

DXA Documentation

SOF began measuring dual x-ray absorptiometry (DXA) on participants at Visit 2 using Hologic QDR 1000 workstations at each of the 4 clinics. At Visit 2, hip and spine scans were performed on most of the participants. Any participant not scanned at Visit 2 was scanned at Visit 3 to complete the data and their data are included in Visit 2 data. At Visit 4, only hips were scanned on the entire cohort, and spine scans were performed on the bone loss cohort. Hips were scanned at all subsequent visits, including on the African American (AA) cohort starting at Visit 6. At Visit 4 whole body scans were performed on the body composition cohort, and at Visits 6 and 7 whole body scans were performed on the year 12 cohort using Hologic QDR 2000 workstations. Whole body change variables were not calculated between visits 4-6 or 4-7 because there is essentially no overlap between the cohorts.

Scans were performed and analyzed at each clinic. Review of scans was done at the UCSF Coordinating Center on random subsets of scans and on problematic scans identified (“flagged”) by technicians at the clinics. Some scans are deemed unacceptable and are not included in the data or are set to special missing value code “.W”.

At follow-up visits, positioning and analysis were matched to the Visit 2 scans, using the “compare” feature of the Hologic QDR. Generally, the right hip was scanned unless there was a fracture, implant, hardware or other problem preventing the right hip from being scanned, in which case the left hip was scanned. If during the study a different side was scanned, then scans at later visits were matched to the first scan of the new side. In addition to matching the follow-up scan to earlier scans, the earlier scans were re-analyzed by adjusting the regions-of-interest (ROI’s) or deleting bone to match the later scan so longitudinal change variables could be calculated. This results in multiple versions of visit scans. For example there are the original scan values for Visit 2, and also longitudinally-adjusted scan values, e.g. a Visit 4-adjusted Visit 2 scan value, a Visit 6-adjusted Visit 2 scan value, etc. The original unadjusted scan is used for cross-sectional data analysis, and the longitudinally-adjusted later visit versions are used for calculating change variables, and for repeated-measures data analysis.

Absolute and percent change variables are calculated using the (current visit – earlier longitudinally-adjusted visit), matching for side (hip scans) and scan mode. Change variables from non-matching sides or scan modes are also set to special missing value code “.W”. In general, change variables are only provided for hip BMD, total spine BMD, and total whole body BMD. The easiest way to calculate additional change variables is to calculate change for only participants with non-missing BMD change, so no checking for matching sides or modes is necessary. For example, to calculate absolute and percent change in total hip BMC between Visits 2 and 4, use the following SAS code:

```
if V42DTHD>.z then V42DTHC= V4THC-V2THC ;  
if V42DTHD>.z then V42PTHC= 100*(V4THC-V2THC)/V2THC ;
```

To calculate annualized change, simply divide by the number of years between scans, in this case with the variable V42HPYRS.

PLEASE NOTE:

At Visits 6 and 7, hips of SOF participants at 2 of the clinics were measured on the QDR 2000 instead of the QDR 1000. Hip measurements between the QDR 1000 and 2000 are not comparable. We attempted to find a correction based on 20 or 30 people measured on both 1000 and 2000, but were unsuccessful.

Hips of all of the AA participants from the 2 clinics were measured on the QDR 2000, plus a handful from the other 2 clinics.

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At Visit 9, hip and whole body measurements were measured at 2 clinics using QDR 4500. No longitudinal variables are calculated and we do not recommend longitudinal analyses combining QDR 4500 data with data from the QDR 1000 or 2000.

WE STRONGLY RECOMMEND that analysis using data from these visits include QDR serial number (V#HPQDR) as a covariate (instead of clinic) when doing both cross-sectional AND longitudinal analyses by creating dummy variables using V#HPQDR.

IN ADDITION, WE RECOMMEND repeating analyses on QDR 1000 (serial numbers<1000) participants only by setting measurement values to missing for hips measured on QDR 2000 (serial numbers>2000).

This does NOT apply to analysis using whole body data measured on only the QDR 2000.

