SUPPLEMENTAL MATERIALS

Supplemental Table 1. Study Characteristics of Health ABC and CHS

	Health ABC	CHS
Recruitment and Enrollment of Parent Cohort, Inclusion/Exclusion Criteria	- Adults 70-79 years old - Recruited from random sample of White and all Black beneficiaries residing in Memphis, TN, and Pittsburgh, PA - Non-institutionalized, well-functioning adults with self-reported ability to walk ¼ mile or climb 10 steps without rest; without difficulty with activities of daily living, obvious cognitive impairment, or communicating with interviewer; expected to remain in community for next ≥3 years; and not receiving active treatment for cancer - Enrolled in 1997-1998 (n=3075)	- Adults 65 years and older - Recruited from age-stratified random sample of Medicare-eligible adults from Sacramento County, CA, Washington County, MD, Forsyth County, NC, Pittsburgh County, PA - Non-institutionalized, community-dwelling adults, not wheelchair-bound at home; able to attend an in-person examination; expected to remain in community for next ≥3 years; and not receiving active treatment for cancer - Initial cohort recruited in 1989-90 (n=5201), followed by a predominantly Black cohort (n=687)
Study Sample	- Participants who completed DXA or CT of the spine in 1997-1998, were free of prevalent heart failure and oral steroid use, and had available covariates - Study baseline: 1997-1998 - Sample size: DXA (n=2835); CT (n=1365)	- Participants who returned to the 1994-1995 examination, completed DXA, were free of prevalent heart failure and oral steroid use, and had available covariates - Study baseline: 1994-1995 - Sample size (n=1268)
DXA Measurement / Primary Exposures	- Areal BMD of total hip and femoral neck - QDR 4500A densitometer, Hologic, Inc, Waltham, MA	- Areal BMD of total hip and femoral neck - QDR 2000 densitometer, Hologic, Inc, Bedford, MA
CT Measurement / Primary Exposure	- Volumetric trabecular BMD of lumbar spine - General Electric 9800 Advantage CT scanner (GE Medical Systems, Milwaukee, WI)	Not performed
Follow-up Evaluation	Semi-annual contacts consisting of telephone interviews or in-person examinations for follow-up evaluations and events surveillance	Semi-annual contacts consisting of telephone interviews or in-person examinations for follow-up evaluations and events surveillance
Heart Failure Assessment	- Potential events reviewed for centralized adjudication - Diagnosis based on physician report of heart failure and	- Potential events reviewed by adjudication committee - Diagnosis based on physician report of heart failure and supportive

	- supportive symptoms and signs; imaging findings; or treatment. - HF subtypes assigned based on imaging information proximate to event - End of follow-up: 2012	- symptoms and signs; imaging findings; or treatment. - HF subtypes assigned based on imaging information proximate to event - End of follow-up: 2014
Covariates	- Questionnaire: age, sex, race, smoking, alcohol, physical activity, medication use - Physical examination: height, weight, waist circumference, blood pressure - Self-reported medical history: prevalent CHD, stroke/TIA, HF, PAD - Electrocardiography/Medicare Claims: prevalent atrial fibrillation or flutter - Laboratory: glucose, lipid fractions, cystatin C; 25-hydroxyvitamin D and phosphate (subset); CRP, IL-6, TNF-α - Spirometry: FEV_1 - Centralized adjudication: incident CHD	- Questionnaire: age, sex, race, smoking, alcohol, physical activity, medication use - Physical examination: height, weight, waist circumference, blood pressure - Self-reported medical history and medical record review, plus adjudication of interval events between enrollment and study baseline: prevalent CHD, stroke/TIA, HF, PAD - Electrocardiography/Medicare Claims: prevalent atrial fibrillation or flutter - Laboratory: glucose, lipid fractions, cystatin C; - Spirometry: FEV_1 - Centralized adjudication: incident CHD

CHD, coronary heart disease; CRP, C-reactive protein; CT, computed tomography; DXA, dual-energy X-ray absorptiometry; FEV_1, forced expiratory volume in 1 second; HF, heart failure; IL-6, interleukin 6; PAD, peripheral arterial disease; TIA, transient ischemic attack; TNF-α, tumor necrosis factor α;

