



# **Reference Set Data Sheets**

*for*

**Central Bone Densitometers**

# Norland Reference Set Inclusion-Exclusion Criteria

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## Data Collection Sites

For the Norland reference sets, the data was gathered at ten (10) study sites across the USA. The ages of the subjects scanned was from 20 to 89 years of age. All scan data was examined to verify acceptable quality (proper positioning, correct region placement, etc.). The numerical values for these subjects are listed in Table 1 in this document.

Data is provided for Female Caucasians for the Total Hip sBMD region as derived from phases 1 and 2 of the third National Health and Nutrition Examination Survey (NHANES III, 1988-1994). Reference values for this set are listed in Table 2 of this document. The values were generated following the formula published in the Journal of Bone and Mineral Research (see page 7 of this document). The formula used is:

$$\text{sBMD} = 1000(1.012 * \text{BMD}_{\text{Norland}} + 0.026)$$

Data is also provided for Female Caucasians for the Spine L2-L4 sBMD region as derived from phases 1 and 2 of the third National Health and Nutrition Examination Survey (NHANES III, 1988-1994). The values were generated following the formula published in Calcified Tissue International (see page 6 of this document). The formula used is:

$$\text{sBMD} = 1000(1.0761 * \text{BMD}_{\text{Norland}})$$

## Data Gathering Process

Information needed to determine appropriate classification into a particular sex and ethnic reference set was obtained from a self-reported detailed medical history required of all study participants. Information was noted on Medical History forms and verified by Norland selected investigators. Categories included height, weight, ancestry (ethnicity), occupation, diet, family history, medical and surgical history, and so forth. Ethnic individuals had to be at least 75% of the claimed ethnic background as self-reported.

Based on review of the medical history information, only data from normal, healthy, untreated individuals was included in each Reference Set. Individual participants having certain conditions and/or medication were included after consideration of each specific situation. Included individuals are grouped by gender, age, and ethnic background. Care was taken to include a significant amount of data from those in the younger age range, as well as a broad distribution of participants across all age ranges.

Data from those participants who reported illnesses or medication affecting the subject's bone health was excluded from the reference sets. Any of the diseases and conditions listed below (and on the Medical History form) were possible grounds for exclusion from the study. Data from participants with diagnosed osteoporosis [defined as those individuals who have x-ray evidence of vertebral fracture (including DXA scan), hip fracture associated with osteoporosis, loss of height, or other specified means] was not used in Norland reference sets.

Completed studies were examined by Norland QA to verify acceptable scan quality for inclusion in the reference set. Finally, subject information was reviewed by the clinical auditor to ensure that the complete clinical history met all the inclusion criteria.

## Medical History Form Review Criteria

The Medical History form provided the information needed to determine whether a given individual should be included in the Normal Group or excluded in the Osteoporotic Group, or excluded from the study entirely. Since some medications significantly affect bone mass, interpretation was necessary to evaluate a particular drug's effect (based on dose, duration and time of life). Interpretation was also necessary to evaluate the effect of certain bone-active disorders. The following paragraphs provide guidance when evaluating the Medical Histories.

## ***OSTEOPOROSIS***

Data obtained from subjects diagnosed with osteoporosis was not used in Norland normative data but was saved for potential future, yet to be determined studies.

## ***OTHER BONE-ACTIVE DISEASES AND CONDITIONS***

The diseases and conditions on the following page are listed in the Medical History form and provide possible grounds for exclusion from the study. Exclusion criteria was established to ensure the collection of bone density measurements from normal, healthy, untreated individuals.

**Amenorrheic Syndrome:** Exclusion only if syndrome was prolonged (at least 2 years), and recent (within the last three months).

**Alcoholism:** Exclusion only if severe, chronic, and accompanied by malnutrition. If possible, quantify amount of alcohol consumption.

**Alzheimer's:** Not grounds for exclusion.

**Births:** Number of births means number of pregnancies.

**Broken/Fractured Hip:** Not grounds for exclusion if occurred more than five years prior to data collection.

**Cancer:** Subject data may be included, as long as subject has been cancer free for more than five years. Localized squamous and basal cell are often not exclusions.

**Cirrhosis:** Exclusion only if clinically apparent and duration is greater than 3 months.

**Cushing's Syndrome:** Grounds for exclusion.

**Diabetes:** Exclusion only if onset occurred in childhood, delaying or retarding growth. Properly treated adult diabetics need not be excluded.

**Early Menopause:** Not grounds for exclusion. Early menopause is considered to be before 40 years of age. Make sure that the date of menopause is included for later analysis.

