| **First Author’s Last Name, Year****Risk of Bias** | **Name of Tool** | **T-Score References Ranges** | **Machine and Software Version if Reported** | **Other Comments on BMD Test** | **Did Analysis Include Additional Adjustments?** | **If Yes, List Adjustment Variables** |
| --- | --- | --- | --- | --- | --- | --- |
| Cadarette, 200182Low | ABONE | Canadian young adult normal values at the femoral neck. (Authors note that the Canadian young adult normal reference at the femoral neck (mean [SD], 0.857 [0.125] g/cm3) is similar to that reported by NHANES III for non-Hispanic white Americans (mean [SD], 0.858 [0.120] g/cm3). | Hologic QDR 4500Hologic QDR 2000Hologic QDR 1000Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Chan, 200686unclear | ABONE | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| D’Amelio, 200588Low | AMMEB | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389Low | AMMEB | NR | DXA (Hologic QDR 4500), NR | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score. | Unclear | NA |
| Nguyen, 2004103Low | DOESCore | Reference ranges for calculation of T scores not described.Under “Measurements”: used BMD values of young Australian women at either the femoral neck or lumbar spine as reference to determine T score | LUNAR DPX-L densitometer | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Jimenez-Nunez, 201394Low | FRAX: Hip | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Pang, 2014106Low | FRAX: Hip without BMD (>3%) | Manufacturer’s sex specific normative databse and an ethnic database. | Lunar Prodigy limited fan-beam machine, NR | NR | Unclear | NA |
| Jimenez-Nunez, 201394Low | FRAX: MOF | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Pang, 2014106Low | FRAX: MOF FRAX without BMD (>6.5%) | Manufacturer’s sex specific normative databse and an ethnic database. | Lunar Prodigy limited fan-beam machine, NR | NR | Unclear | NA |
| Leslie, 2013113Low | FRAX: MOF without BMD | Femoral T-scores calculated based on NHANES III white female reference; lumbar spine used T-scores used manufacturer‘s USA white female reference values | NR | Lowest score at lumbar spine and hip | No | NA |
| Bansal, 201556Fair | FRAX: MOF without BMD (>=9.3%) | NR | NR | NR | No | NA |
| Cass, 2016114Low | FRAX: MOF without BMD (>=9.3%) | NHANES III non-Hispanic White women age 20-29 years old | NR | NR | No | NA |
| Crandall, 201457Low | FRAX: MOF without BMD (>=9.3%) | NHANES III normative reference database (presumably young non-hispanic white females 20-29, though this is not specifically reported) | DXA (Hologic QDR 4500A), NR | Femoral neck | Unclear | NA |
| Gnudi, 200591Low | Gnudi et al clinical prediction tool | “Reference values were those reported by Norland for the European female population.” Age not given | Norland XR 36 | NR | No | NA |
| Cass, 201385Low | MORES | NHANES III non-Hispanic White women age 20-29 years old. | DXA (Hologic QDR 4500A), NR (Standardized conversion formulas furnished by GE Health Care) | “positive” test is a T score of -2.5 at the femoral neck OR total hip | Unclear | NA |
| Shepherd, 2007110; Cass, 2016114Low | MORES | T scores derived from race/ethnicity and sex-specific bone mineral density for Hispanic, non-Hispanic white, and non-Hispanic black men ages 20-29. | Hologic QDR | NR | No | NA |
| Shepherd, 2010115Low | MORES | White men age 20-29; whole body DXA Hologic QDR-4500A | NR | NR | No | no |
| Lynn, 200897Low | MOST | US: NHANESHong Kong: local Chinese reference ranges | Hologic QDR 4500W bone densitometers | Results presented for femoral neck, lumbar spine, total hip, or any site | No | NA |
| Zimering, 2007112Unclear | MSCORE | T score <= -2.5 compared to NHANES III young male, ethnicity/race- specific reference data | Hologic QDR 4500 SL | NR | No | NA |
| Cadarette, 200182Low | NOF | Canadian young adult normal values at the femoral neck. (Authors note that the Canadian young adult normal reference at the femoral neck (mean [SD], 0.857 [0.125] g/cm3) is similar to that reported by NHANES III for non-Hispanic white Americans (mean [SD], 0.858 [0.120] g/cm3). | Hologic QDR 4500Hologic QDR 2000Hologic QDR 1000Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| D’Amelio, 200588Low | NOF | NR | Hologic QDR 4500 | NR | No | NA |