Supplemental Table 2. Sex- and Race-Stratified Baseline Characteristics of the Health ABC Cohort and CHS Combined

Characteristics	Women			Men		
	White (n=1393)	Black (n=819)	*P* Value	White (n=1292)	Black (n=599)	*P* Value
Age, years	74.7 ± 3.7	73.5 ± 3.4	*<0.001*	74.9 ± 3.9	73.7 ± 3.2	*<0.001*
Education, n (%)						
Less than high school	158 (11)	299 (37)	*<0.001*	173 (13)	287 (48)	*<0.001*
High school graduation	538 (39)	284 (35)	*<0.001*	320 (25)	142 (24)	*<0.001*
More than high school	696 (50)	232 (29)	*<0.001*	797 (62)	169 (28)	*<0.001*
Body mass index, kg/m^2	26.1 ± 4.6	29.6 ± 5.6	*<0.001*	26.9 ± 3.7	27 ± 4.2	*0.535*
Waist circumference, cm	94.7 ± 13.3	101 ± 14.7	*<0.001*	100.8 ± 11.3	98.5 ± 12.3	*<0.001*
Smoking, n (%)			*0.004*			*<0.001*
Never smoker	800 (57)	443 (54)		390 (30)	179 (30)	
Former smoker	478 (34)	272 (33)		831 (64)	296 (50)	
Current smoker	115 (8)	103 (13)		69 (5)	123 (21)	
Heavy alcohol use, n (%)	123 (9)	17 (2)	*<0.001*	96 (8)	31 (5)	*0.072*
Physical activity, kcal/wk	1127 ± 1637	608 ± 991	*<0.001*	1849 ± 2450	1061 ± 2017	*<0.001*
Systolic blood pressure, mm Hg	134 ± 20	139 ± 22	*<0.001*	132.4 ± 19.6	138.4 ± 22.1	*<0.001*
Antihypertensive medication, n (%)	653 (46.9)	553 (67.5)	*<0.001*	613 (47.4)	315 (52.6)	*0.038*
Prevalent diabetes, n (%)	144 (10.3)	212 (25.9)	*<0.001*	250 (19.3)	173 (28.9)	*<0.001*
Estrogen replacement therapy, n (%)	369 (26.5)	91 (11.1)	*<0.001*	NA	NA	*NA*
Aspirin use, n (%)	337 (24.2)	221 (27)	*0.144*	424 (32.8)	169 (28.2)	*0.045*
Prevalent coronary heart disease	169 (12.1)	141 (17.2)	*<0.001*	340 (26.3)	120 (20)	*0.003*
Prevalent stroke/TIA, n (%)	79 (5.7)	67 (8.2)	*0.022*	96 (7.4)	53 (8.8)	*0.287*
Prevalent peripheral artery disease	19 (1.4)	15 (1.8)	*0.388*	54 (4.2)	18 (3)	*0.214*
Prevalent atrial fibrillation, n (%)	63 (4.5)	27 (3.3)	*0.159*	80 (6.2)	19 (3.2)	*0.006*
Estimated glomerular filtration rate eGFR, mL/min/1.73 m^2	71 ± 18	74.3 ± 19	*<0.001*	70 ± 17	76 ± 19	*<0.001*
Forced expiratory volume in 1 s, L	1.8 ± 0.4	1.7 ± 0.4	*<0.001*	2.6 ± 0.6	2.3 ± 0.6	*<0.001*
C-reactive protein, mg/mL	3.6 ± 6.7	4.3 ± 5.2	*0.010*	2.8 ± 5.1	3.4 ± 5.2	*0.027*
Interleukin-6, pg/mL	2.3 ± 1.7	2.6 ± 2.1	*0.012*	2.7 ± 2	2.6 ± 2	*0.658*
Tumor necrosis factor-α, pg/mL	3.4 ± 1.5	3.2 ± 1.7	*0.022*	3.7 ± 1.7	3.3 ± 1.9	*0.001*
Calcium, mg/dL	10 ± 0.5	10 ± 0.6	*0.871*	9.9 ± 0.5	9.8 ± 0.5	*0.321*
Phosphate, mg/dL	3.7 ± 0.4	3.7 ± 0.4	*0.909*	3.4 ± 0.4	3.5 ± 0.5	*<0.001*
25-hydroxy vitamin D, ng/mL	28.9 ± 11.5	20.7 ± 11.5	*<0.001*	29 ± 9.1	21.2 ± 8.4	*<0.001*
Parathyroid hormone, pg/mL	46.5 ± 22.6	64.9 ± 42.6	*0.004*	47 ± 22.4	58.3 ± 33.6	*0.001*
Total hip BMD, g/cm^2	0.747±0.130	0.858±0.151	*<0.001*	0.938±0.149	1.018±0.157	*<0.001*
Femoral neck BMD, g/cm^2	0.636±0.111	0.752±0.132	*<0.001*	0.766±0.131	0.849±0.144	*<0.001*
Total hip, WHO categories\			*<0.001*			*<0.001*
Normal, n (%)	382 (27)	481 (59)		1013 (78)	539 (90)	
Osteopenia, n (%)	729 (52)	285 (35)		258 (20)	58 (10)	

