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Cardiovascular Risk in Midlife African American Women Participating in a Lifestyle Physical Activity Program

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Introduction and Background

Cardiovascular disease (CVD) is the largest contributor to disparate morbidity and mortality in African American women.¹ In 2012, the prevalence of CVD in non-Hispanic African American women was 48.3%, compared with 36.4% in all women and 36.1% in non-Hispanic White women. In 2011, the age-adjusted death rate attributable to CVD in African American women was 99.7 per 100,000, compared to 80.1 for White women. African American women also have a history of stroke that is almost twice that of White women (4.7% vs 2.5%).

Hypertension, a major health risk factor for CVD and stroke, is largely responsible for the excess morbidity and mortality among African American women. From 2009 to 2012, the prevalence of hypertension among adults in the United States was one in three, but among non-Hispanic African American women aged 20 and older it was 46.1%. The age-adjusted death rate per 100,000 attributable to hypertension was 18.9 in 2011 overall, but nearly twice that (35.1) for African American women.²

Data from the National Health and Nutrition Examination Survey (NHANES) 2007–2012 data showed that 88.5% of non-Hispanic African American women with hypertension were aware they had high blood pressure, and 82.3% of them were being treated with medication, but only 55.9% had adequate blood pressure control (< 140 mmHg systolic and < 90 mmHg

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diastolic).² Although this control rate of 55.9% was only slightly less than for White women (58.7%), the outcomes of uncontrolled hypertension are much worse in African American women, considering their markedly higher rates of heart disease and strokes. These facts highlight the importance of improving hypertension prevention and control in African American women.

Hypercholesterolemia is another major health risk factor for coronary heart disease and stroke. NHANES 2009–2012 data showed that non-Hispanic African American women and White women had similarly high percentages of total cholesterol levels of 200 mg/dL or higher (40.7% and 45.9%, respectively) and bad low-density lipoprotein (LDL) cholesterol levels of 130 mg/dl or higher (33.6% and 32%, respectively).² Likewise, the percentage of non-Hispanic African American and White women with low levels (< 40 mg/dL) of the good high-density lipoprotein (HDL) cholesterol was similar (10.3% and 10.2%, respectively). NHANES 2009–2010 data for African American men and women combined (the only way reported) showed that they were similar to White men and women on awareness of having hypercholesterolemia (64.2% vs. 65.3%), but fewer African Americans with hypercholesterolemia were treated (63.8% vs. 70.2%) or controlled (45.3% vs. 67.2%).³

Additional health and behavior risk factors that contribute to the burden of CVD in African American women include smoking, diabetes, and obesity. National Health Interview Survey (NHIS) 2013 data showed 15.0% of non-Hispanic African American women smoked cigarettes, significantly less than non-Hispanic White women at 18.7%.⁴ NHANES data showed that 14.6% of non-Hispanic African American women had physician-diagnosed diabetes mellitus, significantly more than White women at 6.1%.² NHANES 2009–2012 also showed approximately 81.9% of African American were overweight or obese, compared to 61.2% of White women.²

Herein, we report the baseline data pertinent to the above CVD risks in a sample of women we recruited for a physical activity intervention: The Women's Lifestyle Physical Activity Program for African American women.⁵ Physical activity is well established as a heart-healthy behavior for the prevention of myocardial infarctions and strokes^{6,7} and for managing hypertension,^{8–13} diabetes,^{12,14,15} and, to a lesser extent, hypercholesterolemia.^{11,16,17} Engaging in regular physical activity results in a cardioprotective effect, lowering blood pressure and improving cholesterol levels through multiple mechanisms, including neurohormonal changes, structural adaptations, and release of fatty acids to be used by skeletal muscle.^{18–20} Further, physical activity helps to maintain weight and prevent the gradual creep of one pound of weight per year resulting in overweight or obesity over time.^{21,22} Given these benefits, regular physical activity is an important priority for non-Hispanic African American women; however, in 2010 only 31.7% of them, compared to 47.4% of White women, met the 2008 physical activity guidelines for adults (at least 150 minutes of moderate or 75 minutes of vigorous aerobic leisure-time physical activity per week or combination).⁴ Thus, we designed and implemented The Women's Lifestyle Physical Activity Program for African American women.