| D’Amelio, 201389Low | NOF | NR | DXA (Hologic QDR 4500), NR | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score. | Unclear | NA |
| Mauck, 2005100Low | NOF | T scores based on references ranges for young healthy women age 20-29 years in the local community area | QDR2000 instrument; Hologic, Waltham, Mass | NR | Yes | Age |
| Cadarette, 200182Low | ORAI | Canadian young adult normal values at the femoral neck. (Authors note that the Canadian young adult normal reference at the femoral neck (mean [SD], 0.857 [0.125] g/cm3) is similar to that reported by NHANES III for non-Hispanic white Americans (mean [SD], 0.858 [0.120] g/cm3). | Hologic QDR 4500Hologic QDR 2000Hologic QDR 1000Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Cadarette, 200483Low | ORAI | NR | HologicLunarNorlandUnknown | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Cass, 200684Low | ORAI | NHANES III non-Hispanic White women age 20-29 years old. | DXA (Hologic QDR 4500A), NR | “positive” test is a T score of -2.5 at the femoral neck OR total hip | Unclear | NA |
| Chan, 200686unclear | ORAI | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Cook et al, 200587unclear | ORAI | T-scores were computed using the databases supplied with the systems | Hologic QDR-4500C | Lowest value of lumbar spine or total hip used to classify as osteoporosis | No | NA |
| D’Amelio, 200588Low | ORAI | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389Low | ORAI | NR | DXA (Hologic QDR 4500), NR | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score. | Unclear | NA |
| Geusens, 200290Unclear | ORAI | FN: non-hispanic female white women age 20-29 (NHANES)LS: unclear | The brand of DXA manufacturer varied among centers, and included Norland, Hologic, and Lunar machines | NR | No | NA |
| Gourlay, 200579unclear | ORAI | T score reference range was NHANES III non-Hispanic white women age 20-29 years at the femoral neck | Hologic QDR 1000, 2000 and 4500densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892Unclear | ORAI | FN: non-hispanic female white women age 20-29 (NHANES)LS: manufacturers norms for women age 30 years | Hologic | NR | No | NA |
| Harrison et al, 200693Low | ORAI | Hologic reference data for the T and z scores calculated using Hologic reference dataa for the lumbar spine and NHANES reference data for the proximal femur | GE Lunar Prodigy (GE Lunar Corporation, Madison, WI, USA) or the Hologic Discovery (Hologic Inc., Bedford, Massachusetts, USA). | Value of -2.5 or below at the total hip, femoral neck or lumbar spine | No | NA |
| Jimenez-Nunez, 201394Low | ORAI | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Martinez-Aguila, 200799Unclear | ORAI | T -Scores from reference range from a study conducted in a Spanish population of healthy subjects of same sex with peak bone mass | Hologic QDR | Lowest site at femoral neck or lumbar spine | No | NA |
| Mauck, 2005100Low | ORAI | T scores based on references ranges for young healthy women age 20-29 years in the local community area | QDR2000 instrument; Hologic, Waltham, Mass | BMD at femoral neck used to determine T score | Yes | Age |
| Nguyen, 2004103Low | ORAI | Reference ranges for calculation of T scores not described.Under “Measurements”: used BMD values of young Australian women at either the femoral neck or lumbar spine as reference to determine T score | LUNAR DPX-L densitometer | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Richy, 200480Unclear | ORAI | Reference values specifically established for the population of Liege. | Hologic QDR2000 | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score.Individual T score by site also reported | No | NA |
| Rud, 2005109Low | ORAI | T scores for the femoral neck and total hip calculated using NHANES III reference valuesHologic references values were used for the lumbar spine.Authors do not specify if age matched reference group was used or young white women. | Hologic QDR 1000/W and QDR 2000 | NR | No | NA |