Osteoporosis, n (%)	282 (20)	53 (6)		21 (2)	2 (0.3)	
Femoral neck, WHO categories			<0.001			<0.001
Normal, n (%)	237 (17)	429 (52)		713 (55)	469 (78)	
Osteopenia, n (%)	836 (60)	341 (42)		532 (41)	122 (20)	
Osteoporosis, n (%)	320 (23)	49 (6)		47 (4)	8 (1)	

*Data are given as mean ± standard deviations for continuous variables and count (percent) for categorical variables. Comparisons between race groups are with t-tests or chi-square tests, as appropriate.

BMD, bone mineral density; eGFR, estimated glomerular filtration rate; TIA, transient ischemic attack; WHO, World Health Organization.

Supplemental Table 3. Sex- and Race-Stratified Associations of DXA BMD Measures and Incident HF in Health ABC Presented per 0.1g/cm² Decrement

		Women				Men		
	n	White	n	Black	n	White	n	Black
		HR* (95% CI), p		HR* (95% CI), p		HR* (95% CI), p		HR* (95% CI), p
Total Hip BMD								
Age-adjusted model	795	0.97(0.85-1.10), 0.622	671	1.15(1.02-1.30), 0.019	861	1.04(0.94-1.15), 0.488	508	0.90(0.80-1.02), 0.095
Fully adjusted model†	739	0.89(0.77-1.04), 0.143	608	1.48(1.25-1.74), <0.001	799	1.07(0.95-1.21), 0.252	469	0.87(0.74-1.01), 0.061
Femoral Neck BMD								
Age-adjusted model	795	0.95(0.82-1.11), 0.540	671	1.13(0.99-1.30), 0.076	861	1.02(0.91-1.14), 0.786	508	0.96(0.84-1.10), 0.531
Fully adjusted model†	739	0.88(0.75-1.04), 0.140	608	1.36(1.14-1.64), <0.001	799	1.06(0.93-1.20), 0.399	469	0.87(0.74-1.03), 0.102

BMD, bone mineral density; CI, confidence interval; DXA, dual-energy X-ray absorptiometry; HF, heart failure; HR, hazard ratio; QCT, quantitative computed tomography

*Per 0.1g/cm² decrement of BMD

†Adjusted for age, body mass index, systolic blood pressure, antihypertensive medication use, diabetes, smoking status, heavy alcohol use, physical activity, estrogen use, prevalent coronary heart disease, prevalent stroke and transient ischemic attack, prevalent peripheral artery disease, prevalent atrial fibrillation, forced expiratory ventilation in 1 second, estimated glomerular filtrate rate.