**Emphysema:** Exclusion if clinically apparent and/or severe COPD.

**Fractures:** Fractures due to accidents and trauma are not grounds for exclusion. Vertebral and other spontaneous fractures are grounds for exclusion.

**Hyperparathyroidism:** Data collected from these subjects will be excluded.

**Hypoparathyroidism:** Data collected from these subjects will be excluded.

**Hyperthyroidism:** If medication (dose) has been stable for 12 consecutive months, data need not be excluded.

**Hypogonadism (Males):** Grounds for exclusion.

**Hypothyroidism:** If medication (dose) has been stable for 12 consecutive months, data need not be excluded.

**Hysterectomy:** Hysterectomy with bilateral oophorectomy will be excluded.

**Immobilization:** Exclusion only if immobilization is prolonged for longer than one month, such as in stroke victims.

**Leukemia:** Grounds for exclusion.

**Liver Disease:** Exclusion only if clinically apparent and duration is greater than 3 months.

**Lymphoma:** Grounds for exclusion.

**Malabsorption Syndromes:** Grounds for exclusion.

**Multiple Myeloma:** Grounds for exclusion.

**Paget's Disease:** Data collected from these subjects will be excluded.

**Renal Dialysis:** Data collected from subjects on dialysis will be excluded.

**Renal Disease:** Renal disease without dialysis is not grounds for exclusion from the study. Subject is included if Creatinine is less than 2 and excluded if creatnin is more than 2. If Creatnine level is unknown, subject will be excluded.

**Smoking:** Not grounds for exclusion. However, please note current smoking habits and past smoking history, which includes amount and timeframe.

**Sickle Cell:** Not grounds for exclusion.

**Tuberculosis:** Only grounds for exclusion if disease is active.

**Vitamin Deficiencies:** Not grounds for exclusion, but such deficiencies should be noted and explained.

### ***MEDICATIONS AFFECTING BONE***

The use of medications affecting bone are possible grounds for exclusion. Such medications include:

**Anticonvulsants:** Grounds for exclusion.

**Birth Control Pills:** In general, birth control pills are not grounds for exclusion. Some postmenopausal subjects will report perimenopausal estrogen replacement therapy as "birth control pills" probably because of a comparison made by their physician. These subjects will not be excluded for estrogen use.

**Bisphosphonates:** Bisphosphonates are grounds for exclusion. Individuals currently using Bisphosphonates or those who have for less than six (6) months will be excluded. For those with a past history, please note medication, duration, dose and time frame on Medical History form.

**Calcitonins:** Calcitonins are grounds for exclusion. Individuals currently using Calcitonins or those who have ever used Calcitonins for more than six (6) months will be excluded. For those with a past history, please note medication, duration, dose and time frame on Medical History form.

**Dilantin:** Grounds for exclusion.

**Estrogen:** HRT and ERT are grounds for exclusion.

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NOTE: Individuals currently on ERT or HRT: Those on ERT or HRT for less than three (3) months can be included in the study. Individuals who have been on HRT or ERT in the past: If it has been more than 24 months since treatment ended, the subject's data can be included in the study.

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**Heparin:** Grounds for exclusion if taken for more than three (3) months.

**Sodium Fluorides:** Sodium Fluorides are grounds for exclusion. Individuals currently using Sodium Fluoride or those who have ever used Sodium Fluorides for more than six (6) months will be excluded. For those with a past history, please note medication, duration, dose and time frame on Medical History form.

**Steroids:** Oral and inhaled steroids are criteria for possible exclusion. Those on high dose (>3 mos.) will be excluded. Please note medication, duration, dose, and time frame on history. (Site specific injections are not grounds for exclusion.)

**Thyroid Hormone:** Not grounds for exclusion if proper dose is given; these actually compensate for an abnormal condition. Subjects will be excluded if dosage has changed within the last twelve months.

## **Statistical Methods**

The raw data was processed by an independent statistician at the University of Wisconsin, Madison to fit scientifically and biologically relevant curves using stepwise deletion of regression break points. The standard deviation was fitted to the curves forcing the standard deviations to be equal at the breakpoints but allowing the standard deviation to change with age.

## Data Entry

Pictured below is an example screen used to enter all of the reference data. Refer to the Operator's manual for instructions on enabling/disabling and editing reference sets.

