| **First Author’s Last Name, Year****Risk of Bias**  | **Name of Tool** | **NPV** | **PPV** | **Other Outcomes** | **Comments (Subgroup Analysis, Other Notes)** |
| --- | --- | --- | --- | --- | --- |
| Cadarette, 200182Low | ABONE | NR | NR | NR | Cutoffs as designated by original developers |
| Chan, 200686unclear | ABONE | NR | NR | NR | Data also presented for lumbar spine |
| D’Amelio, 200588Low | AMMEB | NR | NR | NR | None |
| D’Amelio, 201389Low | AMMEB | NR | NR | NR | None |
| Nguyen, 2004103Low | DOESCore | NR | DOEScore >10: 55% (NR) | LR+ are also reported. | None |
| Jimenez-Nunez, 201394Low | FRAX: Hip | NR | NR | NR | Does not specify thresholds for specificity and sensitivity |
| Pang, 2014106Low | FRAX: Hip without BMD (>3%) | Based on lowest BMD at any site, FRAX Score >3%97.1 | Based on lowest BMD at any site, FRAX Score >3%17.1 | Also reports based on BMD at each individual site, and lowest of the two hip sites. | None |
| Jimenez-Nunez, 201394Low | FRAX: MOF | NR | NR | NR | Does not specify thresholds for specificity and sensitivity |
| Pang, 2014106Low | FRAX: MOF FRAX without BMD (>6.5%) | Based on lowest BMD at any site, FRAX Score >6.5%96.2 | Based on lowest BMD at any site, FRAX Score >6.5%16.8 | Also reports based on BMD at each individual site, and lowest of the two hip sites. | None |
| Leslie, 2013113Low | FRAX: MOF without BMD | NR | NR | NR | None |
| Bansal, 201556Fair | FRAX: MOF without BMD (>=9.3%) | NR | NR | NR | None |
| Cass, 2016114Low | FRAX: MOF without BMD (>=9.3%) | FRAX MOF risk >=9.3%: 0.97 (0.96-0.98) | FRAX MOF risk >=9.3%: 0.14 (0.09-0.20) | NR | None |
| Crandall, 201457Low | FRAX: MOF without BMD (>=9.3%) | NR | FRAX MOF risk >=9.3%: 13.7 (10.4-17.0) | NR | None |
| Gnudi, 200591Low | Gnudi et al clinical prediction tool | Cutoffs based on predicted probablity to have low BMD (PPL-BMD)(1) PPL-BMD = 0.090(2) PPL-BMD = 0.132(3) PPL-BMD = 0.156Gnudi et al clinical prediction tool:(1)90.9%(2) 91.2%(3) 86.1% | Cutoffs based on predicted probablity to have low BMD (PPL-BMD)(1) PPL-BMD = 0.090(2) PPL-BMD = 0.132(3) PPL-BMD = 0.156Gnudi et al clinical prediction tool:(1)40.9%(2)43.9%(3) 44.1% | NR | None |
| Cass, 201385Low | MORES | MORES>=6: 0.99 (0.96-1.00) | MORES>=6: 0.11 (0.06-0.18) | NR | Data reported on includes information for validation study. Article also reports information for development study. |
| Shepherd, 2007110; Cass, 2016114Low | MORES | MORES>=6: 0.10 (0.08-0.13)114 | MORES>=6: 1.00 (0.99-1.00)114 | Simulation study yielded number needed to screen to prevent 1 additional hip fracture in 10,000 men 50 years of olderUniversal DXA: 595; universal MORES for referral to DXA: 279 | Abstracted data for validation cohort only. |
| Shepherd, 2010115Low | MORES | NR | NR | NR | Outcomes by race/ethnicity also provided |
| Lynn, 200897Low | MOST | NR | NR | NR | None |
| Zimering, 2007112Unclear | MSCORE | MSCORE>9: 98 | MSCORE>9: 16 | NR | The study also reports data for a African American validation cohort, but combined data from 95 new subjects and 39 subjects from development cohort, so it was not pure external validation cohort |
| Cadarette, 200182Low | NOF | NR | NR | NR | Cutoffs as designated by original developers |
| D’Amelio, 200588Low | NOF | NR | NR | NR | None |
| D’Amelio, 201389Low | NOF | NR | NR | NR | None |
| Mauck, 2005100Low | NOF | NOF>=1 risk factorNOF Overall: 100% (95% CI, 75% to 100%)Age 45-64: 100% (95% CI, 75% to 100%)Age 65+: NA | NOF>=1 risk factorOverall: 37% (95% CI, 30% to 44%)Age 45-64: 17% (95% CI,9% to 28%)Age 65+: 48% (95% CI, 38% to 57%) | +LR and -LR are also presented | Age-adjusted analysis:AUCNOF 0.65 (0.58-0.71)SnNOF: 100% (95% CI, 55% to 100%)SpNOF: 10% (4% to 29%)NPVNOF: 100% (95% CI, 30% to 100%)PPVNOF: 27% (95% CI, 17% to 41%) |
