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Racial/Ethnic Differences in Physical Activity Guideline Attainment among Participants in the Osteoarthritis Initiative

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Abstract

Objective—This cross-sectional study examined racial/ethnic differences in meeting the 2008 U.S. Department of Health and Human Services Physical Activity Guidelines aerobic component (150 moderate-to-vigorous (MV) minutes/week in bouts 10 minutes) among persons with or at risk for radiographic knee osteoarthritis (RKOA).

Methods—We evaluated African American versus White differences in Guideline attainment using multiple logistic regression adjusting for socio-demographic (age, gender, site, income, education) and health factors (comorbidity, depressive symptoms, overweight/obesity, knee pain). Our analyses included adults aged 49–84 who participated in accelerometer monitoring at the Osteoarthritis Initiative 48-month visit (1142 with and 747 at risk for RKOA).

Results—2.0% of African Americans and 13.0% of Whites met Guidelines. For adults with and at risk for RKOA, significantly lower rates of Guideline attainment among African Americans compared to Whites were partially attenuated by health factor differences, particularly overweight/obesity and knee pain (RKOA: adjusted odds ratio [OR] = 0.24, 95% confidence interval [CI] = [0.08, 0.72]; at risk for RKOA: OR = 0.28, 95% CI = [0.07, 1.05]).

Conclusion—Despite known benefits from physical activity, attainment of Physical Activity Guidelines among persons with and at risk for RKOA was low. African Americans were 72–76% less likely than Whites to meet Guidelines. Culturally-relevant interventions and environmental strategies in the African American community targeting overweight/obesity and knee pain may reduce future racial/ethnic differences in physical activity and improve health outcomes.

INTRODUCTION

An epidemic of arthritis-associated disability is expected in the United States (U.S.) over the next two decades, fueled by the aging population and the growing prevalence of osteoarthritis.¹ Osteoarthritis (OA) affects over 27 million persons in the U.S.² This number is expected to escalate due to the growing obesity epidemic.^{1,3} Nearly two thirds of obese adults are expected to develop knee OA during their lifetime.⁴ OA affecting the knee is a primary cause of disability.^{2,5,6}

Physical activity offers important benefits to adults, including persons with knee OA. Engaging in physical activity can reduce the risk of diabetes, cardiovascular disease, and stroke.^{7–9} Importantly among people with chronic disease, physical activity participation can prevent or delay disability.¹⁰ Randomized clinical trials show physiological benefits from physical activity including improved muscle strength, increased aerobic capacity, and flexibility.^{11–13} Recent federal U.S. Department of Health and Human Services (DHHS) Physical Activity Guidelines specifically include adults with arthritis to promote health benefits.¹⁴

Although overall rates of disability among Americans have declined over time, racial/ethnic disparities in disability persist.¹⁵ Health promotion and equity are national priorities.¹⁶ The DHHS Physical Activity Guidelines serve as the benchmark for science-based recommendations on physical activity and health for Americans.¹⁴ Guideline attainment represents a potential step towards health equity for African Americans, particularly those having knee OA who are at high risk for developing disability. While earlier studies indicated that African Americans are less active than Whites,¹⁷ activity levels in all racial ethnic groups are increasing¹⁸; it is not known to what extent these changes translate into Guideline attainment. This study examines the extent of racial/ethnic differences between African Americans and Whites in meeting the DHHS Physical Activity Guideline aerobic recommendations. To guide public health and policy intervention, we further investigated modifiable health factors that may mediate racial/ethnic differences.

MATERIALS AND METHODS

Population

The Osteoarthritis Initiative (OAI) is a longitudinal, prospective, observational study investigating the natural history of and risk factors for onset and progression of knee OA. OAI recruited 4796 adults aged 45–79 who had or were at high risk of developing symptomatic radiographic knee osteoarthritis (RKO) at enrollment. All racial/ethnic groups were eligible to enroll. Annual OAI evaluations were done at four clinical sites: Baltimore Maryland, Columbus Ohio, Pittsburgh Pennsylvania, and Pawtucket Rhode Island and are currently ongoing (see <http://www.oai.ucsf.edu/datarelease/About.asp>). Institutional Review Board approval was obtained at the participating sites and at Northwestern University. Each participant provided written informed consent.