REFERENCE DATA SET			Age	Value	2 S.D.
Scan Type: AP Spine	20	1.094	0.326		
Region Type: L2	50	1.094	0.326		
	80	0.824	0.326		
Title: Norland 4/00					
Ethnic: C					
Young Ref.: 1.097					
<input checked="" type="checkbox"/> Enabled <input type="checkbox"/> Disabled					
<input checked="" type="checkbox"/> Female <input type="checkbox"/> Male <input type="checkbox"/> N/A					
Display By: <input checked="" type="checkbox"/> Value <input type="checkbox"/> T-Score					
<input checked="" type="checkbox"/> Accept Changes <input type="checkbox"/> Do Not Accept					
	Risk Bands	Level			
	Low Risk	0.934			
		0.9339			
	Medium Risk	0.6895			
		0.6894			
	High Risk	0.445			

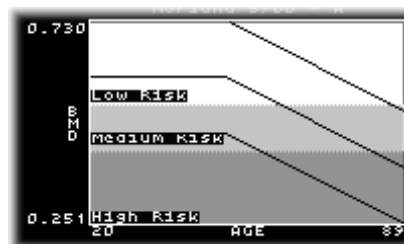
## WHO Criteria

The WHO criteria indicates that patients having T-Scores from +1 to -1 are considered to have normal bone density. Patients having T-Scores between -1 and -2.5 are considered osteopenic (low in bone mass) and at an increased risk of fracture. Patients having T-Scores below -2.5 are considered osteoporotic and have a high risk of fracture.

For detailed information regarding WHO criteria, please obtain a copy of the WHO Technical Report Number 843, entitled "Assessment of Fracture Risk and its Application to Screening for Postmenopausal Osteoporosis". It was published in 1994 by the World Health Organization, Geneva, Switzerland.

## Norland Fracture Risk

Printed reports from all Norland scanners contain a graph plotting the BMD of the current scan against Fracture Risk information, based on the WHO criteria. An example of the graph is shown below. The appearance of the graph on any report may vary, based on the presence of Age-matched values or color versus black and white reports.



The upper area, labeled "Low Risk", represents the range of values termed by WHO to be 'normal' - having adequate bone mineral. This is the region with T-Score values above minus 1 standard deviation, referenced to the young adult mean BMD value found in the reference population.

The middle area, labeled "Medium Risk", represents the range of values termed by WHO to be 'osteopenic' - having reduced bone mineral. The BMD T-Score values in this region range between minus 1 standard deviation and minus 2.5 standard deviations. A patient whose value is plotted in this region may be susceptible to fracture.

The lower area, labeled "High Risk", represents the range of values termed by WHO to be 'osteoporotic' - having severely reduced bone mineral. The BMD T-Score values in this region are more than 2.5 standard deviations below the young adult mean value. A patient whose value is plotted in this region has a high spontaneous fracture probability.

## Excerpt from Calcified Tissue International

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International  
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### *Letter to the Editor*

## Standardization of Measurements for Assessing BMD by DXA

In a recent article, Genant et al. [1] published the results of a trial sponsored by the dual X-Ray absorptiometry (DXA) manufacturers Hologic, Lunar, and Norland to provide the basis for the standardization of measurement units used for the assessment of bone mineral density (BMD) by DXA. In a meeting of the Committee for Standards in DXA held during the annual meeting of the Radiological Society of North America in Chicago on November 30, 1994, the Committee gave final approval to the standardization of postero-anterior (PA) spine BMD measurements by DXA, as published by Genant et al.

In brief, effective September 1, 1995, all participating manufacturers will provide an option on newly shipped instruments which will permit users to select between spine BMD being reported with either the traditional, manufacturer-specific units in g/cm<sup>2</sup> or the standardized, nonmanufacturer-specific units in mg/cm<sup>2</sup>. New systems will be configured to report standardized units by default. Upon request, software will be available from the manufacturers for upgrading existing instruments to provide the standardized units option.

The equations used to convert existing units (g/cm<sup>2</sup>) into standardized units (mg/cm<sup>2</sup>) for PA spine (L2-L4) BMD are as follows:

For Hologic instruments:

$$sBMD = 1000[BMD_{Hologic} \cdot 1.0755]$$

For Lunar instruments:

$$sBMD = 1000[BMD_{Lunar} \cdot 0.9522]$$

For Norland instruments:

$$sBMD = 1000[BMD_{Norland} \cdot 1.0761]$$

Spine BMD values obtained by scanning a patient on any one of these manufacturers instruments should fall within 2–5% of each other. These equations were determined such that, on average, the central vertebra of the ESP [2] reads 1000 mg/cm<sup>2</sup> on all scanners. However, the Committee for Standards in DXA does not endorse a single phantom for the determination of standardized units. The Committee believes that the equivalence of new DXA scanner types cannot be established by measuring a single object, regardless of whether that object is a phantom or a single patient. For that purpose, a study similar to the one described by Genant must be performed *in vivo* on individuals spanning the clinical range of BMD. Different phantoms are available from different manufacturers which, when used in accordance

with manufacturers' directions and specifications, can serve to verify instrument calibration and stability.