| Cadarette, 200182Low | ORAI | NR | NR | NR | Cutoffs as designated by original developers |
| Cadarette, 200483Low | ORAI | NR | NR | NR | Study also looked at weight criterion and OST-chart tool that was developed just for this study (not validated) |
| Cass, 200684Low | ORAI | ORAI>=9: 0.94 (0.90-0.98) | ORAI >=9: 0.20 (0.11-0.29) | NR | Includes subgroup analysis for non-hispanic White, Hispanic, and African American groups |
| Chan, 200686unclear | ORAI | NR | NR | NR | Data also presented for lumbar spine |
| Cook et al, 200587unclear | ORAI | ORAI<14: 0.84 | ORAI<140.48 | NR | None |
| D’Amelio, 200588Low | ORAI | NR | NR | NR | None |
| D’Amelio, 201389Low | ORAI | NR | NR | NR | None |
| Geusens, 200290Unclear | ORAI | NR | NR | NR | The study reported on 4 cohorts in all apart from the US-based clinic sample (1 population-based cohort and 1 clinic-based sample in Netherlands, and 1 clinic-based sample enrolled in a clinical trial of alendronate (FIT) in the US). The study did not rep |
| Gourlay, 200579unclear | ORAI | NR | NR | LR ratios are also reported, but I didn’t pull them because there are like 18 of them; if we decide to synthesize this outcome, we can go back and pull them. | Other results reported in Ben Sedrine et al, 200178 and Richy et al, 200480Data in this study reports findings by age group. |
| Gourlay, 200892Unclear | ORAI | NR | NR | NR | None |
| Harrison et al, 200693Low | ORAI | NR | NR | NR | None |
| Jimenez-Nunez, 201394Low | ORAI | NR | NR | NR | None |
| Martinez-Aguila, 200799Unclear | ORAI | ORAI>=9: 25.0 (95% CI 20.2 to 30.3) | ORAI>=9: 88.5 (95% CI 84.8 to 91.6) | NR | None |
| Mauck, 2005100Low | ORAI | ORAI >=9Overall: 44% (95% CI, 36% to 53%)Age 45-64: 32% (95% CI, 17% to 51%)Age 65+: 48% (95 % CI, 38% to 57%) | ORAI >=9Overall: 98% (95% CI, 89% to 100%)Age 45-64: 98% (95% CI, 89% to 100%)Age 65+: NA | +LR and -LR are also presented | Age-adjusted analysis:AUCORAI 0.79 (0.74-0.83)SnORAI: 98% (95% CI, 51% to 100%)SpORAI: 40% (30% CI to 56%)NPVORAI: 77% (95% CI, 46% to 100%)PPVORAI: 29% (95% CI, 18% to 59%) |
| Nguyen, 2004103Low | ORAI | NR | ORAI >15: 57% (NR) | LR+ are also reported. | None |
| Richy, 200480Unclear | ORAI | ORAI<8Total hip: 98Femoral neck:92Lumbar spine: 85Any site: 80 | ORAI>=8Total hip: 14Femoral neck: 26Lumbar spine: 31Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109Low | ORAI | ORAI 1) cutoff>8: 91 (90–93)(<-2.0)2) cutoff>2: 17 (15–19)(<-2.0)3) cutoff>2: 6 (5–7)(<-2.5) | ORAI 1) cutoff>8: 23 (19–26)(<-2.0)2) cutoff>2: 93 (91–95)(<-2.0)3) cutoff>2: 98 (96–99)(<-2.5) | When the authors evaluated the performance of these clinical prediction tools as the developers described with cutoffs and using FN DXA of -2.5 as reference, did not perform well in this population of women that was generally younger (by >10 years) and us | None |
| Cook et al, 200587unclear | OSIRIS | OSIRIS<0: 89 | OSIRIS<0: 42 | NR | None |
| Harrison et al, 200693Low | OSIRIS | NR | NR | NR | None |
| Jimenez-Nunez, 201394Low | OSIRIS | NR | NR | NR | None |
| Martinez-Aguila, 200799Unclear | OSIRIS | OSIRIS<=1: 88.4 (95% CI, 84.9 to 91.3) | OSIRIS<=1: 27.9 (95% CI 22.3 to 33.9) | NR | None |