The OAI enrollment excluded individuals with rheumatoid or inflammatory arthritis; severe bilateral joint space narrowing in both knees, or unilateral total knee replacement and contralateral severe joint space narrowing; history or plans for bilateral knee replacement within 3 years; contraindications to undergo a 3.0T magnetic resonance knee imaging; positive pregnancy test; inability to provide a blood sample; use of aides other than a cane for more than 50% of ambulation; comorbid conditions that might interfere with study participation; or current participation in a double-blind randomized trial.

Annual knee radiographs used a “fixed-flexion” knee radiography protocol¹⁹, including bilateral, standing, posteroanterior knee films with knees flexed to 20–30° and feet internally rotated 10° using a plexiglass positioning frame. RKO was defined as Kellgren and Lawrence grade (KLG) ≥ 2 at the 48-month visit.²⁰

Physical Activity Measurement

A physical activity ancillary study collected accelerometer data on a subgroup of OAI participants with and at risk for RKO at the OAI 48-month visit.²¹ Eligibility required a scheduled OAI 48-month visit between August 2008 and July 2010. Physical activity was monitored using ActiGraph GT1M uniaxial accelerometers. Trained research personnel gave

uniform scripted in-person instructions to wear the accelerometer on a belt at the natural waistline on the right hip in line with the right axilla upon arising in the morning and continuously until retiring at night, except during water activities, for seven consecutive days. Participants maintained a daily log to record time spent in water and cycling activities, which may not be fully captured by accelerometers. Participants returned the accelerometers to the research center; where data were downloaded using the manufacturer's software, and checked for valid data recording.

Accelerometer output is an activity count, which is the weighted sum of the number of accelerations measured over a minute, where the weights are proportional to the magnitude of measured acceleration. Accelerometer data were analytically filtered using methodology validated in patients with rheumatic disease.^{21,22} Non-wear periods were defined as 90 minutes with zero activity counts (allowing for two interrupted minutes with counts <100). A valid day of monitoring was defined as 10 or more wear hours in a 24-hour period. To provide reliable physical activity estimates, we restricted analyses to participants with 4–7 valid monitoring days.²³ We calculated minutes of moderate-to-vigorous (MV) (counts 2020) physical activity occurring in bouts 10 minutes, with 1–2 minutes interruption below the threshold.²³ Weekly totals were summed over 7 days or estimated as 7 times the average daily total for persons with 4–6 valid monitoring days. Using 2008 DHHS Physical Activity Guidelines on aerobic activity, meeting recommended level of physical activity was defined as 150 minutes/week bouts MV activity.

Covariates

The following socio-demographic and health factors were considered as potential confounders based on their association with race/ethnicity and physical activity in previous studies.^{17,24–28} Socio-demographic factors measured at baseline included race/ethnicity, age, gender, education years, and income. Race/ethnicity (African American, White, or other race) was ascertained from self-report.

Health factors were measured at the OAI 48-month visit. Body mass index (BMI) calculated from measured height and weight [weight (kg)/height (m)²] was classified into normal weight (BMI 18.5–24.9), overweight (BMI 25.0–29.9), or obese (BMI ≥30). Presence of comorbidity was ascertained by Charlson comorbidity index > 0.²⁹ High depressive symptoms were defined by Center for Epidemiological Studies Depression³⁰ score ≥16. Person-level knee pain (range 0–20, maximal pain) was evaluated from the maximum WOMAC (Western Ontario and McMaster University OA Index) scores between two knees. If a 48-month health factor was missing (1.6%, n=31), the most recent annual assessment was used.

Study Sample

A total of 2127 persons consented to accelerometer monitoring, representing 78.4% of the 2712 eligible subcohort. By design, 2084 OAI participants were not eligible due to clinic visits preceding the accelerometer study start date (1543 cases) or were deceased/withdrew/did not return for the 48-month visit (541 cases). For analysis purposes, 52 participants reporting race/ethnicity other than African American or White and 186 participants having <4 valid days of accelerometer monitoring were excluded. The 1889 participants comprising the analysis sample (Figure 1) includes 1142 with RKO in one or both knees, and 747 at risk for RKO.

Statistical Analysis

OAI public data³¹ were merged with accelerometer data. Analyses were performed separately for participants with and at risk for RKO to provide results that can be

generalized to these diagnostic groups. Compared with the analytical sample (n = 1889), those not analyzed (n = 2907) were disproportionately African Americans (20.2% vs. 15.1%) and women (60.8% vs. 55.0%). Recognizing such differences could influence our findings, weighted analyses based on Hogan recommendations were used to reflect the underlying OAI sample.³² All analytical results are weighted.