The Committee for Standards in DXA will continue its work to expand standardization to other anatomical sites assessed by DXA and will report periodically on its progress using Letters to the Editor as a means of communication.

Peter Steiger  
Committee for Standards in DXA  
Waltham, MA  
USA

### Committee members

Harry K. Genant, M.D.	University of California, San Francisco, CA, USA for the American Society for Bone and Mineral Research and the National Osteoporosis Foundation
Michael E. Grman	Norland Corporation, Fort Atkinson, WI, USA
Thomas Hangartner, Ph.D.	Wright State University, Dayton, OH, USA for the American Association of Physicists in Medicine and the National Osteoporosis Foundation
James Hanson, Ph.D.	Lunar Corporation, Madison, WI, USA—Committee Chairman
Willi A. Kalender, Ph.D.	University of Erlangen, Germany, for COMAC/BME
Richard Mazess, Ph.D.	Lunar Corporation, Madison, WI, USA
Rikushi Morita, M.D.	Japanese Society of Bone and Mineral Research, Japan
Hans Schiessl	Stratec Medizintechnik GMBH, Pforzheim, Germany
Peter Steiger, Ph.D.	Hologic Inc., Waltham, MA, USA
Jay Stein, Ph.D.	Hologic Inc., Waltham, MA, USA
Toshiaki Tamegai Ph.D.	Aloka Inc., Japan

### References

1. Genant HK, Grampp S, Gluer CC, et al. (1994) Universal standardization for dual x-ray absorptiometry: patient and phantom cross-calibration results. *J Bone Miner Res* 9:1503–1514
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## Excerpt from the Journal of Bone and Mineral Research

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### Letter to the Editor

### Standardization of Femur BMD

#### To the Editor:

The International Committee for Standards in Bone Measurement gave final approval to the standardization of proximal femur BMD measurements by DXA in a meeting held in Chicago on December 4, 1996. This follows earlier announcements on adoption of standardized units and spine standardization.<sup>(1,2)</sup> Standardization of femur BMD measurements will include region of interest definition, units of measurement, and reference data.

The region of interest used for femur evaluations will be the Total Femur region of interest as used in NHANES III,<sup>(3)</sup> SOF,<sup>(4)</sup> PEPI,<sup>(5)</sup> and other cross-sectional and prospective studies. These studies have demonstrated that the Total Femur region of interest is equally diagnostic but more precise than the Femoral Neck region of interest predominantly used prior to standardization. As part of the standardization effort, the Total Femur region of interest will be made available by all DXA manufacturers offering Standardized Femur BMD.

The Committee has decided to introduce the term "sBMD," expressed in mg/cm<sup>2</sup>, to distinguish Standardized Femur BMD from manufacturer-specific "BMD," expressed in g/cm<sup>2</sup>. The equations used to convert manufacturer-specific units [g/cm<sup>2</sup>] for Total Femur BMD into standardized units [mg/cm<sup>2</sup>] are as follows:

For Hologic Instruments:

$$sBMD = 1000[1.008 \times BMD_{Hologic} + 0.006]$$

For Lunar Instruments:

$$sBMD = 1000[0.979 \times BMD_{Lunar} - 0.031]$$

For Norland Instruments:

$$sBMD = 1000[1.012 \times BMD_{Norland} + 0.026]$$

sBMD values obtained by scanning a patient on any one of these manufacturers' instruments should fall within 3–6% of each other (3% standard error of estimate). These equations were based on the same study used to define sBMD for the spine<sup>(1)</sup> using an approach developed by Lu and colleagues.<sup>(6)</sup> The method used does not require a gold standard and minimizes variance observed between standardized and manufacturer-specific BMD values on all instruments. For new devices entering the market to comply with Standardized Femur BMD a study similar to the one employed here will be required. Such a study would measure a wide range of BMD in human subjects on different scanners and derive Standardized Femur BMD using the method of Lu et al.

The standardization of Total Femur BMD includes the standardization of reference data, thereby making T- and Z-scores derived from different manufacturers' equipment compatible. The data used as the basis for the reference ranges were collected in phases 1 and 2 of the third National Health and Nutrition Examination Survey (NHANES III, 1988–1994).<sup>(3)</sup> The reference data curve was generated based on running means of the raw data. The mean sBMD and standard deviation for the young adult reference for 409 U.S. white women aged 20–29 years was 956 mg/cm<sup>2</sup> and 123 mg/cm<sup>2</sup>, respectively. Age-specific reference data based on a total of 3,251 U.S. white women are listed in Table 1.

