Published in final edited form as:

Am Heart J. 2012 June ; 163(6): 1037–1040. doi:10.1016/j.ahj.2012.03.005.

Physical Activity Participation, Health Perceptions, and CVD Mortality in a Multi-Ethnic Population: The Dallas Heart Study

Reese A. Mathieu IV, B.A.¹, Tiffany M. Powell-Wiley, M.D., M.P.H.², Colby R. Ayers, M.S.³, Darren K. McGuire, M.D., M.H.Sc.^{3,4}, Amit Khera, M.D., M.Sc.^{3,4}, Sandeep R. Das, M.D., M.P.H.^{3,4}, and Susan G. Lakoski, M.D., M.S.^{3,4}

¹ University of Texas Southwestern Medical School, Dallas, Texas ² Cardiovascular and Pulmonary Branch, National Heart, Lung, and Blood Institute, National Institutes of Health, Bethesda, Maryland ³ Donald W. Reynolds Cardiovascular Clinical Research Center at the University of Texas Southwestern Medical Center, Dallas, Texas ⁴ Division of Cardiology, University of Texas Southwestern Medical Center, Dallas, Texas

Abstract

Background—Physical activity (PA) participation differs by ethnicity, but contributing factors and cardiovascular (CV) outcomes related to these disparities are not well understood. We determined whether health beliefs regarding the benefit of PA contribute to ethnic differences in participation and assessed how these differences impact CV mortality.

Methods—The Dallas Heart Study is a longitudinal study of cardiovascular health. We assessed PA participation and health perceptions by questionnaire among 3,018 African American, Hispanic and white men and women at baseline visit (2000-02). Participant mortality was obtained through 2008 using the National Death Index.

Results—African Americans (OR 0.65 95% CI: 0.53-0.80) and Hispanics (OR 0.34 95% CI: 0.26-0.45) were less likely to be physically active compared to whites even after accounting for income, educational status, age, sex, body mass index, diabetes, hypertension and hyperlipidemia. Beliefs regarding the benefits of PA did not contribute to this disparity, as greater than 94% of individuals felt PA was effective in preventing a heart attack across ethnicity. PA participation was associated with a lower risk of all-cause mortality (HR 0.66 CI: 0.46-0.93) and CVD death (HR 0.56 CI: 0.32-0.97) in multivariable adjusted models. Similar results were seen when restricting to African Americans (CVD death; HR 0.57 CI: 0.31-1.05).

Conclusions—Ethnic minorities reported less PA participation, and lack of PA was associated with higher CV mortality overall and among African Americans. Health perception regarding the benefits of PA did not contribute to this difference, indicating there are other ethnic-specific factors contributing to physical inactivity that require future study..

Keywords

physical activity; health perceptions; ethnicity; mortality

Cardiovascular disease is the leading cause of death in the United States.¹ Compared to other racial/ethnic groups, African Americans have the highest rates of CVD mortality at all ages and the highest prevalence of uncontrolled cardiovascular (CV) risk factors.^{2, 3} One

potential contributing factor to these racial/ethnic disparities is a lower rate of physical activity participation among African-Americans. Prior studies, done almost exclusively in whites, support an association between decreased physical activity participation and adverse CV outcomes.^{4, 5} In contrast, there are limited data on physical activity participation and CV outcomes among African Americans. There is also a lack of data on whether racial/ethnic differences in health perceptions regarding the benefits of PA may explain ethnic differences in physical activity participation.

In order to further elucidate these important issues related to racial/ethnic disparities in CV outcomes, we analyzed data from the Dallas Heart Study (DHS), a large multi-ethnic population-based cohort with a mean seven years of follow-up. Our study had the following objectives: (1) to demonstrate the relationship between race/ethnicity and physical activity participation, (2) to quantify the association between lack of PA participation and all-cause and CV mortality with a focus on African Americans, and (3) to determine to what extent racial/ethnic differences in PA participation may be explained by differences in beliefs in the preventive efficacy of PA.

