| **First Author’s Last Name, Year**  **Risk of Bias** | **Name of Tool** | **NPV** | **PPV** | **Other Outcomes** | **Comments (Subgroup Analysis, Other Notes)** |
| --- | --- | --- | --- | --- | --- |
| Cadarette, 200182  Low | ABONE | NR | NR | NR | Cutoffs as designated by original developers |
| Chan, 200686  unclear | ABONE | NR | NR | NR | Data also presented for lumbar spine |
| D’Amelio, 200588  Low | AMMEB | NR | NR | NR | None |
| D’Amelio, 201389  Low | AMMEB | NR | NR | NR | None |
| Nguyen, 2004103  Low | DOESCore | NR | DOEScore >10: 55% (NR) | LR+ are also reported. | None |
| Jimenez-Nunez, 201394  Low | FRAX: Hip | NR | NR | NR | Does not specify thresholds for specificity and sensitivity |
| Pang, 2014106  Low | 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, 201394  Low | FRAX: MOF | NR | NR | NR | Does not specify thresholds for specificity and sensitivity |
| Pang, 2014106  Low | 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, 2013113  Low | FRAX: MOF without BMD | NR | NR | NR | None |
| Bansal, 201556  Fair | FRAX: MOF without BMD (>=9.3%) | NR | NR | NR | None |
| Cass, 2016114  Low | 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, 201457  Low | FRAX: MOF without BMD (>=9.3%) | NR | FRAX MOF risk >=9.3%: 13.7 (10.4-17.0) | NR | None |
| Gnudi, 200591  Low | 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 = 0.156  Gnudi 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 = 0.156  Gnudi et al clinical prediction tool:  (1)40.9%  (2)43.9%  (3) 44.1% | NR | None |
| Cass, 201385  Low | 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, 2016114  Low | 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 older  Universal DXA: 595; universal MORES for referral to DXA: 279 | Abstracted data for validation cohort only. |
| Shepherd, 2010115  Low | MORES | NR | NR | NR | Outcomes by race/ethnicity also provided |
| Lynn, 200897  Low | MOST | NR | NR | NR | None |
| Zimering, 2007112  Unclear | 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, 200182  Low | NOF | NR | NR | NR | Cutoffs as designated by original developers |
| D’Amelio, 200588  Low | NOF | NR | NR | NR | None |
| D’Amelio, 201389  Low | NOF | NR | NR | NR | None |
| Mauck, 2005100  Low | NOF | NOF>=1 risk factor  NOF Overall: 100% (95% CI, 75% to 100%)  Age 45-64: 100% (95% CI, 75% to 100%)  Age 65+: NA | NOF>=1 risk factor  Overall: 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:  AUC  NOF 0.65 (0.58-0.71)  Sn  NOF: 100% (95% CI, 55% to 100%)  Sp  NOF: 10% (4% to 29%)  NPV  NOF: 100% (95% CI, 30% to 100%)  PPV  NOF: 27% (95% CI, 17% to 41%) |
| Cadarette, 200182  Low | ORAI | NR | NR | NR | Cutoffs as designated by original developers |
| Cadarette, 200483  Low | ORAI | NR | NR | NR | Study also looked at weight criterion and OST-chart tool that was developed just for this study (not validated) |
| Cass, 200684  Low | 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, 200686  unclear | ORAI | NR | NR | NR | Data also presented for lumbar spine |
| Cook et al, 200587  unclear | ORAI | ORAI<14: 0.84 | ORAI<14  0.48 | NR | None |
| D’Amelio, 200588  Low | ORAI | NR | NR | NR | None |
| D’Amelio, 201389  Low | ORAI | NR | NR | NR | None |
| Geusens, 200290  Unclear | 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, 200579  unclear | 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, 200480  Data in this study reports findings by age group. |
| Gourlay, 200892  Unclear | ORAI | NR | NR | NR | None |
| Harrison et al, 200693  Low | ORAI | NR | NR | NR | None |
| Jimenez-Nunez, 201394  Low | ORAI | NR | NR | NR | None |