Standardized Femur BMD will be made available on newly-shipped devices no later than September 1, 1997, by all participating manufacturers. Users will be provided with an option that will permit Femur BMD to be reported with either the traditional, manufacturer-specific units in g/cm<sup>2</sup> (for any of the traditional femur regions of interest) or the standardized, non-manufacturer-specific units in mg/cm<sup>2</sup> for the Total Femur region of interest. New systems will be configured to report standardized units by default. Upon request, software will be available from the manufacturers for upgrading existing instruments to provide the standardized units option.

As part of the standardization effort the Committee will collaborate with the relevant scientific and professional societies as well as the regulatory agencies to promote the utilization of Standardized Femur BMD instead of the current, widely-employed, manufacturer-specific Femoral Neck BMD. The medical community should welcome manufacturers' independent T- and Z-scores for diagnosis at the

TABLE 1. STANDARDIZED TOTAL FEMUR REFERENCE DATA FOR WHITE WOMEN

Age (years)	Reference sBMD (mg/cm <sup>2</sup> ) for women
20–29	956
30–39	944
40–49	920
50–59	876
60–69	809
70–79	740
80+	679

The standard deviation is 123 mg/cm<sup>2</sup>.



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Total Femur region of interest. This will eliminate the currently observed inter-manufacturer discrepancy associated with clinical decision-making based on T- and Z-scores at the femur neck region of interest.

The Committee for Standards in Bone Measurement, a voluntary committee of representatives of both industry and the academic community, has provided users of DXA technology the three critical components for standardization of DXA scan results: standardized units in  $\text{mg}/\text{cm}^2$ , a standardized definition of scan regions of interest for spine and femur, and agreement on a universal reference database for the femur, based on NHANES III. This significant accomplishment makes comparisons of data between DXA devices and between manufacturers possible. The clinical benefits of these efforts are evident in greater confidence in scan results, clearer definition of patient condition when applying WHO criteria, ability to compare data between scans performed on different devices, and expanded reference data for the United States. The committee also agreed to update reference data from time-to-time as new information becomes available for additional populations. Standardization of male Total Femur reference data will be completed when the final NHANES data are published. The committee understands that population-based reference data equivalent to NHANES are being evaluated by the European Foundation for Osteoporosis. The need for geographic dependent reference data will be addressed by the committee. The committee will continue its work to expand standardization to other anatomical sites assessed by DXA and will report periodically on its progress using letters to the editor as means for communication.

## REFERENCES

1. Genant HK, Grampp S, Glüer CC, Faulkner KG, Jergas M, Engelke K, Hagiwara S, Van Kuijk C 1994 Universal standardization for dual x-ray absorptiometry: Patient and phantom cross-calibration results. *J Bone Miner Res* 9:1503-1514.
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Address reprint requests to:  
*Jim Hanson, Ph.D.*  
*for the International Committee*  
*for Standards in Bone Measurement*  
*Lunar Corporation*  
*313 West Beltrine Highway*  
*Madison, WI 53713 U.S.A.*

## COMMITTEE MEMBERS

Dieter Felsenberg, M.D.

Thomas Fuerst, Ph.D.  
 Harry K. Genant, M.D.

Thomas Hangartner, Ph.D.

James Hanson, Ph.D.  
 Lewis Harrold, VP Engineering  
 C. Conrad Johnston, Jr., M.D.

Willi A. Kalender, Ph.D.  
 Ying Lu, Ph.D.  
 Richard Mazess, Ph.D.  
 Paul D. Miller, M.D.

Rikushi Morita, M.D., Ph.D.  
 Akira Nakamura, Gen. Mgr.  
 Russell Nord, Ph.D.  
 Jonathan Reeve, DM, DS, FRCP

Hans Schiessl  
 Peter Steiger, Ph.D.  
 Jay Stein, Ph.D.  
 Eric von Stetten, Ph.D.  
 Toshiaki Tamegai Ph.D.  
 Georg Tysarczyk-Niemeyer

