

Supplemental Tables

Do additional clinical risk factors improve the performance of Fracture Risk Assessment Tool (FRAX) Among Postmenopausal Women? Findings from the Women's Health Initiative Observational Study and Clinical Trials

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Supplemental Table 1. Risk Reclassification Table of 10-Year Major Osteoporotic Fracture and Hip Fracture, Stratified by Individual Variables Included in the Model*

Outcome	Variable added to model containing FRAX	Outcome Type	NRI¹
Hip Fracture (High risk $\geq 3\%$)	Diabetes	Case	0.04
		Non-Case	-0.02
	Falls	Case	0.02
		Non-Case	-0.01
	Vasomotor Symptoms	Case	0.02
		Non-Case	-0.01
	Physical Function	Case	0.11
		Non-Case	-0.05
	All Additional Factors	Case	0.14
		Non-Case	-0.06
Osteoporotic Fracture (High risk $\geq 20\%$)	Diabetes	Case	0.01
		Non-Case	-0.00
	Falls	Case	0.01
		Non-Case	-0.00
	Vasomotor Symptoms	Case	0.00
		Non-Case	-0.00
	Physical Function	Case	0.04
		Non-Case	-0.01
	All Additional Factors	Case	0.06
		Non-Case	-0.02

* For cases, NRI calculates and tests being reclassified into the high-risk category; For non-cases, NRI calculates and tests being reclassified into the low-risk category.

Supplemental Table 2. AUC values for Fracture Risk Assessment Tool (FRAX) alone and FRAX with additional clinical characteristics on 10-year major osteoporotic fracture, including participants with less than 10 years of follow-up (regardless of fracture status)

Model*	n	AUC (95% CI)
All Participants		
Age	129439	61.9 (61.4, 62.4)
Age + body mass index	129439	62.0 (61.5, 62.5)
Age + history of fracture (any site)	129439	62.7 (62.1, 63.2)
<i>FRAX alone (all participants)</i>	129439	64.2 (63.6, 64.7)
FRAX alone (white participants)	107906	62.2 (61.6, 62.7)
FRAX alone (black participants)	10960	57.5 (54.3, 60.7)
FRAX + treated diabetes	129439	64.2 (63.7, 64.7)
FRAX + ≥ 2 falls in the past year	129439	64.5 (63.9, 65.0)
FRAX + vasomotor symptoms	129439	64.0 (63.6, 64.6)
FRAX + physical function	129439	64.5 (63.9, 65.0)
FRAX + all additional factors	129439	64.7 (64.2, 65.3)
BMD Subset		
Age	8247	62.2 (60.1, 64.2)
Age + body mass index	8247	62.2 (60.2, 64.2)
Age + history of fracture (any site)	8247	63.9 (61.9, 66.0)
<i>FRAX alone (all participants)</i>	8247	69.2 (67.3, 71.1)
FRAX alone (white participants)	6410	66.2 (64.1, 68.3)
FRAX alone (black participants)	1222	65.2 (54.6, 75.9)
FRAX + treated diabetes	8247	69.3 (67.4, 71.2)
FRAX + ≥ 2 falls in the past year	8247	69.3 (67.3, 71.2)
FRAX + vasomotor symptoms	8247	69.1 (67.2, 71.0)
FRAX + physical function	8247	69.2 (67.3, 71.2)
FRAX + lumbar spine bone mineral density	8247	69.1 (67.2, 71.0)
FRAX + all additional factors	8247	69.5 (67.5, 71.4)

* All models are adjusted for intervention assignment in the WHI Hormone (Active, Placebo, not Randomized) and Calcium Vitamin D (Active, Placebo, Not Randomized) trials. BMD: bone mineral density.

Supplemental Table 3. Area under the Receiver Operating Characteristic Curve Values for Fracture Risk Assessment Tool (FRAX) Alone and FRAX with Additional Clinical Characteristics on Predicted 10-year Risk of Fracture Among Women Not Taking Hormone Therapy*