| Cook et al, 200587unclear | OSIRIS | T-scores were computed using the databases supplied with the systems | Hologic QDR-4500C | Lowest value of lumbar spine or total hip used to classify as osteoporosis | No | NA |
| Harrison et al, 200693Low | OSIRIS | Hologic reference data for the T and z scores calculated using Hologic reference dataa for the lumbar spine and NHANES reference data for the proximal femur | GE Lunar Prodigy (GE Lunar Corporation, Madison, WI, USA) or the Hologic Discovery (Hologic Inc., Bedford, Massachusetts, USA). | Value of -2.5 or below at the total hip, femoral neck or lumbar spine | No | NA |
| Jimenez-Nunez, 201394Low | OSIRIS | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Martinez-Aguila, 200799Unclear | OSIRIS | TScores from reference range from a study conducted in a Spanish population of healthy subjects of same sex with peak bone mass | Hologic QDR | Lowest site at femoral neck or lumbar spine | No | NA |
| Richy, 200480Unclear | OSIRIS | Reference values specifically established for the population of Liege. | Hologic QDR2000 | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score.Individual T score by site also reported | No | NA |
| Adler, 200377Low | OST | NHANES reference database for hipHologic reference source for spineAge, gender, race of reference group not reported | Hologic QDR 4500 | NR | No | NA |
| Cadarette, 200483Low | OST | NR | HologicLunarNorlandUnknown | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Cook et al, 200587unclear | OST | T-scores were computed using the databases supplied with the systems | Hologic QDR-4500C | Lowest value of lumbar spine or total hip used to classify as osteoporosis | No | NA |
| Crandall, 201457Low | OST | NHANES III normative reference database (presumably young non-hispanic white females 20-29, though this is not specifically reported) | DXA (Hologic QDR 4500A), NR | Femoral neck | Unclear | NA |
| D’Amelio, 200588Low | OST | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389Low | OST | NR | DXA (Hologic QDR 4500), NR | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score. | Unclear | NA |
| Geusens, 200290Unclear | OST | FN: non-hispanic female white women age 20-29 (NHANES)LS: unclear | The brand of DXA manufacturer varied among centers, and included Norland, Hologic, and Lunar machines | NR | No | NA |
| Gourlay, 200579unclear | OST | T score reference range was NHANES III non-Hispanic white women age 20-29 years at the femoral neck | Hologic QDR 1000, 2000 and 4500densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892Unclear | OST | FN: non-hispanic female white women age 20-29 (NHANES)LS: manufacturers norms for women age 30 years | Hologic | NR | No | NA |
| Harrison et al, 200693Low | OST | Hologic reference data for the T and z scores calculated using Hologic reference dataa for the lumbar spine and NHANES reference data for the proximal femur | GE Lunar Prodigy (GE Lunar Corporation, Madison, WI, USA) or the Hologic Discovery (Hologic Inc., Bedford, Massachusetts, USA). | Value of -2.5 or below at the total hip, femoral neck or lumbar spine | No | NA |
| Jimenez-Nunez, 201394Low | OST | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Leslie, 2013113Low | OST | Femoral T-scores calculated based on NHANES III white female reference; lumbar spine used T-scores used manufacturer‘s USA white female reference values | NR | Lowest score at lumbar spine and hip | No | NA |
| Lynn, 200897Low | OST | US: NHANESHong Kong: local Chinese reference ranges | Hologic QDR 4500W bone densitometers | Results presented for femoral neck, lumbar spine, total hip, or any site | No | NA |
| Machado, 201098Low | OST | NHANES III young normal references values (sex unspecified) for FN; manufacturer’s database for male caucasian references values for LS (age unspecified) | HologicQDR 4500/c bone densitometer | NR | No | NA |
| Martinez-Aguila, 200799Unclear | OST | TScores from reference range from a study conducted in a Spanish population of healthy subjects of same sex with peak bone mass | Hologic QDR | Lowest site at femoral neck or lumbar spine | No | NA |