Freie Universität Berlin, Radiology, Steglitz Med Centre, Berlin, Germany, for COMAC/BME  
 University of California, San Francisco, CA, U.S.A., Department of Radiology  
 University of California, San Francisco, CA, U.S.A. for the American Society for Bone and Mineral Research and the National Osteoporosis Foundation  
 Wright State University, Dayton, OH, U.S.A. for the American Association of Physicists in Medicine and the National Osteoporosis Foundation  
 Lunar Corporation, Madison, WI, U.S.A. - Committee Chairman  
 Norland Corporation, Fort Atkinson, WI, U.S.A.  
 Indiana University School of Medicine, Indianapolis, IN, U.S.A., for the National Osteoporosis Foundation  
 University of Erlangen, Germany, for COMAC/BME  
 University of California, San Francisco, CA, U.S.A., Dept. of Radiology  
 Lunar Corporation, Madison, WI, U.S.A.  
 Colorado Center for Bone Research, P.C., Lakewood, CO, U.S.A., for the International Society of Clinical Densitometry  
 Shiga University, Otsu City, Japan, for the Japanese Society of Bone and Mineral Research  
 Aloka Co., Ltd. Tokyo Works, Tokyo, Japan  
 Lunar Corporation, Madison, WI, U.S.A.  
 Institute of Public Health, University Forvie Site, Cambridge, U.K., for the European Foundation for Osteoporosis  
 Stratec Medizintechnik GMBH, Pforzheim, Germany  
 Hologic Inc., Waltham, MA, U.S.A.  
 Hologic Inc., Waltham, MA, U.S.A.  
 Hologic Inc., Waltham, MA, U.S.A.  
 Aloka Co., Ltd., Tokyo, Japan  
 Stratec Medizintechnik GmbH, Pforzheim, Germany

Table 1: Norland Reference Data Set Values

Ethnic	Gender	Scan Type	Region	Title	Young Reference	Standard Deviation	Age 20 BMD	Age 50 BMD	Age 80 BMD	Low Risk	Medium Risk	High Risk	Enabled
Asian (A)	Female	AP Spine	L1	Norland 4/00	1.005	0.129	---	---	---	0.876	0.6825	0.489	Y
			L2	Norland 4/00	1.061	0.132	---	---	---	0.929	0.731	0.533	Y
			L3	Norland 4/00	1.090	0.130	---	---	---	0.960	0.765	0.570	Y
			L4	Norland 4/00	1.036	0.127	---	---	---	0.909	0.7185	0.528	Y
			L1-L4	Norland 4/00	1.043	0.125	---	---	---	0.918	0.7305	0.543	Y
			L2-L4	Norland 4/00	1.062	0.126	---	---	---	0.936	0.747	0.558	Y
			Total Spine	Norland 4/00	1142	135	---	---	---	1007	804.5	602	Y
			Fem Neck	Norland 4/00	0.866	0.113	---	---	---	0.753	0.5835	0.414	Y
			Troch	Norland 4/00	0.697	0.108	---	---	---	0.589	0.427	0.265	Y
			Ward's Tri	Norland 4/00	0.712	0.128	---	---	---	0.584	0.392	0.200	Y
Black (B)	Female	AP Spine	Total Hip	Norland 4/00	929	117	---	---	---	812	636.5	461	Y
			L1	Norland 4/00	1.206	0.140	---	---	---	1.066	0.856	0.646	Y
			L2	Norland 4/00	1.256	0.139	---	---	---	1.117	0.9085	0.700	Y
			L3	Norland 4/00	1.259	0.136	---	---	---	1.123	0.919	0.715	Y
			L4	Norland 4/00	1.216	0.127	---	---	---	1.089	0.8985	0.708	Y
			L1-L4	Norland 4/00	1.239	0.126	---	---	---	1.113	0.924	0.735	Y
			L2-L4	Norland 4/00	1.243	0.127	---	---	---	1.116	0.9255	0.735	Y
			Total Spine	Norland 4/00	1338	137	---	---	---	1201	995.5	790	Y
		Hip	Fem Neck	Norland 4/00	1.046	0.140	---	---	---	0.906	0.696	0.486	Y
			Troch	Norland 4/00	0.797	0.125	---	---	---	0.672	0.4845	0.297	Y
			Ward's Tri	Norland 4/00	0.852	0.164	---	---	---	0.688	0.442	0.196	Y
			Total Hip	Norland 4/00	1081	140	---	---	---	941	731	521	Y