General Naming Conventions:

There are 4 types of variables: cross-sectional visit, change, longitudinally-adjusted visit, change variables, and scan information variables. The variable name is a combination of 5 factors: current visit (V#_c or AA); type of change variable (C); earlier visit (#_e); scan type or region (S₁ S₂); and type of measurement (M). See tables below for values of M and S₁ S₂.

1. Cross-sectional variables are 5 character variable names. Current visit is identified by the first 2 characters, scan region in the 3rd and 4th characters, and type of measurement in the 5th character.

V #_c S₁ S₂ M A A S₁ S₂ M
— — — — — or — — — — —

2. Longitudinally-adjusted variables are 6 character variable names similar to cross-sectional variables with the earlier visit number at the end. Current visit is identified by the first 2 characters, scan region in the 3rd and 4th characters, type of measurement in the 5th character, and earlier visit number in the 6th character.

V #_c S₁ S₂ M #_e A A S₁ S₂ M #_e
— — — — — or — — — — —

3. Change variables are 7 character variable names. Current visit is identified by the first 2 characters, earlier visit is the 3rd character, type of change variable is the 4th character, scan region in the 5th and 6th characters, and type of measurement in the 7th character. The type of change variable C is either D for absolute change or P for percent change.

V #_c #_e C S₁ S₂ M A A #_e C S₁ S₂ M
— — — — — or — — — — —

Years between scans is named as follows using scan type for S₁ and S₂ :

V #_c #_e S₁ S₂ Y R S A A #_e S₁ S₂ Y R S
— — — — — or — — — — —

4. Scan information variables (hip side, scan date (days since enrolled), scan mode, and QDR serial number) are 7-8 character variable names. For cross-sectional variables, current visit is identified by

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the first 2 characters, scan type in the 3rd and 4th characters, and SIDE, DAYS, MODE, QDR in the remaining characters. For longitudinally-adjusted variables, the 8th character is #_c, preceded by and SID, DAY, MOD, QDR.

V #_c S₁ S₂ X X X X A A S₁ S₂ X X X X
 _____ or _____ or
 V #_c S₁ S₂ X X X #_c A A S₁ S₂ X X X #_c
 _____ or _____

Take, for example, Total hip.

- a. The Visit 2 cross-sectional visit BMD is V2THD and BMC is V2THC. The Visit 4 cross-sectional visit BMD is V4THD.
- b. The Visit 2 BMD longitudinally-adjusted variable at Visit 4 (considered a Visit 4 variable) is V4THD2.
- c. Absolute change from Visit 2 to Visit 4 (considered a Visit 4 variable) is V42DTHD. Percent change from Visit 2 to Visit 4 is V42PTHD.
- d. A hip information variable for Visit 2 is V2HPSIDE, for Visit 4 is V4HPSIDE, and the Visit 2 longitudinally-adjusted side is V4HPSID2.

Type of measurement (M) abbreviations :

A	Area
C	Bone Mineral Content (BMC)
D	Bone Mineral Density (BMD=BMC/Area)
E	Fat Free Mass (FFM=BMC+Lean)
F	Fat
L	Lean
M	Mass
P	Percent fat

Scan type and region (S₁ S₂) abbreviations:

Scan type		Region	
HP	Hip	TH	Total Hip
		FN	Femoral Neck
		IT	Intertrochanter
		TR	Trochanter
		WD	Wards
SP	Spine	TL	Total Lumbar Spine
		L1	L1
		L2	L2
		L3	L3
		L4	L4
WB	Whole body	TB	Total Whole body
		HD	Head
		LA	Left arm
		RA	Right arm

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		LR	Left rib
		RR	Right rib
		TS	Thoracic spine
		LS	Lumbar spine
		TK	Trunk
		PE	Pelvic
		LL	Left leg
		RL	Right leg

Scan mode coding:

Scan mode	
1	Pencil beam
5	2000 Array
11	4500 Array
12	4500 Fast Array

Hologic QDR Serial numbers

Recoded QDR Serial Numbers			
Clinic	1000	2000	4500
1	100	2100	4100
1	100	2101	
2	200	2200	
3	300	2300	
4	400	2400	4400