It is essential that physical activity interventions are not only informed by, but also tested with participants whose CVD risk factors match what is known about those of the target population. The Women's Lifestyle Physical Activity Program for African American women⁵ was informed by work done in an earlier women's walking program for African American women.²³ The women's walking program was initially developed following six focus groups conducted with African American women.²⁴ Following completion of the program, post-intervention focus groups were held with the participants to learn what they liked and did not like and to make recommendations for additional development.²⁵

In a cohort of community-based inactive midlife African American women who were eligible for the new Women's Lifestyle Physical Activity program, the aims of this paper are to describe their CVD risk factors (hypertension, hypercholesterolemia, smoking, diabetes, and obesity), as well as their awareness, treatment, and control of hypertension and hypercholesterolemia.^{2,3} No one-to-one comparisons or contrasts are possible, but to put our data in context, we present them against the backdrop of one the largest most-referenced databases: the National Health and Nutrition Examination Survey (NHANES).²

Methods

Study Design

Cross-sectional baseline findings are examined herein. The baseline data were collected for a controlled clinical trial testing three study conditions designed to increase adherence to lifestyle physical activity and improve cardiovascular health in midlife African American women that is described in detail elsewhere.⁵

Sample and Setting

Participants were sedentary (not involved in routine exercise two or more times per week in the past 6 months), urban-dwelling, midlife African American women aged 40 to 65 years. Because the average age of menopause for African American women is 49.6 years,²⁶ this age range included women with changing risk for CVD due to loss of the natural cardioprotective ovarian hormones at menopause.^{27,28} Exclusion criteria included only risks for exercise-related adverse events: (1) major signs or symptoms of pulmonary disease or CVD; (2) history of myocardial infarction or stroke; and (3) blood pressure ≥ 160 mmHg systolic or ≥ 100 mmHg diastolic.²⁹ Women with diabetes had to have a A1C less than 9%.³⁰

After receiving Institutional Review Board approval, recruitment was concentrated within the six Chicago communities where the study sites were located, including three community hospitals and three health centers.³¹ The sites were in or bordering communities that were predominantly African American ($> 90\%$) and had 30% of household incomes below the poverty level.³²

A total of 609 women responded to the recruitment strategies, which included using key contacts in the community to distribute informative flyers.³¹ Further, participants used their social networks to encourage participation of other women. Briefly, of the 514 women who completed an initial telephone screening, 105 were ineligible and 409 were scheduled for a

health assessment screening at their respective community site with a study nurse practitioner. After providing written informed consent, participants had a health history and physical examination emphasizing CVD risk factors. Of the 337 women who completed the screening health assessment (72 did not come to the health assessment), 40 were ineligible. The remaining 297 were not at risk for exercise-related adverse events. The reasons for ineligibility at telephone screening or health assessment included too active (55), did not meet age or race criteria (29), major signs of CVD or past history of myocardial infarction or stroke (20), hypertension (18), electrocardiogram abnormality (9), elevated A1C (5), or other health problems (9).

Measures

Demographics and Aerobic Fitness—Demographics included age, marital status, number of children under age 18, education, employment, and family income; women were also asked if they had a regular health care provider. Physical activity was assessed indirectly at baseline by aerobic fitness. A practical estimate of aerobic fitness was determined with the two-minute step test, a part of the Senior Fitness Test recommended for use in low-fit older adults.³³ Scores are classified into six age-adjusted rankings of fitness (<10th, 10–24th, 25–49th, 50–74th, 75–90th, >90th). The cut points were extrapolated from normative scores for community-residing adults ages 60–94.³³

Cardiovascular Risk Factors—Hypertension was identified by responding yes to the question “Are you currently taking prescribed medication for your blood pressure?” Hypertension was also identified as having a mean systolic blood pressure ≥ 140 mmHg or mean diastolic blood pressure ≥ 90 mmHg. This is consistent with the hypertension definitions of NHANES, whose findings we list to provide context.² The equipment used and procedures for measuring hypertension are listed in Table 1.

Hypercholesterolemia was identified by responding yes to the treatment question, “Are you currently taking prescribed medication for your blood cholesterol?”² In addition, hypercholesterolemia was identified by having a LDL level ≥ 130 mg/dL.² This definition varies somewhat from NHANES comparative data,³ which set LDL thresholds for hypercholesterolemia based on an algorithm of the person’s history of hypercholesterolemia, number of CVD risk factors, and Framingham risk equation.² The cut-points we set for high total cholesterol (≥ 200 mg/dL) and low HDL cholesterol (< 40 mg/dL) were consistent with NHANES. The equipment used and procedures for measuring blood pressure and cholesterol are listed in Table 1.

