



Longitudinal Bone Mineral Density Dataset

Baseline through Visit 17

CODEBOOK

ARCHIVED DATASET 2026

Dataset file nialbmd2026

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DOCUMENTATION FOR THE SWAN LONGITUDINAL BONE MINERAL DENSITY DATASET

This codebook documents the Longitudinal Bone Mineral Density Dataset, which includes DXA bone scan results of spine and hip for SWAN visits from baseline to follow-up visit 17. An independent contractor – Synarc, was used for the baseline visit through visit 10 to review randomly selected or questionable DXA scans for quality control. Starting at Visit 12, the University of California, San Francisco (UCSF) was used in this capacity. For both the spine and hip data, there are 4 regions scanned. For the spine, the data correspond to vertebrae L1-L4. For the hip, these correspond to femoral neck, trochanter, inter-trochanter, and ward's triangle. This dataset is intended for use in longitudinal analyses looking at changes in BMD over time.

The dataset includes one record per visit per ID. Since the dataset contains visits from baseline to visit 17, a participant can have between 1 and 17 records (visit 14 is an interim visit and there is no bone scan data). Bone Density Contact Record (BDCR) flags and checks are omitted from this dataset. Although the checks and flags are omitted from the final longitudinal dataset, they are implemented in the data cleaning process, and ultimately affect the construction of the final frozen longitudinal dataset.

Note:

- *The interim visit 11 was a non-funded visit, and quality control was not performed for this visit. Please use the data with caution.*
- *Site 14 did not participate in the bone study at visit 11, visit 15, visit 16, and visit 17. Site 17 did not participate in the bone study at visit 16 and visit 17.*
- *No bone scans were done during interim visit 14.*
- *Sixteen scans occurred before the actual baseline visit, resulting in a negative number for the scan day variables.*

Differences from the prior release of the Longitudinal Bone Mineral Density dataset (nialbmd2026):

- *Visits 15 through 17 were added to the dataset*

Who is included in the public use dataset:

The dataset contains information for the 2365 women from the five clinical sites participating in the SWAN longitudinal bone study who had a baseline bone scan at SWAN core visits 00 through 03. The sites include 11, 12, 14, 15, and 17.

The assigned participant ID has been replaced with a randomly generated ARCHID in order to protect participant privacy. The baseline interview date is denoted as day 0 and is used as the basis for all other dates. A variable describing the race/ethnicity of participants (RACE) was added from the Screener dataset.

Missing data coding:

Original missing codes (-1: not applicable, -7: refused, -8: don't know, -9: missing) have been recoded to SAS missing codes (.B: not applicable, .D: refused, .C: don't know, and .A: missing).

NOTE: Please be aware that there was for the site 16 women a gap of 2-3 visits between Visits 06 and 09. This might affect the accuracy of the created variables.

What is included in the public use dataset:

At each scan visit, a bone density contact record (BDCR) was completed for each scan type and was stored in the BDCR datasets (for V03 to V17) and in the core datasets (V00 to V02). The bone density contact record includes questions which assist in the interpretation of scan results, and the identification of potential problem scans. Scans which were flagged were sent to Synarc for review of artifacts, technical inadequacies, or other problems. The reviews, done by scan reviewers and some by Synarc, and PIs, insure that the subject was positioned correctly, that the measured Region of Interest (ROI) was defined appropriately, and that the BMD change over time for a participant is a true change and not due to scanning problems.

Core datasets were created for visits 00, 01, and 02. After visit 02, a longitudinal dataset was created and then updated with each annual visit. Based on certain flagging criteria, a scan may have been excluded for a particular visit. However, in cases where the same conditions exist for all scans, the scan may be included in the longitudinal dataset. For example, a participant's hip scan may have been excluded because of non-removable metal jewelry present at baseline. However, every time she has been scanned the same non-removable jewelry is present in the scan. All of her scans would be included in the longitudinal dataset because the metal is present in the same location in all her scans.

