Bone Mineral Density in an Urban Cohort of African Americans and Whites

Ngozi Ejiogu,[1] Jennifer Norbeck,[1] Alan B Zonderman,[1] & Michele K Evans[1]

[1]Clinical Research Branch, NIA, NIH

Abstract

Despite the elevated peak bone mass in African Americans, low socioeconomic status (SES) African Americans are at risk for osteoporosis and fracture later in life. Studies have shown accelerated rates of bone loss in low socioeconomic status urban dwellers that increases their risk for osteoporosis and fracture. However, most studies have examined bone mineral density (BMD) in only older samples. *Methods.* We measured hip and lumbar BMD in African American (n=659) and white participants (n=582) from the HANDLS study who were examined twice approximately 4.3 years apart. BMD was measured by dual-energy X-ray absorptiometry (DXA) of the hip and lumbar spine. *Results.* The mean age was 48.4 for African Americans and 49.1 for whites. Lumbar BMD declined at a significantly greater rate in African Americans (.09 g/cm^2 per decade) than in whites (.07 g/cm^2 per decade; p < .05), but there were no such significant differences for hip BMD. Behavioral factors or SES did not affect the rate of BMD decline for hip and lumbar significantly. *Conclusion.* Using rate of decline in BMD may be more accurate in assessing fracture risk in African American populations. Baseline screening for low SES populations should begin earlier than 50 years of age.

Introduction

Studies conducted to date on the rate of decline in BMD of African Americans compared to whites have been few and inconclusive. Such studies as have been done found similar rates of bone loss in African Americans and whites,[1] though another study comparing urban dwelling African Americans to whites showed a greater rate of hip decline in bone mass for African Americans 2.1% vs 1.1%.[2] However these studies examined only small samples of African American participants. Tracy et al[2] examined 138 African Americans and Sheu et al[1] examined 119 African American men in the Baltimore Men's Osteoporosis study. The average age for participants in these studies was greater than 70 years for both studies. Several factors such as low socioeconomic status, diabetes, and social behaviors such as alcohol consumption and smoking have been associated with decline in bone mass.[3,4] Most longitudinal studies have examined the rate of decline in older African American and white men but few studies to date have examined the rate of decline in bone mass in younger, socioeconomically diverse urban dwelling African American and white cohorts. These groups may exhibit higher rates of bone mass decline at earlier ages than assumed previously, predisposing them to lower BMD. We hypothesize that the rapid rate of decline in BMD happens earlier in the urban dwelling socioeconomically disadvantaged and racially diverse population than the current literature has suggested leading to increased fracture risk.

Methods

- *Healthy Aging in Neighborhoods of Diversity across the Life Span* (HANDLS), a longitudinal population-based study of health disparities, was designed to disentangle the effects of race and SES on risk factors for morbidity and mortality, to examine the incidence and progression of pre-clinical disease, and to follow-up the development and persistence of health disparities, longitudinal health status, and health risks.

- Densitometry measurements were obtained in the first and second examination waves with an average interval of 4.3 years between assessments.

- The first examination measured total body, hip and lumber BMD by DXA (Lunar DPX-iq). The second examination measured BMD by DXA (Hologic QDR Discovery-A). Bland-Altman statistics for cross-calibration between the Lunar and Hologic machines showed a strong correspondence between the two devices.

- Bone density measurements were obtained for the total body, hip and lumbar spine.

- Smoking and daily alcohol consumption were obtained through self-report.

- Race/ethnicity was determined by self-identification. Two racial/ethnic groups were included in this study African American and white.

- We examined 1109 African Americans and whites with mean age of 48.8 years of age at initial examination. We included only those participants with two complete DXA scans.

- Separate analyses were performed using mixed-model regression for hip and lumbar region. We evaluated the effects of race (African-American and white) and socio-economic status (below and above poverty status) on BMD, and adjusted for the effects of age, sex, alcohol consumption, present cigarette smoking, and body mass index.

Results

- Age, sex, race, body mass index, and current alcohol use were associated with hip BMD (Table 2)

- Age, sex, race, poverty status, body mass index, and alcohol use were associated with lumbar BMD

- Men and women declined at different rates in both hip and lumbar BMD (Figures 1 & 2)

- African Americans and whites declined at different rates only in lumbar BMD

- Lumbar BMD declined at a significantly greater rate in African Americans (.09 g/cm^2 per decade) than in whites (.07 g/cm^2 per decade; p < .05)

Conclusion

- Using rate of decline in BMD may be more accurate in assessing fracture risk in African Americans populations

- The results suggest that we should reconsider the current stipulated age to commence screening for osteoporosis is between 50 years for women and 60 years for men

- In particular, baseline screening for low SES populations should begin earlier than 50 years of age to initiate measures that will reduce this accelerated rate of decline in the BMD

Table 1. Sample characteristics.