Additional questions related to CVD risk factors included current smoking and presence of diabetes. Women were considered a current smoker if they responded yes to the question “Have you smoked in the past 12 months?” They were considered diabetic if they responded yes to the question “Do you have diabetes?” Body composition was assessed by measuring body mass index (BMI). Consistent with NHANES, overweight was a BMI of 25 kg/m² or greater to less than 30 kg/m² and obesity was a BMI of 30 kg/m² or greater. The equipment used and procedures for measuring body composition are provided in Table 1.

Awareness, Treatment, and Control of Hypertension and

Hypercholesterolemia—All women identified as having hypertension were classified into subgroups based on awareness, treatment, and control—defined the same as in NHANES.² Awareness of hypertension was defined as responding yes to the question, “Have you ever been told by a health care professional that your blood pressure was high?” Treatment of hypertension was based on a yes response to currently taking medication for their blood pressure. Overall hypertension control was defined as a systolic blood pressure BP < 140 mmHg and a diastolic BP < 90 mmHg. Based on having hypertension, we looked at the percentage who were aware (total number aware/total number with hypertension), treated (total number treated/total number with hypertension), and controlled (total number controlled/total number with hypertension). Further, based on a yes response to awareness, we looked at the percentage of aware women who were treated for hypertension (number treated/number aware); and based on a yes response to treatment, we looked at the percentage of treated women whose blood pressure was controlled (number controlled/number treated).

All women identified as having hypercholesterolemia were also classified into subgroups based on awareness, treatment, and control. Consistent with NHANES,³ awareness of the presence of hypercholesterolemia was defined by a yes response to the question, “Have you ever been told by a health care professional that your blood cholesterol was high?” Treatment of hypercholesterolemia was based on a yes response to currently taking cholesterol-lowering medication.² Cholesterol control was defined as a LDL level < 130 mg/dl,² which varies somewhat from NHANES definitions (as noted above).³ Based on having hypercholesterolemia, we looked at the percentage who were aware (total number aware/total number with hypercholesterolemia), treated (total number treated/total number with hypercholesterolemia), and controlled (total number controlled/total number with hypercholesterolemia). Further, based on a yes response to awareness, we looked at the percentage of aware women who were treated for hypercholesterolemia (number treated/number aware); and based on yes response to treatment, we looked at the percentage of treated women whose hypercholesterolemia was controlled (number controlled/number treated).

The specific name, dosage, and frequency of antihypertensive and/or cholesterol-lowering medication were obtained by asking the women to bring all medications to the baseline health assessment. Antihypertensive agents were classified as diuretic, renin-angiotensin system (RAS) blocker, calcium channel blocker (CCB), beta-adrenergic blocking agent, alpha-adrenergic blocking agent, central acting agent, or vasodilator. Cholesterol-lowering medications were classified as a statin, fibrate, or ezetimibe.

National Data Samples—Every year, the American Heart Association along with government agencies such as the Centers for Disease Control and Prevention and the National Institutes of Health compile the most recent statistics on heart disease, stroke, and other vascular diseases and their risk factors.² Much of the data comes from NHANES,² which each year assesses the health and nutritional status of about 5,000 persons located in counties across the United States. Prevalence data are given for adults 18 years by race/ethnicity and sex, providing a standard against which to consider our study sample in terms

of CVD risk. Prevalence data in the document also come from National Health Interview Survey (e.g., smoking), which monitors the health and behavior of the United States population.

We present our sample of African American women baseline CVD risk data against the backdrop of national data on the following risk factors in African American women: blood pressure, cholesterol, smoking, diabetes, and body composition.² In addition, our data on awareness, treatment, and control of hypertension for African American women are presented along with a look at national data for hypertension for African American women² and hypercholesterolemia for African American men and women combined (because this measure is aggregated between both sexes in national reporting).³

Analyses

Frequencies, means, and standard deviations were used to describe the sample demographic characteristics; CVD risks; and awareness, treatment, and control of hypertension and hypercholesterolemia. Chi-square goodness-of-fit analyses were conducted with the dichotomous CVD risk variables; awareness, treatment, and control findings; and proportions reported by national samples.^{3,34} One-sample *t* tests were conducted for the continuous risk factor variables, such as hypertension and hypercholesterolemia.