Supplemental Table 4. Sex- and Race-Stratified Relationships of DXA-derived BMD Measures and Incident HFpEF and HFrEF in Health ABC and CHS Combined

		Women				Men		
	n	White	n	Black	n	White	n	Black
		HR* (95% CI) p		HR* (95% CI) p		HR* (95% CI) p		HR* (95% CI) p
HFpEF								
Cumulative Incidence, n (%)		147 (10.6)		63 (7.7)		107 (8.3)		35 (5.8)
Total Hip BMD								
Age-adjusted model	1393	0.84(0.74-0.96) 0.010	817	1.15(0.96-1.37) 0.13	1292	1.15(1.00-1.32) 0.040	599	0.88(0.71-1.09) 0.251
Fully adjusted model†	1337	0.90(0.78-1.05) 0.179	754	1.60(1.25-2.05) <0.001	1230	1.21(1.04-1.41) 0.016	560	0.91(0.70-1.28) 0.454
Femoral Neck BMD								
Age-adjusted model	1393	0.82(0.71-0.95) 0.009	819	1.14(0.93-1.40) 0.204	1292	1.19(1.01-1.39) 0.034	599	0.95(0.75-1.20) 0.635
Fully adjusted model†	1337	0.87(0.74-1.03) 0.113	756	1.41(1.09-1.84) 0.010	1230	1.28(1.07-1.54) 0.007	560	0.88(0.67-1.16) 0.362
HFrEF								
Cumulative Incidence, n (%)		91 (6.5)		73 (8.9)		131 (10.1)		67 (11.2)
Total Hip BMD								
Age-adjusted model	1393	1.04(0.88-1.23) 0.64	819	1.12(0.95-1.32) 0.176	1292	1.04(0.92-1.17) 0.543	599	0.83(0.71-0.98) 0.024
Fully adjusted model†	1337	0.96(0.79-1.17) 0.668	756	1.35(1.09-1.66) 0.006	1230	1.10(0.96-1.26) 0.190	560	0.73(0.60-0.88) 0.001
Femoral Neck BMD								
Age-adjusted model	1393	1.06(0.87-1.30) 0.549	819	1.08(0.90-1.30) 0.423	1292	1.01(0.88-1.15) 0.937	599	0.87(0.73-1.03) 0.103
Fully adjusted model†	1337	0.98(0.79-1.23) 0.877	756	1.24(0.98-1.56) 0.077	1230	1.06(0.91-1.23) 0.482	560	0.76(0.62-0.92) 0.006

BMD, bone mineral density; CI, confidence interval; HR, hazard ratio; HFrEF, heart failure with preserved ejection fraction; HFpEF, heart failure with reduced ejection fraction

*Per 0.1g/cm^2 decrement of BMD

†Adjusted for age, body mass index, systolic blood pressure, antihypertensive medication use, diabetes, smoking status, heavy alcohol use, physical activity, estrogen use, prevalent coronary heart disease, prevalent stroke and transient ischemic attack, prevalent peripheral artery disease, prevalent atrial fibrillation, forced expiratory ventilation in 1 second, estimated glomerular filtrate rate.

Supplemental Table 5. Sensitivity Analyses: Sex- and Race-Stratified Relationships of DXA-Derived BMD Measures and Incident HF in Health ABC and CHS Combined Starting 2 Years After BMD Measurement or Adjusting for Time-Varying CHD

		Women					Men		
	n	White	n	Black	n	White	n	Black
		HR* (95% CI) p		HR* (95% CI) p		HR* (95% CI) p		HR* (95% CI) p
Start of follow-up 2 years after BMD								
Total Hip BMD								
Fully adjusted model	1087	0.92 (0.82-1.03) 0.124	414	1.38 (1.16-1.64) <0.001	1013	1.14 (1.04-1.25) 0.005	564	0.95 (0.81-1.12) 0.571
Femoral Neck BMD								
Fully adjusted model	1087	0.91 (0.8-1.03) 0.14	414	1.22 (1.02-1.45) 0.032	1013	1.16 (1.04-1.29) 0.006	564	0.95 (0.8-1.14) 0.594
Accounting for interim CHD								
Total Hip BMD								
Fully adjusted model + time-varying CHD	1337	0.97 (0.88-1.08) 0.605	756	1.46 (1.26-1.70) 0.022	1230	1.15 (1.06-1.24) 0.001	560	0.82 (0.73-0.93) 0.003
Femoral Neck BMD								
Fully adjusted model + time-varying CHD	1337	0.94 (0.84-1.06) 0.311	756	1.29 (1.10-1.50) 0.001	1230	1.14 (1.04-1.24) 0.006	560	0.80 (0.69-0.91) 0.001

BMD, bone mineral density; CHD, coronary heart disease; CI, confidence interval; HR, hazard ratio