Descriptive statistics present age-gender adjusted percentages of meeting guidelines. Multiple logistic regression models of racial/ethnic differences adjusted for socio-demographic and health factors; an associated 95% confidence interval (CI) excluding 1 indicates statistical significance. Bivariate logistic regression models revealed no significant interactions between race/ethnicity and examined risk factors. Literature findings on racial/ethnic differences in physical activity guideline attainment were translated into odds ratios to provide a consistent metric. Statistical testing used SAS software version 9.2 and a nominal 5% alpha level.

RESULTS

The analysis sample of 1889 participants (286 African Americans and 1603 Whites) included 1142 with RKO and 747 at risk for RKO (Table 1). Among RKO participants, African Americans compared with Whites were younger, more likely to be women, have lower income (<\$50K), lower education level (0–12 years) and worse health including higher rates of comorbidity, depressive symptoms, obesity, and greater knee pain severity. Similar patterns were observed for those at risk for RKO.

Factors associated with meeting DHHS Physical Activity Guidelines (Table 2)

Overall, only 10.9% of OAI participants met the Guidelines (RKO: 10.4%; at risk for RKO: 11.8%). Racial/ethnic differences were substantial: 2.0% of African Americans (RKO: 1.9%; at risk for RKO: 2.3%) compared to 13.0% of Whites (RKO: 12.7%; at risk for RKO: 13.4%) met Guidelines. Guideline attainment rates varied significantly by socio-demographic and health factors.

African American versus White Rates for Meeting DHHS Physical Activity Guidelines

The age-gender adjusted African American Guideline attainment rate was less than one-seventh that of Whites: RKO 2.2% vs. 16.5%; without RKO 3.0% vs. 16.6%.

Recognizing that differences in socio-demographic and health factors may contribute to racial/ethnic differences in Guideline attainment, further analyses in Table 3 controlled for these factors. After adjusting for demographics (age, gender, and OAI clinical site), African Americans compared to Whites were 90% less likely to meet Guidelines among adults with RKO (OR = 0.10, 95% CI: 0.03, 0.30) and 81% less likely to meet Guidelines among adults at risk for RKO (OR = 0.19, 95% CI: 0.05, 0.76). Further adjustment for education and income made little change. Estimates were further attenuated after adjustment for differences in health factors including comorbidity, depressive symptoms, overweight/obesity, and knee pain (RKO, OR = 0.24, 95% CI: 0.08, 0.72; at risk for RKO, OR = 0.28, 95% CI: 0.07, 1.05), but still remained statistically significant among adults with RKO (African Americans were 76% less likely to meet Guidelines).

Multiple logistic regression models (not shown) among the RKO group, simultaneously adjusting for all risk factors showed that, in addition to race/ethnicity factors significantly associated with lower odds of meeting Guidelines included older age (OR = 0.96, 95% CI=0.94, 0.98), female gender (OR = 0.57, 95% CI=0.37, 0.88), being obese (OR = 0.20, 95% CI=0.10, 0.40) or overweight (OR = 0.60, 95% CI=0.36, 1.00), and greater knee pain (OR = 0.86, 95% CI=0.79, 0.95). Among persons at risk for RKO significant factors

included older age (OR = 0.96, 95% CI=0.94, 0.99), female gender (OR = 0.49, 95% CI=0.30, 0.80), high depressive symptoms (OR = 0.28, 95% CI=0.10, 0.80), being obese (OR = 0.37, 95% CI=0.20, 0.69), or overweight (OR = 0.48, 95% CI=0.27, 0.86), and greater knee pain (OR = 0.85, 95% CI=0.76, 0.96).

To understand which potentially modifiable health factors most strongly explain the observed racial/ethnic differences, we separately adjusted the models for each health factor. For this purpose, the reference is the Table 3 socio-demographics adjusted racial/ethnic OR (RKO, OR = 0.13; at risk for RKO, OR = 0.21). For RKO group, there was little change in racial/ethnic differences related to comorbidities or depressive symptoms. However, greater knee pain and higher BMI each attenuated the racial/ethnic differences (from the reference OR = 0.13 to OR = 0.16, 95% CI: 0.05, 0.50 and to OR = 0.18, 95% CI: 0.06, 0.56 respectively). Among adults at risk for RKO, the only individual health factor which attenuated racial/ethnic differences was greater knee pain (from the reference OR = 0.21 to OR = 0.29, 95% CI: 0.07, 1.13).