| Richy, 200480Unclear | OSIRIS | OSIRIS>=1Total hip: 97Femoral neck:92Lumbar spine: 84 Any site: 80 | OSIRIS<1Total hip: 19Femoral neck: 34Lumbar spine: 37Any site: 50 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Adler, 200377Low | OST | Cutoff used by study authors(OST<3)98%Cutoff used for older men (ref 10),(OST<2)97%Cutoff used for white women (ref 6),(OST<1)95%All compared to DXA outcome of any T score (LS, FN, TH)=< -2.5 | Cutoff used by study authors(OST<3)33%Cutoff used for older men (ref 10),(OST<2)38%Cutoff used for white women (ref 6),(OST<1)41%All compared to DXA outcome of any T score (LS, FN, TH)=< -2.5 | none | Subgroup analyses for race, age deciles, cortocosteroid treatment.AUCs (no CI):White: 0.848Black: 0.80050-59: 0.93860-69: 0.89470-79: 0.696>=80: 0.993Current CS treatment: 0.786No current CS: 0.803 |
| Cadarette, 200483Low | OST | NR | NR | NR | Study also looked at weight criterion and OST-chart tool that was developed just for this study (not validated) |
| Cook et al, 200587unclear | OST | OST<=-1: 56 | OST<=-1: 44 | NR | None |
| Crandall, 201457Low | OST | NR | OST<2: 14.7 (12.4-16.9) | NR | None |
| D’Amelio, 200588Low | OST | NR | NR | NR | None |
| D’Amelio, 201389Low | OST | NR | NR | NR | None |
| Geusens, 200290Unclear | OST | NR | NR | NR | The study reported on 4 cohorts in all apart from the US-based clinic sample (1 population-based cohort and 1 clinic-based sample in Netherlands, and 1 clinic-based sample enrolled in a clinical trial of alendronate (FIT) in the US). The study did not rep |
| Gourlay, 200579unclear | OST | NR | NR | LR ratios are also reported, but I didn’t pull them because there are like 18 of them; if we decide to synthesize this outcome, we can go back and pull them. | Other results reported in Ben Sedrine et al, 200178 and Richy et al, 200480Data in this study reports findings by age group. |
| Gourlay, 200892Unclear | OST | NR | NR | LR- 0.31LR+ 1.64 | None |
| Harrison et al, 200693Low | OST | NR | NR | NR | None |
| Jimenez-Nunez, 201394Low | OST | NR | NR | NR | None |
| Leslie, 2013113Low | OST | NR | NR | NR | None |
| Lynn, 200897Low | OST | OST <297.4% | OST <29.7% | NR | None |
| Machado, 201098Low | OST | OST <2: 89.2% | OST <2: 25.6% (NR) | NR | Calculation for OST: 0.2×(body weight in kilograms−age in years), truncate to yield an integer |
| Martinez-Aguila, 200799Unclear | OST | OST <2: 89.9 (95% CI 86.3 to 92.9) | OST <2: 26.4 (95% CI 21.5 to 31.7) | NR | None |
| McLeod, 2015101Low | OST | NR | NR | NR | Score of <2 considered to optimal to achieve close to 90% sensitivity |
| Morin, 2009102Unclear | OST | NR | NR | NR | None |
| Pang, 2014106Low | OST | Based on lowest BMD at any site(OST Threshold = 0: not clear if this means <=0 or <0)96.9 | Based on lowest BMD at any site (OST Threshold = 0: not clear if this means <=0 or <0)17.5 | Also reports based on BMD at each individual site, and lowest of the two hip sites. | None |
| Richards, 2014108Unclear | OST | NR | NR | NR | This study also reported sensivity and specificity of FRAX without BMD to predict osteoporosis, but did not report the threshold value, so it is not clear how to interpret it. Also reports results by race and age. Findings suggest that “an OST index of ≤5 |
| Richy, 200480Unclear | OST | OST<2Total hip: 99Femoral neck: 95 Lumbar spine: 89Any site: 86 | OST<2Total hip: 13Femoral neck: 25Lumbar spine: 31Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109Low | OST | OST 1) cutoff <2:100 (99–100) (<-2.5)2) cutoff<5: 96 (93–97)(<-2.0)3) cutoff<5: 99 (97–100)(<-2.5) | OST 1) cutoff <2: 2 (1–3)(<-2.5)2) cutoff<5: 15 (14–17)(<-2.0)3) cutoff<5: 6.0 (4–7)(<-2.5) | When the authors evaluated the performance of these clinical prediction tools as the developers described with cutoffs and using FN DXA of -2.5 as reference, did not perform well in this population of women that was generally younger (by >10 years) and us | None |