Methods

The Dallas Heart Study (DHS) is a longitudinal study of cardiovascular health in a probability-based population sample of Dallas County adults aged 18 to 65. African Americans were intentionally oversampled to make up 50% of the study cohort. Details of participant selection and study design have been published previously.⁶ Participants were enrolled from July 2000 to January 2002, and participant mortality was obtained through July 1, 2008 using the National Death Index. Deaths were classified as cardiovascular if they included International Statistical Classification of Diseases, 10th Revision codes I10-I80.3.

Demographic information, including race/ethnicity, household income, educational level achieved, and medical history were determined by self-report at study entry. Body mass index (BMI) was calculated based on measured height and weight. Hypertension was defined as one of the following: systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg, or the use of anti-hypertensive medication. Hypercholesterolemia was defined either by self-report, by use of lipid-lowering medication or by a fasting low-density lipoprotein (LDL) ≥ 160 mg/dl. Diabetes mellitus was defined either by self-report, by use of anti-hyperglycemic medication or by fasting serum glucose ≥ 126 mg/dl.

At study entry, participants were asked about their physical activity participation and health beliefs as part of a detailed questionnaire. For physical activity, the question was asked, "During the past month, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" in a yes/no format in accordance with previous literature.⁷ Questions abstracted from the 1999 Behavioral Risk Factor Surveillance System were incorporated into the DHS survey instrument to assess beliefs about general health perceptions and health care access.⁸ Regarding health perceptions and exercise, "How effective do you think regular exercise is in preventing a heart attack?" was asked on a Likert scale.

Baseline characteristics were compared between PA participants and non-participants using the unpaired Student's t-test for continuous variables and the chi-squared test for categorical variables. Logistic regression was used to quantify the association between race/ethnicity and PA participation. Multivariable Cox proportional hazards models were used to determine the association of PA with mortality after adjustment for age, sex, ethnicity, BMI, history of diabetes, history of hypertension, and income. All p-values are 2-sided; $p < 0.05$

was considered statistically significant. Statistical analyses were performed using SAS version 9.2 (SAS Institute Inc, Cary, North Carolina).

Grant support for the Dallas Heart Study was provided by the Donald W. Reynolds Foundation at the University of Texas Southwestern Medical Center, Dallas, TX, the US Public Health Service General Clinical Research Center Grant M01-RR00633 from National Institutes of Health, National Center for Research Resources - Clinical Research, and the National Heart, Lung, and Blood Institute T35-HL086346. Dr. Lakoski had full access to all of the data in the study and takes responsibility for the design and conduct of this study.

Results

At study entry, DHS participants (N=3018, white 31%, African American 50%, Hispanic 17%, women 55%, mean age 45±10 years) were asked about physical activity participation within the previous month. Ethnic differences were apparent, with whites having higher percentage of physical activity participation than African American or Hispanic subjects ($p<0.001$ for each) (**Table 1**). Women were less likely to report PA participation in the last month compared to men ($p<0.001$). Diabetes, higher BMI, smoking, and hypertension were all associated with lower rates of physical activity participation ($p<0.05$ for each); cholesterol levels were not related to PA participation ($p=0.12$). Higher levels of both education and income were associated with increased physical activity participation ($p<0.001$ for each). In multivariable models, African Americans (OR 0.65 95% CI: 0.53-0.80) and Hispanics (OR 0.34 95% CI: 0.26-0.45) were less likely to be physically active compared to whites even after accounting for income, education, age, sex, BMI, diabetes, hypertension and hyperlipidemia. Beliefs regarding the importance of physical activity in preventing a heart attack did not explain the race/ethnicity difference. Greater than 94% of whites, African Americans, and Hispanics felt PA was either somewhat or highly effective in preventing a heart attack, though actual self-reported physical activity participation was significantly higher among whites (**Figure 1**) ($p<0.001$).