DISCUSSION

This study investigated racial/ethnic differences in meeting the aerobic component of the DHHS Physical Activity Guidelines among adults with and at risk for RKO. Our results showed that despite the known benefits from physical activity, only 1 out of 50 African Americans and less than 1 out of 8 Whites met Guidelines when objectively assessed via accelerometer. After adjusting for social-demographic and health factors, African American rates for meeting Guidelines were less than one-third of their Whites counterparts; these differences remained significant in the RKO subgroup and substantial but insignificant in adults at risk for RKO.

The current 2008 Guidelines are less strict than earlier recommendations, by allowing the activity to be acquired over a week without daily specifications (150 minutes of MV activity/week) and can take into consideration persons who do a mix of both moderate and vigorous intensity activity. When Guidelines were applied to the general adult population surveyed by the 2007 Behavioral Risk Factor Surveillance System (BRFSS)³³ and 2005–2006 National Health and Nutrition Examination Survey (NHANES)²⁵ self-reported physical activity data, similar racial differences were found (OR range: 0.54–0.63). In contrast, accelerometer measured objective physical activity data of the NHANES sample did not show strong racial/ethnic differences in meeting the Guidelines (OR = 0.93).²⁵ However, other NHANES findings indicate that racial/ethnic differences were age-specific.²³ African Americans under age 60 compared to Whites on average spent more time in objectively measured moderate and vigorous physical activity, but among adults over age 60 this trend was reversed. Those NHANES results corroborate the current results documenting racial/ethnic differences in an older chronic disease cohort. These studies in the general population showed strong racial/ethnic disparities in meeting guidelines when based on self-reported physical activity data, but ambiguous results when physical activity was objectively measured.

Literature on racial/ethnic differences in meeting physical activity guidelines among adults with arthritis is limited. Self-reported physical activity data from the 2000³⁴, 2001³⁵, and 2003 BRFSS³⁶ were applied to the 2003 physical activity guidelines (30 minutes of moderate-intensity physical activity on 5+ days per week or 20 minutes of vigorous-intensity physical activity on 3+ days per week³⁷) in arthritis populations. All three studies showed African Americans were less likely than Whites to meet the 2003 guidelines (OR range: 0.49–0.74). To our knowledge no studies from arthritis populations used objective physical activity measurements to assess racial/ethnic differences in guideline attainment.

Our study fills this gap by demonstrating large racial/ethnic differences in meeting the current Guidelines using accelerometer-monitored physical activity in adults with RKOA.

To guide public health and policy intervention, we examined modifiable health factors that may mediate racial/ethnic differences. Obese/overweight status and greater knee pain partially attenuated racial/ethnic differences for adults with RKOA. Overweight/obese and pain are frequently reported as factors associated with inactivity^{26,27} and as barriers to participating in MV physical activity.²⁵ In fact, pain is the most common barrier to physical activity among adults with arthritis.²⁸ Our sample was consistent with literature that finds that African Americans with osteoarthritis are heavier than Whites and report substantially higher levels of knee pain.²⁴ These findings are relevant to potential public health action targeting overweight/obesity and knee pain in the African American community to reduce future racial/ethnic differences in Guideline attainment.

Importantly, racial/ethnic differences in meeting Guidelines remained substantial, and significant in adults with RKOA after controlling for all assessed socio-demographic and health factors. These persistent differences support the need for future exploration of racial/ethnic barriers to activity. In recent systematic reviews, unsafe neighborhoods, lack of facilities, lack of childcare, and inflexible work environments were the most commonly reported barriers to physical activity among African Americans.^{38,39} Common facilitators of physical activity among African Americans included social support, availability of structured/group exercise programs, positive health benefits, a sense of well-being, and weight loss.³⁸ Siddiqi et al concluded that “African American adults clearly stress the need for targeted programs (e.g., through faith-based interventions) and the availability of safe and accessible facilities and places that are conducive to physical activity.” The Centers for Disease Control and Prevention (CDC) recommend six structured, group exercise programs as safe and effective (reduce pain, increase function, improve mood and quality-of-life and delay disability) for adults with arthritis.⁴⁰ These programs have been delivered in churches, local community centers, etc. in both urban and rural environments and worksites.