| Sinnott, 2006111Low | OST | OST<4: 98OST<2: 99 | OST<4: 13OST<2: 19 | NR | Score of 4 considered optimal for African-American men |
| Zimering, 2007112Unclear | OST | OST<2 (cutoff established in elderly male population): 96OST<3 (cutoff established in male veteran popualation): 95 | OST<2 (cutoff established in elderly male population): 22OST<3 (cutoff established in male veteran popualation): 17 | NR | The study also reports data for a African American validation cohort, but combined data from 95 new subjects and 39 subjects from development cohort, so it was not pure external validation cohort |
| Chan, 200686unclear | OSTA | NR | NR | NR | Data also presented for lumbar spine |
| Kung, 200395Low | OSTA | NR | NR | NR | None |
| Kung, 200596Low | OSTA | NR | NR | NR | None |
| Machado, 201098Low | OSTA | OSTA < 2: 88.4% (NR) | OSTA < 2: 26.0% (NR) | NR | Calculation for OSTA: 0.2×body weight in kilograms (truncate to yield an integer)−0.2×age in years (truncate to yield an integer) |
| Nguyen, 2004103Low | OSTA | NR | OSTA <-1: 28% (NR) FN | LR+ are also reported. | None |
| Oh, 2013104Low | OSTA | OSTA=<-1 for T score<=-2.5 at femoral neck or lumbar spine87.0 (83.9-89.6)OSTA =<0 for T score<=-2.5 at femoral neck or lumbar spine92.3 (88.1-95.4) | OSTA=<-1 for T score<=-2.5 at femoral neck or lumbar spine49.4 (44.8-54.0)OSTA =<0 for T score<=-2.5 at femoral neck or lumbar spine35.9 (32.6-39.3) | OST=<-1 or T score<=-2.5 at femoral neck or lumbar spinePositive Likelihood Ratio2.32 (2.05, 2.61)Negative Likelihood Ratio0.36 (0.29, 0.44)OSTA=<0 for T score<=-2.5 at femoral neck or lumbar spinePositive Likelihood Ratio1.33 (1.26, 1.40)Negative | None |
| Oh, 2016105Low | OSTA | OSTA<=1: 98.0 (95.9 to 99.2)OSTA<=0: 97.2 (95.4 to 98.5) | OSTA<=1: 11.0 (8.9 to 13.4)OSTA<= 0: 12.8 (10.2 to 15.7) | NR | None |
| Park, 2003107Unclear | OSTA | OSTA≤-1: 98% | OSTA>-1=<: 24% | NR | None |
| Zimering, 2007112Unclear | Reduced MSCORE (age and weight-variable specific scores) | Reduced MSCORE>9: 97 | Reduced MSCORE>9: 18 | NR | The study also reports data for a African American validation cohort, but combined data from 95 new subjects and 39 subjects from development cohort, so it was not pure external validation cohort |
| Ben Sedrine, 200178Low | SCORE | SCORE>=6, T<-2.5Total hip99.0Femoral neck 96.8Lumbar spine 91.2Any site89.1Hip (total or neck) or spine 98.8All sites 99.3study cutoff >=8, T<-2.5Total hip98.3Femoral neck 93.7Lumbar spine 86.5Any site83.4Hip (total or neck) or spine | SCORE>=6, T<-2.5Total hip11.3Femoral neck 21.9Lumbar spine 27.7Any site37.0Hip (total or neck) or spine 14.0All sites 7.3study cutoff >=8, T<-2.5Total hip13.5Femoral neck 25.0Lumbar spine 30.0Any site40.6Hip (total or neck) or spine 1 | NR | Other results reported in Gourlay et al, 200579 and Richy et al, 200480SCORE>6, T<-2.5Sn- Women >=65Total hip100Femoral neck 99.8 Lumbar spine 98.7Any site98.9Hip (total or neck) or spine 100.0All sites 100.0Sp- Women >=65Total |
| Brenneman, 200381Low | SCORE | NR | NR | NR | SCORE cutoff recalibrated from >=6 to >=7 to account for the age group of this sample |
| Cadarette, 200182Low | SCORE | NR | NR | NR | Cutoffs as designated by original developers |
| Cass, 200684Low | SCORE | SCORE>=6: 0.93 (0.89-0.97) | SCORE>=6: 0.19 (0.09-0.29) | NR | Includes subgroup analysis for non-hispanic White, Hispanic, and African American groups |
| Chan, 200686unclear | SCORE | NR | NR | NR | Data also presented for lumbar spine |