Results

The mean age of participants eligible for the Women's Lifestyle Physical Activity program was 53 years (range 40–65). About one-third were married (32.8%), and 36.4% had at least one child under age 18. Nearly half of the women had a college degree (49.0%). Three-fourths were employed (74.0%). Family income was: 13.1% < \$20,000, 26.3% \$20,000–\$39,999, 22.3% \$40,000–\$59,999, 17.0% \$60,000–\$79,999, and 21.2% ≥ \$80,000. Thirteen percent of the women had no health care provider. Aerobic fitness based on the two-minute step test revealed the following rankings: 32.6% < 25th percentile, 38.7% 25th–49th percentile, 22.6% 50th–74th percentile, and 6.1% ≥ 75th percentile.

Cardiovascular Risk Factors

Of the 297 women eligible for the Women's Lifestyle Physical Activity Program, 173 (58.2%) had hypertension, 101 (38.3%) had hypercholesterolemia, and 30 (10.1%) were currently smoking (Table 2). Almost 14% had diabetes, and most (88.5%) were obese (BMI ≥ 30 kg/m² or waist circumference > 35 inches or both), indicating high or very high risk for CVD.³⁵ A total of 282 (94.9%) women had ≥ 1 CVD risk factors, 205 (69.1%) women had 2 CVD risk factors, and 94 (31.7%) women had ≥ 3 CVD risk factors.

Examination of the CVD risk factors for the women eligible for this study vs. national data for African American women over 18 years old revealed that they were significantly more likely to have hypertension and to be overweight or obese (Table 2). They were also significantly more likely to have an HDL cholesterol < 40 mg/dL. However, fewer women had a total cholesterol ≥ 200 mg/dL and LDL cholesterol ≥ 130 mg/dL than the African American women in the NHANES data. Their risk for hypercholesterolemia, however,

mirrored that for women in NHANES, as did their risk for diabetes. Smoking rates were lower in our sample than in national data for African American women.

Awareness, Treatment, and Control of Hypertension and Hypercholesterolemia

The profiles of women in our study with hypertension mirrored those for African American women in NHANES for hypertension awareness, treatment, and control (Table 3). Most women in both the study sample and NHANES who were aware of having hypertension were being treated (96.3% and 93%, respectively). In both the study sample and NHANES, the percentage of women treated for hypertension for whom it was controlled was under 70%. In our study sample, of the 147 women on antihypertensive medication, 146 (99.3%) brought their medications to the health assessment. Most were taking diuretics (64.4%), followed by RAS blockers (52.7%), CCBs (34.2%), and beta blockers (17.1%). The number of different drug classes the women were prescribed ranged 1 to 3 ($M = 1.7$). Of the 58 women with treated but uncontrolled hypertension, 31 (53%) were on medications from two or more drug classes.

Examination of awareness, treatment, and control of hypercholesterolemia for the women in this study compared to the NHANES data for African Americans (men and women combined) revealed they mirrored one another for awareness (see Table 3). Compared to NHANES, significantly fewer women in this study were being treated for elevated cholesterol, and significantly fewer had controlled hypercholesterolemia. Less than half of the women who were aware of having hypercholesterolemia were being treated, which differs significantly from NHANES (men and women combined), where nearly all of those aware of having hypercholesterolemia were treated. However, across both samples approximately 70% of those treated for hypercholesterolemia were controlled. Of the 34 women taking medication for hypercholesterolemia, all brought their medications with them. The most frequent medication taken for hypercholesterolemia was a statin (94.1%).

Discussion

Of the 297 women in this sample, all of whom were recruited from community settings, 95% represent individuals in need of CVD risk reduction. Of the five key CVD risk factors examined in this study, two showed similarity between our sample and the national sample (hypercholesterolemia and diabetes), two showed our sample to have higher risk (hypertension and obesity), while one showed a lower risk (smoking). Overweight and obesity were found in 94.5% of the sample; these are associated with downstream sequelae of hypertension, hypercholesterolemia, and diabetes.