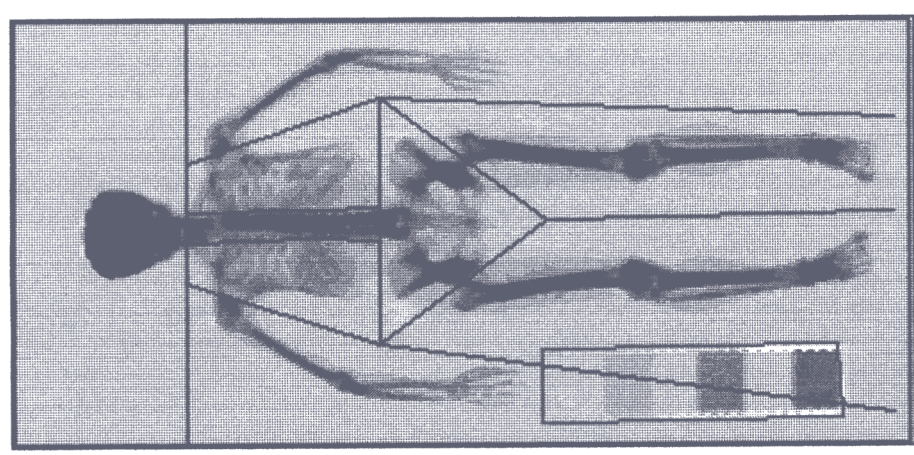
V9WBDAYS

Name:
 Comment:
 I.D.: - - Sex: F
 S.S.#: - - Ethnic: C
 ZIP Code: Height:
 Operator: Weight:
 BirthDate: Age:
 Physician:

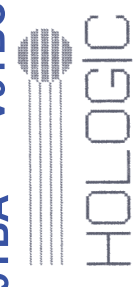
Image not for diagnostic use

TOTAL BMC and BMD CV is < 1.0%
 C.F. 0.999 1.066 1.000

Region	Area (cm2)	BMC (grams)	BMD (gms/cm2)
Head	V9HDA	V9HDC	V9HDD
L Arm	V9LAA	V9LAC	V9LAD
R Arm	V9RAA	V9RAC	V9RAD
L Ribs	V9LRA	V9LRC	V9LRD
R Ribs	V9RRA	V9RRC	V9RRD
T Spine	V9TSA	V9TSC	V9TSD
L Spine	V9LSA	V9LSC	V9LSD
Pelvis	V9PEA	V9PEC	V9PED
L Leg	V9LLA	V9LLC	V9LLD
R Leg	V9RLA	V9RLC	V9RLD
TOTAL	V9TBA	V9TBC	V9TBD



May 8 10:49 2003 [333 x 140]
 Hologic QDR-2000 (S/N 213A)V9WBQDR
 Whole BodyV9WBMODE



Hologic QDR-2000 (S/N 2136)
 Whole Body V5.73
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Name: _____
 Comment: _____
 I.D.: _____ Sex: F
 S.S.#: - - Ethnic: C
 ZIP Code: _____ Height: _____
 Operator: _____ Weight: _____
 BirthDate: _____ Age: _____
 Physician: _____

TBAR263
 F.S. 68.00% 0(10.00)%

Region	BMC (grams)	Fat (grams)	Lean (grams)	Lean+BMC (grams)	Total (grams)	% Fat (%)
L Arm		V9LAF	V9LAL	V9LAE		
R Arm		V9RAF	V9RAL	V9RAE		
Trunk	V9TKC	V9TKF	V9TKL	V9TKE		
L Leg		V9LLF	V9LLL	V9LLE		
R Leg		V9RLF	V9RLL	V6RLE		
SubTot						
~ Head		V9HDF	V9HDL	V9HDE	V9TBM	V9TBP
TOTAL		V9TBF	V9TBL	V9TBE		

~ assumes 17.0% brain fat
 LBM 73.2% water