| Cook et al, 200587Unclear | SCORE | SCORE<12: 0.85 | SCORE<12: 0.46 | NR | None |
| Crandall, 201457Low | SCORE | NR | SCORE >7: 14.1 (11.9-16.4) | NR | None |
| Gourlay, 200579unclear | SCORE | NR | NR | LR ratios are also reported, but I didn’t pull them because there are like 18 of them; if we decide to synthesize this outcome, we can go back and pull them. | Other results reported in Ben Sedrine et al, 200178 and Richy et al, 200480Data reports previous findings from other studies by age group. |
| Gourlay, 200892Unclear | SCORE | NR | NR | NR | None |
| Harrison et al, 200693Low | SCORE | NR | NR | NR | None |
| Jimenez-Nunez, 201394Low | SCORE | NR | NR | NR | None |
| Mauck, 2005100Low | SCORE | SCORE>=6Overall: 100% (95% CI, 89% to 100%)Age 45-64 :100% (95% CI, 88% to 100%)Age 65+: 100% (95% CI, 48% to 100%) | SCORE>=6Overall: 41% (95% CI, 34% to 39%)Age 45-64 :22% (95% CI, 11% to 35%)Age 65+: 50% (95% CI, 40% to 59%) | +LR and -LR are also presented | Age-adjusted analysis:AUCSCORE 0.85 (0.80-0.89)SnSCORE: 100% (95% CI, 55% to 100%)SpSCORE: 29% (95% CI, 18% to 48%)NPVSCORE: 100% ((5% CI, 51% to 100%)PPVSCORE: 27% (95% CI, 17% to 48%) |
| Richy, 200480Unclear | SCORE | SCORE<7Total hip: 98Femoral neck:94Lumbar spine: 87 Any site: 86 | SCORE >=7Total hip: 14Femoral neck: 25Lumbar spine: 30Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109Low | SCORE | 1) a priori cut off based on developers cutoffs and DXA outcome of T score FN=< -2.52) cutoff based on ROC analysis to yield Sn close to 90% and DXA outcome lowest T score of FN, TH, LS=< -2.5SCORE 1) n/a (wrong DXA threshold)2) cutoff>3: 95 (92–97)( | 1) a priori cut off based on developers cutoffs and DXA outcome of T score FN=< -2.52) cutoff based on ROC analysis to yield Sn close to 90% and DXA outcome lowest T score of FN, TH, LS=< -2.5SCORE 1) n/a (wrong DXA threshold)2) cutoff>3: 16 (14–18)( | When the authors evaluated the performance of these clinical prediction tools as the developers described with cutoffs and using FN DXA of -2.5 as reference, did not perform well in this population of women that was generally younger (by >10 years) and us | None |
| Brenneman, 200381Low | SOF | NR | NR | NR | None |
| Cook et al, 200587unclear | SOFSURF | SOFSURF<10.89 | SOFSURF<10.42 | NR | None |
| Geusens, 200290Unclear | SOFSURF | NR | NR | NR | The study reported on 4 cohorts in all apart from the US-based clinic sample (1 population-based cohort and 1 clinic-based sample in Netherlands, and 1 clinic-based sample enrolled in a clinical trial of alendronate (FIT) in the US). The study did not rep |
| Nguyen, 2004103Low | SOFSURF | NR | SOFSURF >10 : 47% (NR) | LR+ are also reported. | None |

**Abbreviations:** AUC=area under the curve; BMD=bone mineral density; CI=confidence interval; DOEScore=Dubbo Osteoporosis Epidemiology Score; DXA=dual energy x-ray absorptiometry; FN=femoral neck;FRAX=Fracture Risk Assessment tool; LR=likelihood ratio; LS=lumbar spine; MOF=major osteoporotic fracture defined as fractures of the proximal femur, distal radius, proximal humerus, and clinical; NA=not applicable; NOF=National Osteoporosis Foundation; NPV=negative predictive value; NR=not reported; ORAI=Osteoporosis Risk Assessment Instrument; OSIRIS=Osteoporosis Index of Risk; OST=osteoporosis self-assessment tool; OSTA=Osteoporosis Self-assessment Tool for Asians; PPL=predicted probability of low; PPV=positive predictive value; ROC=receiver operating characteristics; SCORE=Simple Calculated Osteoporosis Risk Estimation Tool; Sn=sensitivity; SOFSURF=Study of Osteoporotic Fractures Simple Useful Risk Factors;Sp=specificity; TH=total hip.