Model	Hip Fracture		Major Osteoporotic Fracture	
	n	AUC (95% CI)	n	AUC (95% CI)
All Participants				
Age	45431	76.6 (75.2, 77.9)	46980	64.1 (63.4, 64.8)
Age + BMI	45431	77.0 (75.7, 78.3)	46980	64.2 (63.5, 64.9)
Age + hx fracture (any site)	45431	76.6 (75.2, 77.9)	46980	64.6 (63.9, 65.4)
<i>FRAX alone (all participants)</i>	<i>45431</i>	<i>76.6 (75.3, 77.9)</i>	<i>46980</i>	<i>65.0 (64.3, 65.7)</i>
FRAX alone (white participants)	38551	75.4 (74.0, 76.8)	39897	63.6 (62.9, 64.4)
FRAX alone (black participants)	3969	79.9 (71.3, 88.5)	4044	60.2 (56.3, 64.1)
FRAX + treated diabetes	45431	76.2 (74.9, 77.5)	46980	65.2 (64.5, 65.9)
FRAX + ≥ 2 falls in the past year	45431	75.5 (74.1, 76.9)	46980	65.3 (64.6, 66.0)
FRAX + vasomotor symptoms	45431	74.7 (73.2, 76.2)	46980	65.0 (64.3, 65.7)
FRAX + physical function	45431	75.2 (73.8, 76.6)	46980	66.0 (65.3, 66.7)
FRAX + all additional factors	45431	75.2 (73.7, 76.6)	46980	66.4 (65.7, 67.1)
BMD Subset				
Age	2917	73.3 (68.2, 78.4)	3044	65.8 (63.2, 68.4)
Age + BMI	2917	73.6 (68.4, 78.7)	3044	65.7 (63.2, 68.3)
Age + hx fracture (any site)	2917	73.4 (68.4, 78.4)	3044	67.2 (64.6, 69.8)
<i>FRAX alone (all participants)</i>	<i>2917</i>	<i>80.2 (75.9, 84.5)</i>	<i>3044</i>	<i>71.2 (68.8, 73.7)</i>
FRAX alone (white participants)	2331	77.9 (73.2, 82.7)	2440	68.4 (65.6, 71.1)
FRAX alone (black participants)	407	79.9 (61.1, 98.7)	413	69.4 (56.1, 82.6)
FRAX + treated diabetes	2917	80.0 (75.6, 84.4)	3044	71.4 (68.9, 73.8)
FRAX + ≥ 2 falls in the past year	2917	78.7 (74.2, 83.3)	3044	71.6 (69.1, 74.0)
FRAX + vasomotor symptoms	2917	80.0 (75.0, 84.1)	3044	71.3 (68.9, 73.8)
FRAX + physical function	2917	78.7 (74.3, 83.0)	3044	72.6 (70.2, 75.0)
FRAX + lumbar spine BMD	2917	78.5 (74.0, 83.0)	3044	71.0 (68.6, 73.5)
FRAX + all additional factors	2917	80.0 (75.6, 84.4)	3044	73.2 (70.8, 75.6)

* BMD: Bone mineral density

Supplemental Table 4. Area under the Receiver Operating Characteristic Curve Values for Fracture Risk Assessment Tool (FRAX) Alone and FRAX with Additional Clinical Characteristics on Predicted 10-year Risk of Fracture Among Women Aged ≥ 65 Years

Model ¹	Hip Fracture		Osteoporotic Fracture	
	n	AUC (95% CI)	n	AUC (95% CI)
All Participants				
Age	38227	69.4 (68.1, 70.8)	39771	60.3 (59.6, 61.0)
Age + BMI	38227	70.0 (68.6, 71.3)	39771	60.3 (59.6, 61.0)
Age + hx fracture (any site)	38227	69.6 (68.2, 71.0)	39771	61.3 (60.6, 62.1)
<i>FRAX alone (all participants)</i>	<i>38227</i>	<i>69.0 (67.7, 70.4)</i>	<i>39771</i>	<i>61.3 (60.6, 62.0)</i>
FRAX alone (white participants)	34375	68.5 (67.1, 69.9)	35765	60.5 (60.0, 61.3)
FRAX alone (black participants)	1860	77.2 (69.9, 84.5)	1906	62.5 (58.0, 67.1)
FRAX + treated diabetes	38227	69.7 (68.3, 71.0)	39771	61.7 (61.0, 62.5)
FRAX + ≥ 2 falls in the past year	38227	68.7 (67.3, 70.0)	39771	61.9 (61.2, 62.6)
FRAX + vasomotor symptoms	38227	68.7 (67.3, 70.0)	39771	61.3 (60.6, 62.0)
FRAX + physical function	38227	69.5 (68.2, 70.9)	39771	62.9 (62.2, 63.7)
FRAX + all additional factors	38227	70.0 (68.7, 71.4)	39771	63.5 (62.8, 64.2)
BMD Subset				
Age	2363	67.7 (62.5, 73.0)	2498	61.8 (59.0, 64.6)
Age + BMI	2363	68.3 (63.1, 73.5)	2498	61.8 (59.0, 64.7)
Age + hx fracture (any site)	2363	67.7 (62.4, 72.9)	2498	63.7 (60.9, 66.5)
<i>FRAX alone (all participants)</i>	<i>2363</i>	<i>72.0 (67.0, 77.0)</i>	<i>2498</i>	<i>67.7 (65.1, 70.3)</i>
FRAX alone (white participants)	2067	71.7 (66.5, 76.9)	2190	66.4 (63.7, 69.2)
FRAX alone (black participants)	198	81.2 (75.8, 86.7)	202	75.0 (62.4, 87.6)
FRAX + treated diabetes	2363	73.1 (68.2, 78.1)	2498	67.9 (65.3, 70.5)
FRAX + ≥ 2 falls in the past year	2363	73.1 (68.1, 78.0)	2498	68.1 (65.5, 70.7)
FRAX + vasomotor symptoms	2363	71.8 (66.8, 76.8)	2498	67.7 (65.1, 70.3)
FRAX + physical function	2363	72.0 (67.0, 77.0)	2498	69.2 (66.6, 71.8)
FRAX + lumbar spine BMD	2363	71.7 (66.7, 76.6)	2498	67.4 (64.8, 70.0)
FRAX + all additional factors	2363	75.3 (70.6, 80.1)	2498	70.0 (67.4, 72.6)