Physical activity participation was inversely associated with mortality among African Americans who had the highest mortality rates compared to other race/ethnic groups over a mean 7 year follow-up period (104 of 136 deaths). Overall, physical activity participation was associated with half the mortality risk compared to lack of PA participation history at baseline visit (HR 0.54; 95% CI: 0.39-0.76) (**Figure 2**). In multivariable models adjusting for age, sex, race, BMI, diabetes, hypertension, education, and income, physical activity participation remained associated with lower mortality risk (HR 0.66 95% CI: 0.46-0.93) and CVD mortality (HR 0.56 95% CI: 0.32-0.97). Similar results were seen when restricting to African Americans for CVD death in fully-adjusted models (HR 0.57 95% CI: 0.31-1.05). Due to the low number of deaths among whites and Hispanics, ethnic-specific analyses for these subgroups were not performed.

Conclusions

In a large, multi-ethnic, population-based cohort we demonstrate that African-Americans and Hispanics report lower rates of physical activity participation compared with whites. We also report, for the first time, an independent association between lack of PA participation and all-cause mortality among African-Americans in a population-based cohort. Finally, we show that racial/ethnic differences in PA participation do not appear to be driven by racial/ethnic differences in beliefs in the preventive efficacy of physical activity.

Physical inactivity is an important cardiovascular risk factor, though data on physical activity participation and outcomes are limited for ethnic minorities.⁵ There are only three

cohort studies, to our knowledge, which have assessed the relationship between PA participation and adverse CV events in an ethnic-specific manner. Two studies showing an inverse relationship between adverse CV events and physical activity across race/ethnicity were confined to specific subgroups (women and diabetics, respectively).^{9, 10} In a healthy, multi-ethnic cohort study, Folsom et al. found no association between CHD events and physical activity among African Americans despite finding a significant association among non-black participants.¹¹ In contrast, our findings indicate that physical activity is associated with lower mortality among African-Americans, which may be due to an adequate number of events in African-Americans to detect a difference in the current study. In addition, it is possible that the single physical activity participation question utilized in our study is a superior indicator of CV mortality in African-Americans compared to other PA instruments.

Although low income and low educational attainment are associated with lack of physical activity participation, a majority of studies have demonstrated racial/ethnic differences in physical activity participation are independent of these measures of socioeconomic status.¹²⁻¹⁶ Consistent with these previous studies, we found that Hispanic and African American participants reported lower physical activity participation compared to white participants after adjusting for income and education. In addition, our results demonstrate that the perceived benefits of PA participation did not differ across racial/ethnic groups, and are thus unlikely to explain racial/ethnic differences in physical activity. Our data suggest that factors beyond income, education, and belief in the efficacy of PA participation in reducing MI contribute to the racial/ethnic disparities in physical activity participation. Two studies suggest that levels of physical activity among ethnic minorities may be especially vulnerable to the effects of the built environment, including the availability, safety, and quality of nearby parks or recreational centers.^{17, 18} Studies evaluating physical activity among diverse populations of women point to varying racial/ethnic perceptions in gender roles¹⁹, differing social perceptions toward exercise, and differential needs for peer support²⁰ as possible contributing factors to racial/ethnic disparities in physical activity participation. In addition, differing views on exercise as a social “norm” and the overall value placed on personal health and well-being may contribute to these disparities.

Limitations and strengths to our study require consideration. Though there were a small number of deaths, a large proportion of deaths were among African Americans, allowing us to determine associations between physical activity and mortality in this racial/ethnic subgroup. We utilized a single-item questionnaire to assess leisure-time physical activity. Single-item PA assessments have been previously validated,^{7, 21} and are supported in the current study by expected associations between physical activity participation and other clinical risk factors (i.e. gender, body mass index, age).

In conclusion, racial/ethnic minorities reported less PA participation, and lack of PA was associated with higher CV mortality. Health perception regarding the benefits of PA did not contribute to this difference across racial/ethnic groups, indicating there are other reasons for inactivity specific to at-risk African-American and Hispanic populations that must be addressed. Future research is needed to delineate the factors contributing to racial/ethnic disparities in physical activity participation. Understanding and overcoming physical inactivity is important to promote risk factor control and improve cardiovascular outcomes for all racial/ethnic groups.