| McLeod, 2015101Low | OST | NHANES III | GE Lunar Prodigy densitometer | Results presented for femoral neck and lumbar spine | No | NA |
| Morin, 2009102Unclear | OST | Reports T Scores for LS used manufacturers US white female reference ranges, based on revised NHANES III, but these are only applicable to FN, and the study states this reference range was used for LS. | Lunar Prodigy; GE Lunar, Madison, WI, USA). | NR | No | NA |
| Pang, 2014106Low | OST | Manufacturer’s sex specific normative databse and an ethnic database. | Lunar Prodigy limited fan-beam machine, NR | NR | Unclear | NA |
| Richards, 2014108Unclear | OST | NHANES III | DXA on either the Hologic (Hologic Inc., Bedford, MA) or the Lunar (GE Healthcare, Madison, WI) scanner, specific to each participating center. To adjust for systematic differences in BMD by DXA, values were standardized to the Hologic BMD using published | NR | No | NA |
| Richy, 200480Unclear | OST | Reference values specifically established for the population of Liege. | Hologic QDR2000 | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score.Individual T score by site also reported | No | NA |
| Rud, 2005109Low | OST | T scores for the femoral neck and total hip calculated using NHANES III reference valuesHologic references values were used for the lumbar spine.Authors do not specify if age matched reference group was used or young white women. | Hologic QDR 1000/W and QDR 2000 | NR | No | NA |
| Sinnott, 2006111Low | OST | T-scores were calculated using the manufacturer’s reference values, namely a young Caucasian male database for the hip and a Caucasian femaledatabase for the spine | GE lunar machine (General Electric, Madison, Wis.) | Results presented for total hip, femoral neck or trochanter | No | NA |
| Zimering, 2007112Unclear | OST | T score <= -2.5 compared to NHANES III young male, ethnicity/race- specific reference data | Hologic QDR 4500 SL | NR | No | NA |
| Chan, 200686unclear | OSTA | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Kung, 200395Low | OSTA | Peak young Chinesemean values used for calculating T-scores: L1–L4 BMD1.02±0.11 g/cm2, femoral neck 0.77±0.09 g/cm2, total hip BMD0.86±0.10 g/cm2, | Sahara ultrasound bone densitometer (Hologic) | Results presented for femoral neck, or femoral neck or lumbar spine | No | NA |
| Kung, 200596Low | OSTA | NR | QDR 2000 Plus, Hologic | Results presented for femoral neck, lumbar spine, or femoral neck or lumbar spine | No | NA |
| Machado, 201098Low | OSTA | NHANES III young normal references values (sex unspecified) for FN; manufacturer’s database for male caucasian references values for LS (age unspecified) | HologicQDR 4500/c bone densitometer | NR | No | NA |
| Nguyen, 2004103Low | OSTA | Reference ranges for calculation of T scores not described.Under “Measurements”: used BMD values of young Australian women at either the femoral neck or lumbar spine as reference to determine T score | LUNAR DPX-L densitometer | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Oh, 2013104Low | OSTA | Sex-specific normal values for young Japanese women. | QDR Discovery fan beam densitometer (Hologic), Hologic Discovery software (version 13.1) | NR | Unclear | NA |
| Oh, 2016105Low | OSTA | Gender specific norms for young Japanese men. | Hologic | Defined Osteo as BMd of -2.5 or -2.0 (did both) at the femoral neck or lumbar spine. | No | n/a |
| Park, 2003107Unclear | OSTA | Reference range for young Korean women | GE Lunar Model DPQ-IQ, | NR | No | NA |
| Zimering, 2007112Unclear | Reduced MSCORE (age and weight-variable specific scores) | T score <= -2.5 compared to NHANES III young male, ethnicity/race- specific reference data | Hologic QDR 4500 SL | NR | No | NA |
| Ben Sedrine, 200178Low | SCORE | Hologic QDR reference values specifically established for the population of Liege, Belgium (local reference values) | Hologic | NR | No | NA |
| Brenneman, 200381Low | SCORE | NHANES IIIdo not specify age or gender of reference group | Hologic QDR 2000 | NR | No | NA |
