MrOS Baseline Visit FORE-FRC Fracture Risk Calculator Analysis File FC1XXXX.sd2 Documentation

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The dataset FC1XXXXX includes the Fracture Risk Calculator (FRC) data from the Foundation for Osteoporosis Research and Education (FORE) that were calculated using risk factors collected at the MrOS baseline visit.

For the February 2012 release, FORE FRC probabilities were calculated based on the most recent version of FRC, 1.0.

All variables in the MrOS FORE Fracture Risk Calculator™ data set begin with **FC**.

The FRC 10-year fracture probabilities include:

FCOSTWO	10 year probability (%) of major osteoporotic fracture, calculated without knowing BMD
FCOSTW	10 year probability (%) of major osteoporotic fracture, calculated knowing BMD
FCHIPWO	10 year probability (%) of hip fracture, calculated without knowing BMD
FCHIPWO	10 year probability (%) of hip fracture, calculated knowing BMD

Values for these probabilities over 50 were originally sent by FORE-FRC as “>50”.
These values have all been set to 51 in the 4 probability variables.
The number of values that were >50 that have been set to the value of 51 are:

- 9 for FCHIPW
- 2 for FCHIPWO
- 22 for FCOSTW
- 15 for FCOSTWO

Example of a Description for Methods Sections:
The Fracture Risk Calculator (FRC) is a modification of a fracture risk model originally developed in 2000-2001 at Division of Research, Kaiser Permanente Medical Care Program, Northern California Region.[1] The choice of risk factors was originally based on the NOF’s 1998 choice of key, independent risk factors[2] but later expanded to include additional risk factors.[3] Since 2005, it has been available for public use on the Foundation for Osteoporosis Research and Education (FORE) website.[4] Subsequently, in 2007, the FRC tool was further modified by incorporating updated US fracture rates[5], by changes in some input variables (changing to either parent with hip fracture rather than mother and/or sister; adding heavy alcohol use), and by being made accessible at no charge in batch mode for large datasets.

The FRC tool uses 10-year fracture probabilities for age and gender derived from the 2006 U.S. National Inpatient Survey.[5] Specific patient characteristics (body mass index

(BMI), history of fracture, parental history of hip fracture, smoking and alcohol consumption, use of corticosteroids, prevalence of rheumatoid arthritis, and secondary osteoporosis) are compared to the base population and relative risks are applied to factors that differ between the individual patient and the base population. Race/ethnicity offsets are based on published fracture risk ratios relative to Caucasian.[6] In general, the product of base rate times the risk differences yields the predicted absolute 10-year risk. Data on age, gender, race and BMI are required. If data is missing on any of the other clinical characteristics the value for that characteristic is set to null. The tool provides 10-year risk estimates of both hip fracture and major osteoporotic fracture (hip, clinical spine, forearm, shoulder); risk estimates can be calculated with and without femoral neck bone mineral density (BMD) as an input parameter.

References

1. Ettinger B, Hillier TA, Pressman A, Che M, Hanley DA. Simple computer model for calculating and reporting 5-year osteoporotic fracture risk in postmenopausal women. J Women's Health 2005; 14:159-171.
2. National Osteoporosis Foundation. Osteoporosis: Review of the evidence for prevention, diagnosis, and treatment and cost-effectiveness analysis: Status Report. Osteoporos Int 1998; 8 (suppl 4) 1-128.
3. Lo JC, Pressman AR, Chandra M, Ettinger B. Fracture risk tool validation in an integrated healthcare delivery system. Am J Manag Care. 2011;17(3):188-194.
4. FORE 10-year Fracture Risk Calculator for Health Care Professionals. http://riskcalculator.fore.org/. Accessed December 1, 2011.
5. Ettinger B, Black DM, Dawson-Hughes B, Pressman AR, Melton LJ, 3rd. Updated fracture incidence rates for the US version of FRAX. Osteoporos Int. 2010;21(1):25-33.
6. Tosteson AN, Melton LJ, 3rd, Dawson-Hughes B, et al. Cost-effective osteoporosis treatment thresholds: the United States perspective. Osteoporos Int. 2008;19(4):437-447.