References

1. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, Ferguson TB, Ford E, Furie K, Gillespie C, Go A, Greenlund K, Haase N, Hailpern S, Ho PM, Howard V, Kissela B, Kittner S, Lackland D, Lisabeth L, Marelli A, McDermott MM, Meigs J, Mozaffarian D, Mussolino M, Nichol G, Roger VL, Rosamond W, Sacco R, Sorlie P, Stafford R, Thom T, Wasserthiel-

- Smoller S, Wong ND, Wylie-Rosett J. Heart disease and stroke statistics--2010 update: A report from the american heart association. *Circulation*. 2010; 121:e46–e215. [PubMed: 20019324]
2. Prevention CfDCA. Racial/ethnic and socioeconomic disparities in multiple risk factors for heart disease and stroke--united states, 2003. *MMWR Morb Mortal Wkly Rep*. 2005; 54:113–117. [PubMed: 15703691]
3. Mensah GA, Mokdad AH, Ford ES, Greenlund KJ, Croft JB. State of disparities in cardiovascular health in the united states. *Circulation*. 2005; 111:1233–1241. [PubMed: 15769763]
4. Kohl HW. Physical activity and cardiovascular disease: Evidence for a dose response. *Med Sci Sports Exerc*. 2001; 33:S472–483. discussion S493–474. [PubMed: 11427773]
5. Shiroma EJ, Lee IM. Physical activity and cardiovascular health: Lessons learned from epidemiological studies across age, gender, and race/ethnicity. *Circulation*. 2010; 122:743–752. [PubMed: 20713909]
6. Victor RG, Haley RW, Willett DL, Peshock RM, Vaeth PC, Leonard D, Basit M, Cooper RS, Iannacchione VG, Visscher WA, Staab JM, Hobbs HH, Dallas Heart Study I. The dallas heart study: A population-based probability sample for the multidisciplinary study of ethnic differences in cardiovascular health. *Am J Cardiol*. 2004; 93:1473–1480. [PubMed: 15194016]
7. Macera CA, Ham SA, Jones DA, Kimsey CD, Ainsworth BE, Neff LJ. Limitations on the use of a single screening question to measure sedentary behavior. *Am J Public Health*. 2001; 91:2010–2012. [PubMed: 11726385]
8. US Dept of Health and Human Services CfDCAp. 1999 behavioral risk factor surveillance system questionnaire. 1999.
9. Manson JE, Greenland P, LaCroix AZ, Stefanick ML, Mouton CP, Oberman A, Perri MG, Sheps DS, Pettinger MB, Siscovick DS. Walking compared with vigorous exercise for the prevention of cardiovascular events in women. *N Engl J Med*. 2002; 347:716–725. [PubMed: 12213942]
10. Gregg EW, Gerzoff RB, Caspersen CJ, Williamson DF, Narayan KMV. Relationship of walking to mortality among us adults with diabetes. *Arch Intern Med*. 2003; 163:1440–1447. [PubMed: 12824093]
11. Folsom AR, Arnett DK, Hutchinson RG, Liao F, Clegg LX, Cooper LS. Physical activity and incidence of coronary heart disease in middle-aged women and men. *Med Sci Sports Exerc*. 1997; 29:901–909. [PubMed: 9243489]
12. Winkleby MA, Kraemer HC, Ahn DK, Varady AN. Ethnic and socioeconomic differences in cardiovascular disease risk factors: Findings for women from the third national health and nutrition examination survey, 1988-1994. *JAMA*. 1998; 280:356–362. [PubMed: 9686553]
13. Sundquist J, Winkleby MA, Pudarc S. Cardiovascular disease risk factors among older black, mexican-american, and white women and men: An analysis of nhanes iii, 1988-1994. Third national health and nutrition examination survey. *J Am Geriatr Soc*. 2001; 49:109–116. [PubMed: 11207863]
14. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the third national health and nutrition examination survey, 1988-1994. *Am J Prev Med*. 2000; 18:46–53. [PubMed: 10808982]
15. Appel SJ, Harrell JS, Deng S. Racial and socioeconomic differences in risk factors for cardiovascular disease among southern rural women. *Nursing Research*. 2002; 51
16. August KJ, Sorkin DH. Racial/ethnic disparities in exercise and dietary behaviors of middle-aged and older adults. *J Gen Intern Med*. 2011; 26:245–250. [PubMed: 20865342]
17. Sallis JF, Floyd MF, Rodriguez DA, Saelens BE. Role of built environments in physical activity, obesity, and cardiovascular disease. *Circulation*. 2012; 125:729–737. [PubMed: 22311885]
18. Franzini L, Taylor W, Elliott MN, Cuccaro P, Tortolero SR, Janice Gilliland M, Grunbaum J, Schuster MA. Neighborhood characteristics favorable to outdoor physical activity: Disparities by socioeconomic and racial/ethnic composition. *Health & place*. 2010; 16:267–274. [PubMed: 19896408]
19. Lee SH, Im EO. Ethnic differences in exercise and leisure time physical activity among midlife women. *Journal of advanced nursing*. 2010; 66:814–827. [PubMed: 20423369]