	Poverty status		Race	
	Below (n=509)	Above (n=732)	African American (n=659)	White (n=582)
Age	48.1	49.2	48.4	49.1
Sex (% men)	36	42	40	39
Race (% African American)	41	71		
Poverty status (% below)			55	26
Body mass index	28.9	29.9	29.5	29.5
Current alcohol use (%)	25	25	26	24

Table 2. Association of hip and lumbar bone mineral density with age, sex, race, poverty status, body mass index, current alcohol use, and current cigarette smoking.

	Bone mineral density	
	Hip	Lumbar
Intercept	0.724	0.848
Age decade	-0.055*	-0.071*
Sex (men)	0.056*	0.035*
Race (African American)	0.053*	0.055*
Poverty status (below)	-0.002	0.022*
Body mass index	0.011*	0.007*
Current alcohol use	-0.018*	-0.002
Current cigarette smoker	-0.010	-0.017
Age decade × Sex	0.026*	0.043*
Age decade × Race	0.012	-0.023*

*p<.05

Figure 1. Rate of change in hip bone mineral density for African Americans and whites above and below 125% of the poverty level.

Figure 2. Rate of change in lumbar bone mineral density for African Americans and whites above and below 125% of the poverty level.

Citations

1. Sheu Y, Cauley JA, Wheeler VW, et al. Age-related decline in bone density among ethnically diverse older men. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA. Feb 2011;22(2):599-605.
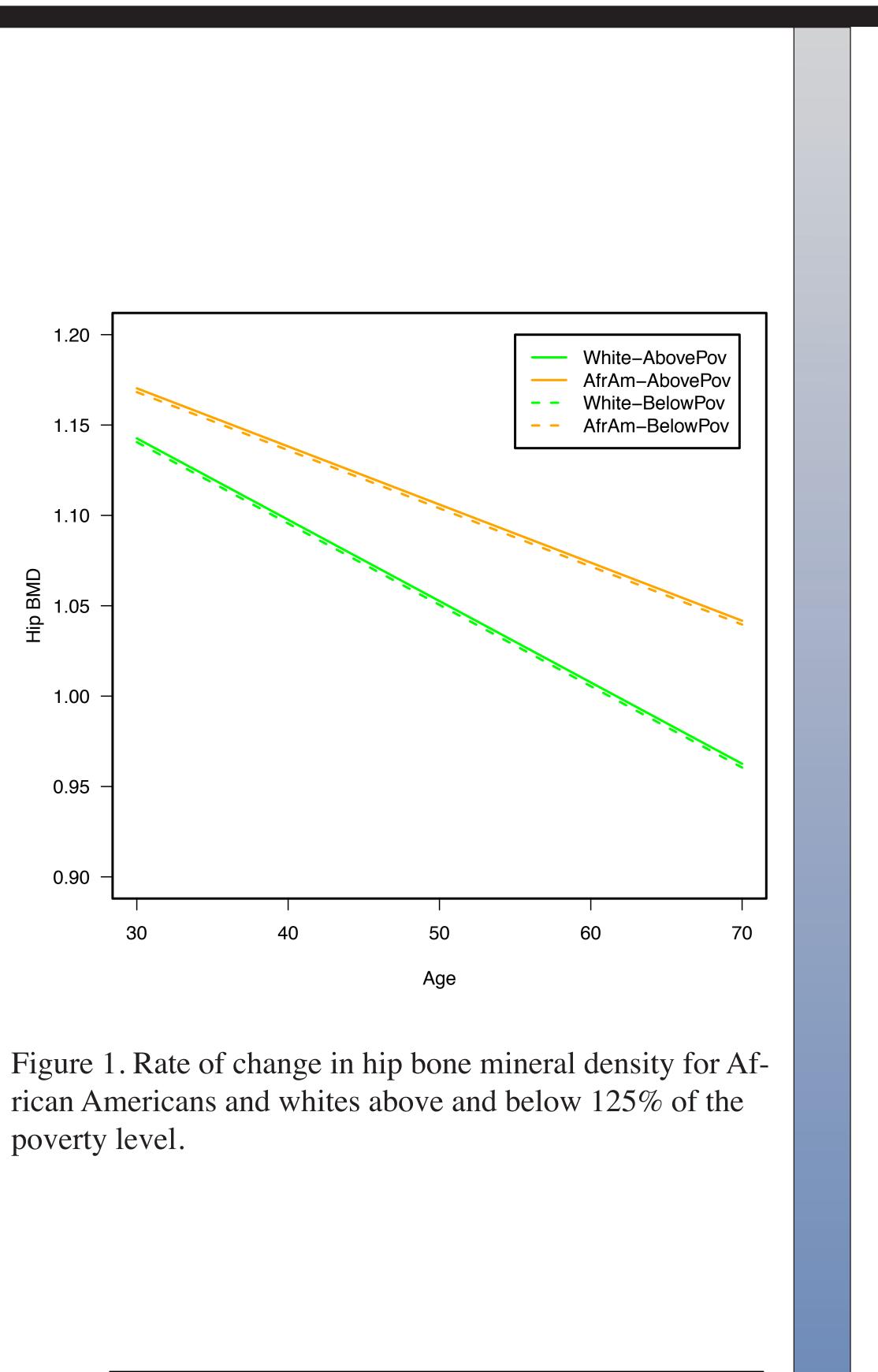
2. Tracy JK, Meyer WA, Flores RH, Wilson PD, Hochberg MC. Racial differences in rate of decline in bone mass in older men: the Baltimore men's osteoporosis study. Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research. Jul 2005;20(7):1228-1234.
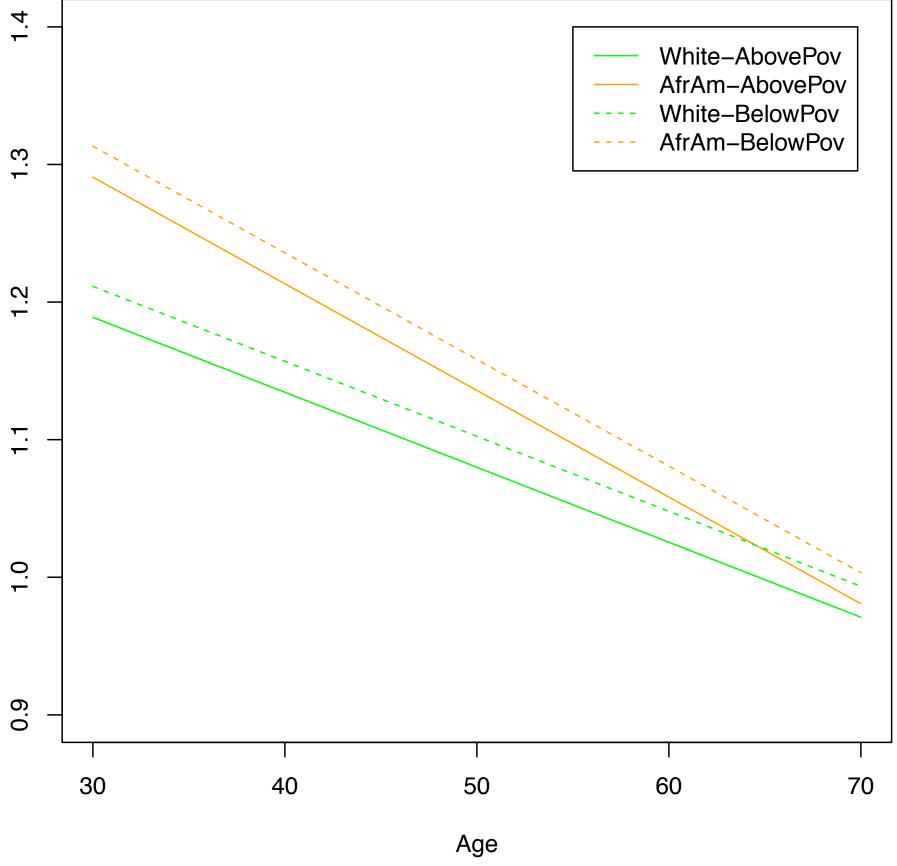
3. Travison TG, Chiu GR, McKinlay JB, Araujo AB. Accounting for racial/ethnic variation in bone mineral content and density: the competing influences of socioeconomic factors, body composition, health and lifestyle, and circulating androgens and estrogens. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA. Oct 2011;22(10):2645-2654.

4. Navarro MC, Sosa M, Saavedra P, et al. Poverty is a risk factor for osteoporotic fractures. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA. Mar 2009;20(3):393-398.