| Cadarette, 200182Low | SCORE | Canadian young adult normal values at the femoral neck. (Authors note that the Canadian young adult normal reference at the femoral neck (mean [SD], 0.857 [0.125] g/cm3) is similar to that reported by NHANES III for non-Hispanic white Americans (mean [SD], 0.858 [0.120] g/cm3). | Hologic QDR 4500Hologic QDR 2000Hologic QDR 1000Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Cass, 200684Low | SCORE | NHANES III non-Hispanic White women age 20-29 years old. | DXA (Hologic QDR 4500A), NR | “positive” test is a T score of -2.5 at the femoral neck OR total hip | Unclear | NA |
| Chan, 200686unclear | SCORE | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Cook et al, 200587Unclear | SCORE | T-scores were computed using the databases supplied with the systems | Hologic QDR-4500C | Lowest value of lumbar spine or total hip used to classify as osteoporosis | No | NA |
| Crandall, 201457Low | SCORE | NHANES III normative reference database (presumably young non-hispanic white females 20-29, though this is not specifically reported) | DXA (Hologic QDR 4500A), NR | Femoral neck | Unclear | NA |
| Gourlay, 200579unclear | SCORE | T score reference range was NHANES III non-Hispanic white women age 20-29 years at the femoral neck | Hologic QDR 1000, 2000 and 4500densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892Unclear | SCORE | FN: non-hispanic female white women age 20-29 (NHANES)LS: manufacturers norms for women age 30 years | Hologic | NR | No | NA |
| Harrison et al, 200693Low | SCORE | Hologic reference data for the T and z scores calculated using Hologic reference dataa for the lumbar spine and NHANES reference data for the proximal femur | GE Lunar Prodigy (GE Lunar Corporation, Madison, WI, USA) or the Hologic Discovery (Hologic Inc., Bedford, Massachusetts, USA). | Value of -2.5 or below at the total hip, femoral neck or lumbar spine | No | NA |
| Jimenez-Nunez, 201394Low | SCORE | Manufacturer’s reference for the Spanish population | GE Lunar Prodigy Advance DEXA densitometer (software ENCORE 2006) | Lowest score at femoral neck or lumbar spine | No | NA |
| Mauck, 2005100Low | SCORE | T scores based on references ranges for young healthy women age 20-29 years in the local community area | QDR2000 instrument; Hologic, Waltham, Mass | BMD at femoral neck used to determine T score | Yes | Age |
| Richy, 200480Unclear | SCORE | Reference values specifically established for the population of Liege. | Hologic QDR2000 | Lowest BMD at total hip, femoral neck, or lumbar spine used to determine T score.Individual T score by site also reported | No | NA |
| Rud, 2005109Low | SCORE | T scores for the femoral neck and total hip calculated using NHANES III reference valuesHologic references values were used for the lumbar spine.Authors do not specify if age matched reference group was used or young white women. | Hologic QDR 1000/W and QDR 2000 | NR | No | NA |
| Brenneman, 200381Low | SOF | NHANES IIIdo not specify age or gender of reference group | Hologic QDR 2000 | NR | No | NA |
| Cook et al, 200587unclear | SOFSURF | T-scores were computed using the databases supplied with the systems | Hologic QDR-4500C | Lowest value of lumbar spine or total hip used to classify as osteoporosis | No | NA |
| Geusens, 200290Unclear | SOFSURF | FN: non-hispanic female white women age 20-29 (NHANES)LS: unclear | The brand of DXA manufacturer varied among centers, and included Norland, Hologic, and Lunar machines | NR | No | NA |
| Nguyen, 2004103Low | SOFSURF | Reference ranges for calculation of T scores not described.Under “Measurements”: used BMD values of young Australian women at either the femoral neck or lumbar spine as reference to determine T score | LUNAR DPX-L densitometer | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |

**Abbreviations**: BMD=body mass index; cm=centimeter; DEXAor DXA=dual energy X-ray absorptiometry; FN=femoral neck; G=gram; LS=lumbar spine; NA=not applicable; NHANES=National Health And Nutrition Examination Survey; NR=not reported; SD=standard deviation; WI=Wisconsin.