At each scan visit, four spine regions are scanned, with results from the four regions combined for total bone mineral content (BMC) and total bone mineral density (BMD). Four hip regions are also scanned, with the first three regions combined for total BMC and BMD. For each region scanned, bone mineral density (BMD) is calculated as follows:

$$\text{BMD} = \frac{\text{BMC}}{\text{AREA}}$$

Scan rules:

The bone density contact record flags spine scans based upon the following criteria: excluded vertebrae, scoliosis, use of angled lines for the top or bottom of the ROI, or for the inter-vertebral markers, inability of the computer to define bone edges, visible motion or other scan artifacts, metal overlying the spine, calcium pill overlying the spine, or inability to match baseline scan. All of these flags, except metal overlying the spine, require that the bone technician send the scan to Hologic/Synarc for review and adjudication via a Data Action Sheet (DAS). *(Please note: because the contract with Synarc ended April, 2008, and sites stopped sending DASs to Synarc in the middle of Visit 10, there will be DASs that were not finalized or reviewed by Synarc).*

The bone density contact record flags hip scans based upon the following criteria: painted hip, bone mapping inaccuracy, inability to separate the femoral neck from the pelvis or greater trochanter, inability to view the bottom of the less trochanter, femoral neck box size less than 12mm, size of the ROI, placement of lines down the middle of the femoral neck, visible motion, scan artifact, or non-correctable anatomy, or metal overlying the hip. All of these flags, except metal overlying the hip and inability to see the bottom of the lesser trochanter, require that the bone technician send the scan to Hologic/Synarc for review and adjudication.

The SWAN protocol requires that the left hip be scanned unless one of the following is true.

- Subject's left leg is missing, artificial, partly paralyzed, or totally paralyzed;
- Subject's left hip is artificial;
- Subject's left hip cannot be, but her right hip can be, internally rotated by the necessary amount;
- Subject has ever fractured her left hip or left femur; or
- Subject's right hip was used for her baseline SWAN scan.

For some scans, if the conditions are similar over visit and change in BMD is thought reasonable, the scan will be included in the dataset.

Variables included in the dataset:

Variable	Label	Codes
ARCHID	Participant ID	
VISIT	Study visit	"00" = Baseline to "17" = Visit 17
RACE	Race/Ethnicity	1 = Black 2 = Chinese/Chinese American 3 = Japanese/Japanese American 4 = White Non-Hispanic 5 = Hispanic
SPSCNAGE	Age at Spine Scan	Numeric
HPSCNAGE	Age at Hip Scan	Numeric
SPSCNDAY	Spine Scan Day	# of days since baseline (day 0)
HPSCNDAY	Hip Scan Day	# of days since baseline (day 0)
SPSCNTIM	Spine Scan Time	Numeric
SPSCMODE	Spine Scan Machine Model	5 = 2000 machine 11= 4500 machine
HPSCNTIM	Hip Scan Time	Numeric
HPSCMODE	Hip Scan Machine Model	5 = 2000 machine 11= 4500 machine
BMDFLG	Scan Flag	1 = Spine not Reanalyzed 2 = Hip not Reanalyzed 3 = Spine DAS not sent 4 = Hip DAS not sent 5 = PI recommended for Spine Exclusion
CAL_SPBMDT	Total Spine BMD w/ Cross Calibrations Applied	Numeric
CAL_HPBDT	Total Hip BMD w/ Cross Calibrations Applied	Numeric

Created Variables:

- AGE: Two age variables (**SPSCNAGE**, **HPSCNAGE**) were created using scan dates and participant date of birth.
- SCAN DAY: Date of scan variables (**SPSCNDAY**, **HPSCNDAY**) are given in days from interview date at baseline. Note that for 5 participants, interview completion dates at baseline were not available and alternative dates were substituted either from the Self-Administered Questionnaire-A or Physical Measures completion dates at baseline.
- SPINE: The total spine BMD variable **CAL_SPBMDT** is edited for longitudinal use with the cross-calibration factors applied at site 14 and 17 for visit 08 and later, and the cross-calibration factors applied at site 12 starting from January 27, 2010.
- HIP: The total hip BMD variable **CAL_HPBDT** is edited for longitudinal use with the cross-calibration factors applied at site 14 and 17 for visit 08 and later, and the cross-calibration factors were applied at site 12 during Visit 12.
- MACHINE: Two variables were used to indicate the scan machine model used (**SPSCMODE**, **HPSCMODE**). The QDR 2000 was used at site 14 and 17 prior to Visit 08, and the QDR 4500 at site 11, 12, and 15, and at site 14 and 17 from visit 08 forward.
- A flag variable, **BMDFLG**, has the following values
 - 1 = spine scan was not reanalyzed (Synarc recommended to reanalyze the scan but the site did not do so)
 - 2 = hip scan was not reanalyzed;
 - 3 = spine DAS was not sent out (according to protocol a DAS was supposed to be sent to Synarc)
 - 4 = hip DAS not sent out
 - 5 = if PI recommended for spine exclusion.