Our sample, despite having higher prevalence of hypertension, was similar to NHANES findings in awareness, treatment, and control of hypertension. In both samples, most women with hypertension were aware they had the condition and were being treated, consistent also with findings from the Jackson Heart Study of urban African Americans.³⁶ Strikingly, fewer than 70% of the women in both samples receiving treatment for hypertension had adequately controlled blood pressure. Consistent with Joint National Committee 7 guidelines,³⁷ most women with hypertension in our sample were prescribed two or more medications for blood pressure control. We speculate that most women took their medications on the day of their

baseline examination because they received a reminder call to do so. The women in our sample with inadequately controlled blood pressures may have required more medication.

Our sample had lower HDL cholesterol levels (which confers higher CVD risk) but lower levels of LDL cholesterol (which confers lower CVD risk). Despite these mixed results, most CVD risk indicators reported here were the same or worse for our sample compared to national samples, indicating a high level of CVD risk in this sample of inactive, urban, midlife African American women. The percentage of women having two or more CVD risk factors was close to the level of risk found in African American women who had already sustained a cardiovascular event (69.1% vs. 80.5%, respectively).³⁸ Although the prevalence of hypercholesterolemia in our sample was similar to that in NHANES, treatment was significantly lower than in NHANES, which may explain the lower percentage of participants with controlled hypercholesterolemia in our sample.³

We reviewed 11 prior studies for CVD risk factors of participants in physical activity intervention studies that included primarily African American women.^{23,39–48} Though not looking for one-to-one correlations, we were interested in the sample characteristics because these studies were similar to ours. Although those studies did not measure the exact set of CVD risk factors that we did, the women in our sample appear to be at somewhat higher CVD risk. Ten earlier studies that included baseline BMI reported a mean range of 27.9–34.7 kg/m²,^{23,40–48} whereas the baseline mean BMI for our participants was 35.5 kg/m². Mean baseline systolic and diastolic blood pressures in our sample were in the prehypertensive stage (126.8 mmHg and 80.2 mmHg, respectively), similar to the earlier studies reporting this information (overall *Mdn* = 128.6 mmHg and 78 mmHg, respectively). However, the percentage of women in our study with hypertension (58%) was slightly above the median percentage of the five studies reporting hypertension (*Mdn* = 53%, range = 34%–72%).^{23,40,42,43,45} This happened despite our exclusion of women who had systolic blood pressures ≥ 160 mmHg or a diastolic blood pressure ≥ 100 mmHg. We believe our sample having higher CVD risk (therefore most in need of intervention), was due to our exclusion of only women with very high levels of CVD risk factors or known CVD that could cause an adverse event during physical activity.

This report has limitations. No direct statistical comparisons were done between our exact study sample baseline data and those of others. This is because our study sample and measures did not correlate exactly with other studies. Our comparison NHANES data were for adults 18 years and older rather than the more specific characteristics of women in our study. Unlike the national data on heart disease, stroke, and CVD risk, our study included only sedentary women and not women who routinely participate in PA. This was verified by the low aerobic fitness levels of the women (71.3 % below the 50th percentile) prior to beginning the Women's Lifestyle Physical Activity program. Thus, this may contribute to the women having higher risk factor profiles than reported in the national data for African American women. However, we expect some useful perspective is achieved by showing our findings against the backdrop of other databases, such as NHANES. For example, most NHANES participants who screened positive for hypertension and hypercholesterolemia would likely be in the same age range as our participants.

Implications for Practice

Our findings show high CVD risk affecting community-dwelling, urban, midlife African American women and reveal the high prevalence of poor control of hypertension and treatment of hypercholesterolemia in this sample. These women are at particularly high risk for stroke and premature CVD. These data show that health care professionals need to be aware of the high incidence of CVD risk in this population and focus on CVD risk reduction interventions for them. Opportunities exist in traditional health care settings, health fairs and other community events, churches, and through community-based research programs. Once identified, high-risk women have an urgent need for pharmacological and lifestyle interventions. Health care practitioners must deliver guideline-recommended care to ensure control of hypertension and hypercholesterolemia, while addressing lifestyle-related risk factors through targeted lifestyle interventions such as physical activity. Opportunities must be taken to educate African American women about their heightened risk for CVD and stroke and to encourage them to engage in prevention strategies. As our study suggests, given the opportunity, many community-dwelling African American women at elevated risk for CVD and stroke are willing to participate in a physical activity intervention.