| Martinez-Aguila, 200799  Unclear | 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, 2005100  Low | ORAI | ORAI >=9  Overall: 44% (95% CI, 36% to 53%)  Age 45-64: 32% (95% CI, 17% to 51%)  Age 65+: 48% (95 % CI, 38% to 57%) | ORAI >=9  Overall: 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:  AUC  ORAI 0.79 (0.74-0.83)  Sn  ORAI: 98% (95% CI, 51% to 100%)  Sp  ORAI: 40% (30% CI to 56%)  NPV  ORAI: 77% (95% CI, 46% to 100%)  PPV  ORAI: 29% (95% CI, 18% to 59%) |
| Nguyen, 2004103  Low | ORAI | NR | ORAI >15: 57% (NR) | LR+ are also reported. | None |
| Richy, 200480  Unclear | ORAI | ORAI<8  Total hip: 98  Femoral neck:92  Lumbar spine: 85  Any site: 80 | ORAI>=8  Total hip: 14  Femoral neck: 26  Lumbar spine: 31  Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109  Low | 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, 200587  unclear | OSIRIS | OSIRIS<0: 89 | OSIRIS<0: 42 | NR | None |
| Harrison et al, 200693  Low | OSIRIS | NR | NR | NR | None |
| Jimenez-Nunez, 201394  Low | OSIRIS | NR | NR | NR | None |
| Martinez-Aguila, 200799  Unclear | 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, 200480  Unclear | OSIRIS | OSIRIS>=1  Total hip: 97  Femoral neck:92  Lumbar spine: 84  Any site: 80 | OSIRIS<1  Total hip: 19  Femoral neck: 34  Lumbar spine: 37  Any site: 50 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Adler, 200377  Low | 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: 0.848  Black: 0.800  50-59: 0.938  60-69: 0.894  70-79: 0.696  >=80: 0.993  Current CS treatment: 0.786  No current CS: 0.803 |
| Cadarette, 200483  Low | 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, 200587  unclear | OST | OST<=-1: 56 | OST<=-1: 44 | NR | None |
| Crandall, 201457  Low | OST | NR | OST<2: 14.7 (12.4-16.9) | NR | None |
| D’Amelio, 200588  Low | OST | NR | NR | NR | None |
| D’Amelio, 201389  Low | OST | NR | NR | NR | None |
| Geusens, 200290  Unclear | 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, 200579  unclear | 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, 200480  Data in this study reports findings by age group. |
| Gourlay, 200892  Unclear | OST | NR | NR | LR- 0.31  LR+ 1.64 | None |
| Harrison et al, 200693  Low | OST | NR | NR | NR | None |
| Jimenez-Nunez, 201394  Low | OST | NR | NR | NR | None |
| Leslie, 2013113  Low | OST | NR | NR | NR | None |
| Lynn, 200897  Low | OST | OST <297.4% | OST <29.7% | NR | None |
| Machado, 201098  Low | 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, 200799  Unclear | 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, 2015101  Low | OST | NR | NR | NR | Score of <2 considered to optimal to achieve close to 90% sensitivity |
| Morin, 2009102  Unclear | OST | NR | NR | NR | None |
| Pang, 2014106  Low | 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, 2014108  Unclear | 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, 200480  Unclear | OST | OST<2  Total hip: 99  Femoral neck: 95  Lumbar spine: 89  Any site: 86 | OST<2  Total hip: 13  Femoral neck: 25  Lumbar spine: 31  Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109  Low | 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, 2006111  Low | OST | OST<4: 98  OST<2: 99 | OST<4: 13  OST<2: 19 | NR | Score of 4 considered optimal for African-American men |
| Zimering, 2007112  Unclear | OST | OST<2 (cutoff established in elderly male population): 96  OST<3 (cutoff established in male veteran popualation): 95 | OST<2 (cutoff established in elderly male population): 22  OST<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, 200686  unclear | OSTA | NR | NR | NR | Data also presented for lumbar spine |
| Kung, 200395  Low | OSTA | NR | NR | NR | None |
| Kung, 200596  Low | OSTA | NR | NR | NR | None |
| Machado, 201098  Low | 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, 2004103  Low | OSTA | NR | OSTA <-1: 28% (NR) FN | LR+ are also reported. | None |