Churches can significantly contribute to the health and well-being of African Americans because of their role in communication, social and spiritual support, and the ability to provide safe local facilities.⁴¹ Among a sample of African American churches in South Carolina, 42% offered physical activity programs. Church members who reported having physical activity programs at their church were significantly more likely to meet physical activity recommendations.⁴² Offering evidence-based, low-cost, structured programs in churches may overcome barriers to physical activity reported by African Americans. In addition, a tested CDC community-wide health communication campaign targeted to African Americans and Whites that promotes physical activity for managing arthritis symptoms “*Physical Activity. The Arthritis Pain Reliever*”, increased knowledge of the benefits of physical activity for arthritis.⁴³ Health communication campaigns paired with availability of structured community-based physical activity programs may positively increase physical activity participation in African American communities.

Lower levels of physical activity among African Americans compared with Whites, particularly among adults with osteoarthritis who are at high risk for multiple poor health outcomes, is a significant public health issue. African Americans are more likely than Whites to develop obesity and physical inactivity-related chronic conditions such as type 2 diabetes, stroke, cardiovascular disease, and hypertension.^{44–47} Not only does physical activity improve arthritis symptoms, it lowers the risk of developing these serious conditions.^{7,8,37} Racial/ethnic disparities in potentially life-threatening conditions may be reduced through culturally targeted programs that promote physical activity and reduce barriers to activity, most notably obesity and knee pain.

This study had substantial strengths, which include the large sample size, objective accelerometer physical activity assessment, radiographic verification of knee OA, the application of current DHHS Physical Activity Guidelines, and the age and gender diversity of this cohort. Accelerometers capture all activity, including occupational, household, and transportation, which may not be well-captured using self-report instruments. However, there are limitations worth noting. Accelerometers lack information on context of physical activity (e.g., transportation, leisure), which may inform culturally relevant activities for interventions. The accelerometer used cannot capture water activities and may underestimate activities with minimal vertical acceleration/deceleration, such as cycling. However, diary information indicated that the median time this sample spent in water and cycling activities was 0 minutes/day (interquartile range = 0.0 to 3.4 minutes/day), so the underestimate is negligible. In addition, OAI is not a population representative sample. Therefore our results here cannot be generalized to the US population.

Despite benefits from physical activity, attainment of 2008 DHHS Physical Activity Guidelines was low for all groups. African Americans were even less likely than Whites to meet Guidelines; this relationship held among persons with or at risk for RKO. After controlling for differences in socio-demographics and health factors, substantial racial/ethnic differences remained. These disparities were partially mediated by differences in knee pain severity and obesity status. Focused efforts in African Americans to address knee pain severity and weight status may improve physical activity participation and lead to better health outcomes.

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SIGNIFICANCE AND INNOVATIONS

- Despite known benefits from physical activity, attainment of federally recommended physical activity levels among adults with and at risk for knee osteoarthritis was low.
- Older African Americans were over 70% less likely than their White counterparts with and at risk for knee osteoarthritis to meet federally recommended physical activity levels, whose attainment can reduce poor health outcomes.
- Racial/ethnic disparities in potentially life-threatening conditions may be reduced by decreasing barriers to being active, most notably obesity and knee pain, and through culturally targeted programs that promote physical activity.

Figure 1.
Flow chart of analytical sample Osteoarthritis Initiative participants in accelerometer study

Table 1

Characteristics of African Americans and Whites participating in accelerometer monitoring with and at risk for radiographic knee osteoarthritis (RKOA)

Characteristics	With RKOA (n=1142)		At risk for RKOA (n=747)	
	African American	White	African American	White
N	206	936	80	667
Socio-demographic Factors				
Age in years: mean (SD)	62.9 (14.2)	67.2 (13.8)	61.7 (15.5)	63.8 (15.0)
Gender Men %	32.3	44.7	30.0	42.9
Women %	67.7	55.3	70.1	57.1
Income 0–\$50K %	54.7	32.2	68.5	30.7
\$50K %	34.6	63.5	28.3	66.5
Unknown %	10.7	4.3	3.2	2.8
Education years 0–12 %	30.7	13.9	21.9	8.8
13+ %	63.6	86.1	78.1	90.7
Missing %	5.7	0.0	0.0	0.4
Health Factors				
Presence of comorbidity %	48.5	38.0	69.7	36.8
BMI: mean (SD)	32.0 (8.8)	28.8 (7.4)	28.8 (8.9)	27.4 (7.1)
Normal [†] %	6.2	22.5	24.8	32.0
Overweight ^{††} %	29.3	40.2	27.8	42.2
Obese ^{†††} %	64.5	37.4	47.4	25.8
High depressive symptoms [#]	22.4	10.1	40.8	15.6
Knee pain severity: mean ^{##} (SD)	5.8 (8.4)	3.0 (4.9)	5.6 (8.1)	2.2 (5.0)

[†] Normal body mass index (BMI): 18.5–24.9 (includes 6 participants with BMI 17.2–18.4),

^{††} Overweight BMI: 25.0–29.9,

^{†††} Obese BMI: ≥ 30.

