanones	Q5 vs Q1	Osteoporosis vs Normal	0.66 (0.45,0.97)
1.70	1.29	Flavanones	Continuous	Osteoporosis vs Normal	0.83 (0.72,0.95)

Note: Fully adjusted model: age, sex, and ethnicity, education, marital status, PIR, BMI, smoking status, physical exercise, hypertension, T2DM, CKD, cancer, and history of fracture. Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval.