| **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, 200182  Low | 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 4500  Hologic QDR 2000  Hologic QDR 1000  Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Chan, 200686  unclear | ABONE | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| D’Amelio, 200588  Low | AMMEB | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389  Low | 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, 2004103  Low | 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, 201394  Low | 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, 2014106  Low | 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, 201394  Low | 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, 2014106  Low | 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, 2013113  Low | 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, 201556  Fair | FRAX: MOF without BMD (>=9.3%) | NR | NR | NR | No | NA |
| Cass, 2016114  Low | FRAX: MOF without BMD (>=9.3%) | NHANES III non-Hispanic White women age 20-29 years old | NR | NR | No | NA |
| Crandall, 201457  Low | 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, 200591  Low | 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, 201385  Low | 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, 2016114  Low | 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, 2010115  Low | MORES | White men age 20-29; whole body DXA Hologic QDR-4500A | NR | NR | No | no |
| Lynn, 200897  Low | MOST | US: NHANES  Hong 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, 2007112  Unclear | MSCORE | T score <= -2.5 compared to NHANES III young male, ethnicity/race- specific reference data | Hologic QDR 4500 SL | NR | No | NA |
| Cadarette, 200182  Low | 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 4500  Hologic QDR 2000  Hologic QDR 1000  Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| D’Amelio, 200588  Low | NOF | NR | Hologic QDR 4500 | NR | No | NA |
| D’Amelio, 201389  Low | 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, 2005100  Low | 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, 200182  Low | 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 4500  Hologic QDR 2000  Hologic QDR 1000  Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Cadarette, 200483  Low | ORAI | NR | Hologic  Lunar  Norland  Unknown | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Cass, 200684  Low | 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, 200686  unclear | ORAI | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Cook et al, 200587  unclear | 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, 200588  Low | ORAI | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389  Low | 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, 200290  Unclear | 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, 200579  unclear | 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 4500  densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892  Unclear | 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, 200693  Low | 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, 201394  Low | 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, 200799  Unclear | 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, 2005100  Low | 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, 2004103  Low | 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, 200480  Unclear | 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, 2005109  Low | ORAI | T scores for the femoral neck and total hip calculated using NHANES III reference values  Hologic 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, 200587  unclear | 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, 200693  Low | 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, 201394  Low | 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, 200799  Unclear | 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, 200480  Unclear | 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, 200377  Low | OST | NHANES reference database for hip  Hologic reference source for spine  Age, gender, race of reference group not reported | Hologic QDR 4500 | NR | No | NA |
| Cadarette, 200483  Low | OST | NR | Hologic  Lunar  Norland  Unknown | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| Cook et al, 200587  unclear | 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, 201457  Low | 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, 200588  Low | OST | NR | Hologic QDR 4500 | Lowest BMD at femoral neck, or lumbar spine used to determine T score. | No | NA |
| D’Amelio, 201389  Low | 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, 200290  Unclear | 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, 200579  unclear | 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 4500  densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892  Unclear | 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, 200693  Low | 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, 201394  Low | 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, 2013113  Low | 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, 200897  Low | OST | US: NHANES  Hong 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, 201098  Low | OST | NHANES III young normal references values (sex unspecified) for FN; manufacturer’s database for male caucasian references values for LS (age unspecified) | Hologic  QDR 4500/c bone densitometer | NR | No | NA |
| Martinez-Aguila, 200799  Unclear | 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, 2015101  Low | OST | NHANES III | GE Lunar Prodigy densitometer | Results presented for femoral neck and lumbar spine | No | NA |
| Morin, 2009102  Unclear | 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, 2014106  Low | OST | Manufacturer’s sex specific normative databse and an ethnic database. | Lunar Prodigy limited fan-beam machine, NR | NR | Unclear | NA |
| Richards, 2014108  Unclear | 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, 200480  Unclear | 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, 2005109  Low | OST | T scores for the femoral neck and total hip calculated using NHANES III reference values  Hologic 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, 2006111  Low | OST | T-scores were calculated using the manufacturer’s reference values, namely a young Caucasian male database for the hip and a Caucasian female  database for the spine | GE lunar machine (General Electric, Madison, Wis.) | Results presented for total hip, femoral neck or trochanter | No | NA |
| Zimering, 2007112  Unclear | OST | T score <= -2.5 compared to NHANES III young male, ethnicity/race- specific reference data | Hologic QDR 4500 SL | NR | No | NA |
| Chan, 200686  unclear | OSTA | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Kung, 200395  Low | OSTA | Peak young Chinese  mean values used for calculating T-scores: L1–L4 BMD  1.02±0.11 g/cm2, femoral neck 0.77±0.09 g/cm2, total hip BMD  0.86±0.10 g/cm2, | Sahara ultrasound bone densitometer (Hologic) | Results presented for femoral neck, or femoral neck or lumbar spine | No | NA |
| Kung, 200596  Low | OSTA | NR | QDR 2000 Plus, Hologic | Results presented for femoral neck, lumbar spine, or femoral neck or lumbar spine | No | NA |
| Machado, 201098  Low | OSTA | NHANES III young normal references values (sex unspecified) for FN; manufacturer’s database for male caucasian references values for LS (age unspecified) | Hologic  QDR 4500/c bone densitometer | NR | No | NA |
| Nguyen, 2004103  Low | 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, 2013104  Low | 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, 2016105  Low | 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, 2003107  Unclear | OSTA | Reference range for young Korean women | GE Lunar Model DPQ-IQ, | NR | No | NA |
| Zimering, 2007112  Unclear | 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, 200178  Low | SCORE | Hologic QDR reference values specifically established for the population of Liege, Belgium (local reference values) | Hologic | NR | No | NA |
| Brenneman, 200381  Low | SCORE | NHANES III  do not specify age or gender of reference group | Hologic QDR 2000 | NR | No | NA |
| Cadarette, 200182  Low | 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 4500  Hologic QDR 2000  Hologic QDR 1000  Lunar DPX | BMD at femoral neck used to determine T score | No | NA |
| Cass, 200684  Low | 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, 200686  unclear | SCORE | NR | DXA (Hologic QDR 4500A), NR | BMD at femoral neck used to determine T score | Unclear | NA |
| Cook et al, 200587  Unclear | 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, 201457  Low | 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, 200579  unclear | 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 4500  densitometers | BMD at femoral neck used to determine T score | No | NA |
| Gourlay, 200892  Unclear | 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, 200693  Low | 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, 201394  Low | 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, 2005100  Low | 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, 200480  Unclear | 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, 2005109  Low | SCORE | T scores for the femoral neck and total hip calculated using NHANES III reference values  Hologic 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, 200381  Low | SOF | NHANES III  do not specify age or gender of reference group | Hologic QDR 2000 | NR | No | NA |
| Cook et al, 200587  unclear | 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, 200290  Unclear | 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, 2004103  Low | 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.