Table 1: Norland Reference Data Set Values

Ethnic	Gender	Scan Type	Region	Title	Young Reference	Standard Deviation	Age 20 BMD	Age 50 BMD	Age 80 BMD	Low Risk	Medium Risk	High Risk	Enabled
Black (B)	Male	AP Spine	L1	Norland 4/00	1.232	0.184	---	---	---	1.048	0.772	0.496	Y
			L2	Norland 4/00	1.291	0.204	---	---	---	1.087	0.781	0.475	Y
			L3	Norland 4/00	1.309	0.215	---	---	---	1.094	0.7715	0.449	Y
			L4	Norland 4/00	1.279	0.201	---	---	---	1.078	0.7765	0.475	Y
			L1-L4	Norland 4/00	1.271	0.191	---	---	---	1.080	0.7935	0.507	Y
			L2-L4	Norland 4/00	1.293	0.202	---	---	---	1.091	0.788	0.485	Y
			Total Spine	Norland 4/00	1391	218	---	---	---	1173	846	519	Y
			Fem Neck	Norland 4/00	1.161	0.205	---	---	---	0.956	0.6485	0.341	Y
			Troch	Norland 4/00	0.933	0.181	---	---	---	0.752	0.4805	0.209	Y
			Ward's Tri	Norland 4/00	0.939	0.217	---	---	---	0.722	0.3965	0.071	Y
Caucasian (C)	Female	AP Spine	Total Hip	Norland 4/00	1188	198	---	---	---	990	693	396	Y
			L1	Norland 4/00	1.029	0.155	1.034	1.034	0.779	0.874	0.6415	0.409	Y
			L2	Norland 4/00	1.097	0.163	1.094	1.094	0.824	0.934	0.6895	0.445	Y
			L3	Norland 4/00	1.115	0.171	1.108	1.108	0.885	0.944	0.6875	0.431	Y
			L4	Norland 4/00	1.082	0.169	1.063	1.063	0.893	0.913	0.6595	0.406	Y
			L1-L4	Norland 4/00	1.086	0.159	1.074	1.074	0.851	0.927	0.6885	0.450	Y
			L2-L4	Norland 4/00	1.102	0.162	1.087	1.087	0.869	0.940	0.697	0.454	Y
			Spine sBMD	Norland 4/00	1186	175	1170	1170	935	1011	748.5	486	Y
		Hip	Fem Neck	Norland 4/00	0.987	0.117	0.981	0.873	0.655	0.870	0.6945	0.519	Y
			Troch	Norland 4/00	0.787	0.109	0.775	0.699	0.559	0.678	0.5145	0.351	Y
			Ward's Tri	Norland 4/00	0.851	0.125	0.848	0.674	0.441	0.726	0.5385	0.351	Y
		Forearm	Distal	Norland 798	0.3191	0.04822	0.3191	0.3211	0.2039 *	0.27088	0.19855	0.12622	Y

**Table 1: Norland Reference Data Set Values**

Ethnic	Gender	Scan Type	Region	Title	Young Reference	Standard Deviation	Age 20 BMD	Age 50 BMD	Age 80 BMD	Low Risk	Medium Risk	High Risk	Enabled
Caucasian (C)	Female	Forearm	Proximal	Norland 798	0.7127	0.06237	0.7127	0.7276	0.4553 *	0.65033	0.556775	0.46322	Y
			P Radius	Norland 798	0.7181	0.063265	0.7181	0.7260	0.4546 *	0.654835	0.559938	0.465040	Y
		Forearm H	Distal	Norland 798	0.3567	0.0539	0.3567	0.3589	0.2279 *	0.3028	0.22195	0.1411	Y
			Proximal	Norland 798	0.8552	0.07484	0.8552	0.8731	0.5463 *	0.78036	0.66810	0.55584	Y
			P Radius	Norland 798	0.8481	0.07472	0.8481	0.8575	0.5369 *	0.77338	0.66130	0.54922	Y
	Male	AP Spine	L1	Norland 4/00	1.105	0.167	1.096	1.066	1.036	0.938	0.6875	0.437	Y
			L2	Norland 4/00	1.171	0.186	1.158	1.127	1.097	0.985	0.706	0.427	Y
			L3	Norland 4/00	1.181	0.191	1.165	1.146	1.127	0.990	0.7035	0.417	Y
			L4	Norland 4/00	1.134	0.199	1.126	1.126	1.126	0.935	0.6365	0.338	Y
			L1-L4	Norland 4/00	1.148	0.176	1.130	1.119	1.107	0.972	0.708	0.444	Y
			L2-L4	Norland 4/00	1.164	0.184	1.146	1.133	1.121	0.980	0.704	0.428	Y
			Total Spine	Norland 4/00	1253	198	1233	1219	1206	1055	758	461	Y
		Hip	Fem Neck	Norland 4/00	1.108	0.125	1.111	0.940	0.770	0.983	0.7955	0.608	Y
			Troch	Norland 4/00	0.933	0.113	0.925	0.838	0.751	0.820	0.6505	0.481	Y
			Ward's Tri	Norland 4/00	0.908	0.126	0.905	0.680	0.456	0.782	0.593	0.404	Y
			Total Hip	Norland 4/00	1147	123	1150	1027	903	1024	839.5	655	Y
			L1	Norland 4/00	1.054	0.152	1.041	1.041	0.775	0.902	0.674	0.446	Y
Cauc-Hisp (CH)	Female	AP Spine	L2	Norland 4/00	1.124	0.159	1.100	1.100	0.820	0.965	0.7265	0.488	Y
			L3	Norland 4/00	1.133	0.167	1.112	1.112	0.882	0.966	0.7155	0.465	Y
			L4	Norland 4/00	1.084	0.165	1.066	1.066	0.892	0.919	0.6715	0.424	Y
			L1-L4	Norland 4/00	1.101	0.156	1.080	1.080	0.848	0.945	0.711	0.477	Y
			L2-L4	Norland 4/00	1.115	0.158	1.091	1.091	0.866	0.957	0.720	0.483	Y
			Total Spine	Norland 4/00	1200	170	1174	1174	932	1030	775	520	Y