20. Quinn ME, Guion WK. A faith-based and cultural approach to promoting self-efficacy and regular exercise in older african american women. *Gerontology & geriatrics education*. 2010; 31:1–18. [PubMed: 20390624]
21. Schechtman KB, Barzilai B, Rost K, Fisher EB. Measuring physical activity with a single question. *Am J Public Health*. 1991; 81:771–773. [PubMed: 2029054]

\$watermark-text

\$watermark-text

\$watermark-text

Figure 1.

Relationship between Health Beliefs and Physical Activity Participation by Ethnic Group in the Dallas Heart Study

PA= physical activity

*p-value assessing ethnic differences in physical activity participation

Figure 2.
Physical Activity Participation and 7-Year Cumulative Mortality Rates in the Dallas Heart Study
PA= physical activity

Table 1

Relationship between Baseline Clinical Variables and Physical Activity Participation in DHS (2000-2002)

	No PA participation (n=1118)	PA participation (n=1898)	p-value
Age	45 (10)	44 (10)	0.009
Gender			
Men	438 (39%)	910 (48%)	<0.001
Women	680 (61%)	988 (52%)	
Ethnicity			
African-American	622 (56%)	886 (47%)	<0.001
White	203 (18%)	736 (39%)	
Hispanic	275 (25%)	233 (12%)	
Other	18 (2%)	43 (2%)	
Body mass index (kg/m ²)	31.8 (8.1)	30.1 (7.2)	<0.001
Systolic BP (mmHg)	126.9(20.2)	123.7(17.9)	<0.001
Diastolic BP (mmHg)	79.2(10.7)	77.8(10)	<0.001
Total cholesterol (mg/dl)	182.7(42)	180.3(38.5)	0.12
HDL cholesterol (mg/dl)	49.4(14.5)	50.2(15)	0.13
LDL cholesterol (mg/dl)	107.4(35.7)	106.5(35.6)	0.50
History of hypercholesterolemia	154 (14%)	247 (13%)	0.55
History of diabetes	174 (16%)	181 (10%)	<0.001
History of hypertension	429 (38%)	610 (32%)	0.001
Smoking status	352 (31%)	492 (26%)	0.001
Income			
<16K	257 (29%)	284 (17%)	<0.001
16-30K	249 (29%)	353 (21%)	
30-50K	210 (24%)	423 (25%)	
>50K	157 (18%)	634 (37%)	
Education			
<High School	311 (28%)	271 (14%)	<0.001
High School	400 (36%)	507 (27%)	
Some College	267 (24%)	582 (31%)	
College or greater	140 (13%)	538 (28%)	

PA = physical activity

BP- blood pressure

LDL = low-density lipoprotein

HDL = high-density lipoprotein