[#] High depressive symptoms were defined as CESD ≥ 16.

^{##} Person-level knee pain score was calculated using the maximum value of WOMAC knee pain scores of the two knees; a higher number represents worse symptoms.

Table 2

Frequency of meeting aerobic Physical Activity Guidelines among adults with and at risk for radiographic knee osteoarthritis (RKOA)

Characteristics	With RKOA		At risk for RKOA	
	Sample Size	% Met DHHS 2008 Physical Activity Guidelines	Sample Size	% Met DHHS 2008 Physical Activity Guidelines
	n	% (95% CI)	n	% (95% CI)
Overall	1142	10.4 (8.6, 12.2)	747	11.8 (9.5, 14.1)
Socio-demographic Factors				
Race/ethnicity				
African American	206	1.9 (0.0, 3.8)	80	2.3 (0.6, 8.3)
White	936	12.7 (10.6, 14.8)	667	13.4 (10.8, 16.0)
Age in years				
49–64	518	14.0 (11.0, 17.0)	411	12.2 (9.0, 15.4)
65	624	7.5 (5.4, 9.6)	336	11.2 (7.8, 14.6)
Gender				
Male	516	13.8 (10.8, 16.8)	335	15.7 (11.8, 19.6)
Female	626	7.9 (5.8, 10.0)	412	9.1 (6.3, 11.9)
Education				
0–12 yrs or missing	173	5.0 (1.8, 8.2)	77	8.8 (2.5, 15.1)
13+ yrs	969	11.6 (9.6, 13.6)	670	12.2 (9.7, 14.7)
Income				
< \$50k	375	5.2 (3.0, 7.4)	226	7.1 (3.8, 10.4)
\$50k	710	13.8 (11.3, 16.3)	501	14.1 (11.1, 17.1)
Unknown	57	9.7 (2.0, 17.4)	20	23.2 (4.7, 41.7)
Health Factors				
Presence of comorbidity				
Yes	443	6.7 (4.4, 9.0)	260	7.5 (4.3, 10.7)
No	699	12.8 (10.3, 15.3)	487	14.9 (11.7, 18.1)
Depressive symptoms				
High	126	4.9 (1.1, 8.7)	96	2.7 (0.9, 7.4)
Low	1016	11.2 (9.3, 13.1)	651	14.0 (11.3, 16.7)
BMI Status				
Normal [†]	226	18.6 (13.5, 23.7)	253	18.2 (13.4, 23.0)
Overweight ^{††}	455	13.6 (10.5, 16.7)	288	9.7 (6.3, 13.1)
Obese ^{†††}	461	3.9 (2.1, 5.7)	206	7.9 (4.2, 11.6)
Severe knee pain [*]				
Yes	58	1.8 (0.4, 7.3)	17	0.0

Characteristics	With RKO		At risk for RKO	
	Sample Size	% Met DHHS 2008 Physical Activity Guidelines	Sample Size	% Met DHHS 2008 Physical Activity Guidelines
	n	% (95% CI)	n	% (95% CI)
No	1084	10.9 (9.0, 12.8)	730	12.5 (10.1, 14.9)

[†] Normal body mass index (BMI): 18.5–24.9 (includes 6 participants with BMI 17.2–18.4),

^{††} Overweight BMI: 25.0–29.9,

^{†††} Obese BMI: ≥ 30

* Severe knee pain was classified as severe (score ≥ 10.9, based on the average score among adults with end-stage knee OA awaiting total knee replacement⁴⁸) versus not severe.

Table 3

Racial/Ethnic odds ratios of Physical Activity Guideline attainment (African Americans vs. Whites) among adults with and without radiographic knee osteoarthritis (RKO)

Adjustment Factors	With RKO (n=1142)	without RKO (n=747)
Socio-demographics		
Demographics (age, gender, site)	0.10 (0.03, 0.30)	0.19 (0.05, 0.76)
Demographics + Education/income	0.13 (0.04, 0.40)	0.21 (0.05, 0.87)
Socio-demographics + <i>all</i> Health Factors *	0.24 (0.08, 0.72)	0.28 (0.07, 1.05)

* Health factors include comorbid conditions, depressive symptoms, body mass index, and pain severity.