| Oh, 2013104  Low | OSTA | OSTA=<-1 for T score<=-2.5 at femoral neck or lumbar spine  87.0 (83.9-89.6)  OSTA =<0 for T score<=-2.5 at femoral neck or lumbar spine  92.3 (88.1-95.4) | OSTA=<-1 for T score<=-2.5 at femoral neck or lumbar spine  49.4 (44.8-54.0)  OSTA =<0 for T score<=-2.5 at femoral neck or lumbar spine  35.9 (32.6-39.3) | OST=<-1 or T score<=-2.5 at femoral neck or lumbar spine  Positive Likelihood Ratio  2.32 (2.05, 2.61)  Negative Likelihood Ratio  0.36 (0.29, 0.44)  OSTA=<0 for T score<=-2.5 at femoral neck or lumbar spine  Positive Likelihood Ratio  1.33 (1.26, 1.40)  Negative | None |
| Oh, 2016105  Low | 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, 2003107  Unclear | OSTA | OSTA≤-1: 98% | OSTA>-1=<: 24% | NR | None |
| Zimering, 2007112  Unclear | 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, 200178  Low | SCORE | SCORE>=6, T<-2.5  Total hip99.0  Femoral neck 96.8  Lumbar spine 91.2  Any site89.1  Hip (total or neck) or spine 98.8  All sites 99.3  study cutoff >=8, T<-2.5  Total hip98.3  Femoral neck 93.7  Lumbar spine 86.5  Any site83.4  Hip (total or neck) or spine | SCORE>=6, T<-2.5  Total hip11.3  Femoral neck 21.9  Lumbar spine 27.7  Any site37.0  Hip (total or neck) or spine 14.0  All sites 7.3  study cutoff >=8, T<-2.5  Total hip13.5  Femoral neck 25.0  Lumbar spine 30.0  Any site40.6  Hip (total or neck) or spine 1 | NR | Other results reported in Gourlay et al, 200579 and Richy et al, 200480  SCORE>6, T<-2.5  Sn- Women >=65  Total hip100  Femoral neck 99.8  Lumbar spine 98.7  Any site98.9  Hip (total or neck) or spine 100.0  All sites 100.0  Sp- Women >=65  Total |
| Brenneman, 200381  Low | SCORE | NR | NR | NR | SCORE cutoff recalibrated from >=6 to >=7 to account for the age group of this sample |
| Cadarette, 200182  Low | SCORE | NR | NR | NR | Cutoffs as designated by original developers |
| Cass, 200684  Low | 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, 200686  unclear | SCORE | NR | NR | NR | Data also presented for lumbar spine |
| Cook et al, 200587  Unclear | SCORE | SCORE<12: 0.85 | SCORE<12: 0.46 | NR | None |
| Crandall, 201457  Low | SCORE | NR | SCORE >7: 14.1 (11.9-16.4) | NR | None |
| Gourlay, 200579  unclear | 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, 200480  Data reports previous findings from other studies by age group. |
| Gourlay, 200892  Unclear | SCORE | NR | NR | NR | None |
| Harrison et al, 200693  Low | SCORE | NR | NR | NR | None |
| Jimenez-Nunez, 201394  Low | SCORE | NR | NR | NR | None |
| Mauck, 2005100  Low | SCORE | SCORE>=6  Overall: 100% (95% CI, 89% to 100%)  Age 45-64 :100% (95% CI, 88% to 100%)  Age 65+: 100% (95% CI, 48% to 100%) | SCORE>=6  Overall: 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:  AUC  SCORE 0.85 (0.80-0.89)  Sn  SCORE: 100% (95% CI, 55% to 100%)  Sp  SCORE: 29% (95% CI, 18% to 48%)  NPV  SCORE: 100% ((5% CI, 51% to 100%)  PPV  SCORE: 27% (95% CI, 17% to 48%) |
| Richy, 200480  Unclear | SCORE | SCORE<7  Total hip: 98  Femoral neck:94  Lumbar spine: 87  Any site: 86 | SCORE >=7  Total hip: 14  Femoral neck: 25  Lumbar spine: 30  Any site: 41 | NR | Other results reported in Ben Sedrine et al, 200178 and Gourlay et al, 200578 |
| Rud, 2005109  Low | SCORE | 1) a priori cut off based on developers cutoffs and DXA outcome of T score FN=< -2.5  2) cutoff based on ROC analysis to yield Sn close to 90% and DXA outcome lowest T score of FN, TH, LS=< -2.5  SCORE  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=< -2.5  2) cutoff based on ROC analysis to yield Sn close to 90% and DXA outcome lowest T score of FN, TH, LS=< -2.5  SCORE  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, 200381  Low | SOF | NR | NR | NR | None |
| Cook et al, 200587  unclear | SOFSURF | SOFSURF<1  0.89 | SOFSURF<1  0.42 | NR | None |
| Geusens, 200290  Unclear | 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, 2004103  Low | 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.