Table 1: Norland Reference Data Set Values

Ethnic	Gender	Scan Type	Region	Title	Young Reference	Standard Deviation	Age 20 BMD	Age 50 BMD	Age 80 BMD	Low Risk	Medium Risk	High Risk	Enabled
Cauc-Hisp (CH)	Female	Hip	Fem Neck	Norland 4/00	0.995	0.116	0.993	0.871	0.656	0.879	0.705	0.531	Y
			Troch	Norland 4/00	0.779	0.108	0.772	0.698	0.560	0.671	0.509	0.347	Y
			Ward's Tri	Norland 4/00	0.846	0.124	0.849	0.674	0.442	0.722	0.536	0.350	Y
			Total Hip	Norland 4/00	1022	118	1010	920	741	904	727	550	Y
	Male	AP Spine	L1	Norland 4/00	1.109	0.167	1.096	1.065	1.034	0.942	0.6915	0.441	Y
			L2	Norland 4/00	1.176	0.187	1.160	1.125	1.089	0.989	0.7085	0.428	Y
			L3	Norland 4/00	1.183	0.191	1.166	1.142	1.119	0.992	0.7055	0.419	Y
			L4	Norland 4/00	1.138	0.199	1.122	1.122	1.122	0.939	0.6405	0.342	Y
			L1-L4	Norland 4/00	1.152	0.176	1.130	1.118	1.106	0.976	0.712	0.448	Y
			L2-L4	Norland 4/00	1.168	0.185	1.147	1.130	1.113	0.983	0.7055	0.428	Y
			Total Spine	Norland 4/00	1257	199	1234	1216	1198	1058	759.5	461	Y
		Hip	Fem Neck	Norland 4/00	1.107	0.126	1.109	0.939	0.769	0.981	0.792	0.603	Y
			Troch	Norland 4/00	0.928	0.114	0.919	0.835	0.751	0.814	0.643	0.472	Y
			Ward's Tri	Norland 4/00	0.900	0.128	0.898	0.678	0.457	0.772	0.580	0.388	Y
			Total Hip	Norland 4/00	1146	124	1147	1025	903	1022	836	650	Y
Hispanic (H)	Female	AP Spine	L1	Norland 4/00	1.088	0.126	---	---	---	0.962	0.773	0.584	Y
			L2	Norland 4/00	1.149	0.122	---	---	---	1.027	0.844	0.661	Y
			L3	Norland 4/00	1.144	0.126	---	---	---	1.018	0.829	0.64	Y
			L4	Norland 4/00	1.080	0.121	---	---	---	0.959	0.7775	0.596	Y
			L1-L4	Norland 4/00	1.112	0.119	---	---	---	0.993	0.8145	0.636	Y
			L2-L4	Norland 4/00	1.123	0.117	---	---	---	1.006	0.8305	0.655	Y
			Total Spine	Norland 4/00	1207	128	---	---	---	1079	887	695	Y

**Table 1: Norland Reference Data Set Values**

Ethnic	Gender	Scan Type	Region	Title	Young Reference	Standard Deviation	Age 20 BMD	Age 50 BMD	Age 80 BMD	Low Risk	Medium Risk	High Risk	Enabled
Hispanic (H)	Female	Hip	Fem Neck	Norland 4/00	0.982	0.111	---	---	---	0.871	0.7045	0.538	Y
			Troch	Norland 4/00	0.740	0.103	---	---	---	0.637	0.4825	0.328	Y
			Ward's Tri	Norland 4/00	0.800	0.125	---	---	---	0.675	0.4875	0.300	Y
			Total Hip	Norland 4/00	1021	109	---	---	---	912	748.5	585	Y

\* This reference set has Age-Matched values for ages 20, 50, and 90.

**Table 2: NHANES III Reference Data Set Values**

Ethnic	Gender	Region Type	Young Reference	Standard Deviation	Age 20 BMD	Age 25 BMD	Age 35 BMD	Age 45 BMD	Age 55 BMD	Age 65 BMD	Age 75 BMD	Age 85 BMD	Low Risk	Medium Risk	High Risk
Caucasian	Female	Hip sBMD	956	123	956	956	944	920	876	809	740	679	833	648.5	464

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