Missing Risk Factor Data:
Two participants were missing data on BMI but were given the study median value to use for the risk calculation. One participant was missing data on BMD.
For all other risk factors, data was complete for 4371 (72.92%) of men. For those variables with missing data, there were flag variables created to show which participants had the missing value assumed to be "no" for the risk factor, No one was missing data on age, race, sex, rheumatoid arthritis or BMI. The flag variables for those with missing data are as follows:

Risk Factor	Number missing data	Flag Variable
Any risk factor (excluding BMD or BMI)	1623	FCMISS
Prior fracture after age 45	1	FCPRFXMS
Parent had a hip fracture	1437	FCFMFXMS
Current Smoker	1	FCSMOKMS
Corticosteroid use	239	FCSTERMS
Secondary osteoporosis	235	FC2NDMS
3 or more alcoholic drinks/day	8	FCALCHMS
BMD	1	FCNBMDMS

Variables passed to the FRC:

Variable	Correponding MrOS data	How it was calculated	Comments
Race/ethnicity	GIERACE	A character version of this variable was made with w=Caucasian b-African American o=Asian h=Hispanic u=other	FORE requires this format
Age	GIAGE1		
Sex		"m" for all ppts	
BMI	HWBMI	truncated those with BMI>45 to 45, rounded to 1 decimal place, those 2 missing BMI given the median value=26.9.	FORE requires this value be trimmed at 45 and rounded
Prior fracture after age 45	calculated	Similar code to FFFX50 was used to create any fx with age>=45, excluding the traumatic fxs	FORE says to leave out fxs of fingers, toes, facial bones, and skull but Bruce Ettinger had me leave them in here
Parent had a hip fracture	calculated from FFMOMHIP and FFDADHIP	If FFMOMHIP or FFDADHIP=1 then this is 1. If MOMHIP=0 and DADHIP=0 then this is 0. If the answer for 1 parent is 0 but the second parent is missing, this is set to 0. This is the same as used in FRAX.	25% of men are missing this field
Current Smoker	TURSMOKE	If TURSMOKE=2 then SMOKE=1; if TURSMOKE in(0,1) then SMOKE=0;	
Corticosteroid use	M1CORTO		FORE has specific definition of this, but we did not have that much information so this is the closest we had.
Rheumatoid Arthritis	MHARTH and MHRHEUM	If MHRHEUM=1 then RA=1; If MHARTH=0 or MHRHEUM=0 then RA=0;	
Secondary osteoporosis	M1INSULN and MHHTHY	IF M1INSULN=1 or MHHTHY=1 then SECOND_DEGREE=1; IF M1INSULN=0 and MHHTHY=0 then SECOND_DEGREE=0;	FORE includes, malabsorption, hyperthyroidism, chronic liver disease, and type 1 diabetes in this definition. We only have data on self-report of hyperthyroidism and diabetes. Bruce Ettinger asked to just pick those on insulin for type 1 diabetes.
3 or more alcoholic drinks/day	TUDRPRWK	If TUPRDRWK/7>=3 then ALCOHOL=1; IF .z<TURDRPRWK/7<3 then ALCOHOL=0;	
Machine Type		"Hologic" for all ppts	
Femoral Neck BMD	B1FND	trimmed to 3 decimal places.	
Femoral Neck T-score		used race specific norms from the Looker paper from age 20-29 category, used white norms for Asian and other race, trimmed to 1	

		decimal place.	
Femoral Neck Z-score		used age and race specific norms from the Looker paper, used white norms for Asian and other race, trimmed to 2 decimal places and truncated to range -4.0 to 4.0	FORE does not accept values below -4.0 and above 4.0 so a few were trimmed