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References

1. Mosca L, Benjamin EJ, Berra K, et al. Effectiveness-based guidelines for the prevention of cardiovascular disease in women--2011 update: A guideline from the American Heart Association. *J Am Coll Cardiol*. 2011; 57(12):1404–1423. DOI: 10.1016/j.jacc.2011.02.005 [PubMed: 21388771]
2. Mozaffarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics-2015 update: A report from the American Heart Association. *Circulation*. 2014; 131(4):e29–322. [PubMed: 25520374]
3. Muntner P, Levitan EB, Brown TM, et al. Trends in the prevalence, awareness, treatment and control of high low density lipoprotein-cholesterol among United States adults from 1999–2000 through 2009–2010. *Am J Cardiol*. 2013; 112(5):664–670. [PubMed: 23726177]
4. Schiller JS, Lucas JW, Ward BW, Peregoy JA. Summary health statistics for U.S. adults: National Health Interview Survey, 2010. *Vital Health Stat*. 2012; 10(252):1–207. http://www.cdc.gov/nchs/data/series/sr_10/sr10_252.pdf.
5. Wilbur J, Miller A, Fogg L, et al. Randomized clinical trial of the women's lifestyle physical activity program for African American women: 24- and 48-week outcomes. *A J Health Promot*. 2014 accepted for publication.
6. Wright JS, Wall HK, Briss PA, Schooley M. Million hearts--where population health and clinical practice intersect. *Circ Cardiovasc Qual Outcomes*. 2012; 5(4):589–591. [PubMed: 22811503]
7. Dennison Himmelfarb CH, Laura. Calling all cardiovascular nurses: Be one in a million hearts: Million hearts initiative. *J Cardiovasc Nurs*. 2013; 28(2):103–105. DOI: 10.1097/JCN.0b013e3182819dcc [PubMed: 23392521]
8. Carroll S, Dudfield M. What is the relationship between exercise and metabolic abnormalities? A review of the metabolic syndrome. *Sports Med*. 2004; 34(6):371–418. DOI: 10.2165/00007256-200434060-00004 [PubMed: 15157122]
9. Chudyk AP, Robert. Effects of exercise on cardiovascular risk factors in type 2 diabetes: A meta-analysis. *Diabetes Care*. 2011; 34(5):1228–1237. DOI: 10.2337/dc10-1881 [PubMed: 21525503]
10. Hayashino Y, Jackson JL, Fukumori N, Nakamura F, Fukuhara S. Effects of supervised exercise on lipid profiles and blood pressure control in people with type 2 diabetes mellitus: A meta-analysis

- of randomized controlled trials. *Diabetes Res Clin Pract.* 2012; 98(3):349–360. DOI: 10.1016/j.diabres.2012.10.004 [PubMed: 23116535]
11. Pattyn N, Cornelissen VA, Eshghi SR, Vanhees L. The effect of exercise on the cardiovascular risk factors constituting the metabolic syndrome: A meta-analysis of controlled trials. *Sports Med.* 2013; 43(2):121–133. DOI: 10.1007/s40279-012-0003-z [PubMed: 23329606]
 12. Sukala WR, Page R, Cheema BS. Exercise training in high-risk ethnic populations with type 2 diabetes: A systematic review of clinical trials. *Diabetes Res Clin Pract.* 2012; 97(2):206–216. DOI: 10.1016/j.diabres.2012.02.001 [PubMed: 22385831]
 13. Whelton SP, Chin A, Xin X, He J. Effect of aerobic exercise on blood pressure: A meta-analysis of randomized, controlled trials. *Ann Intern Med.* 2002; 136(7):493–503. DOI: 10.7326/0003-4819-136-7-200204020-00006 [PubMed: 11926784]
 14. Shaw K, Gennat H, O'Rourke P, Del Mar C. Exercise for overweight or obesity. *Cochrane Database Syst Rev.* 2006; (4):CD003817.doi: 10.1002/14651858.CD003817.pub3 [PubMed: 17054187]
 15. Thomas DE, Elliott EJ, Naughton GA. Exercise for type 2 diabetes mellitus. *Cochrane Database Syst Rev.* 2006; 3:CD002968.doi: 10.1002/14651858.CD002968.pub2 [PubMed: 16855995]
 16. Kelley GA, Kelley KS. Effects of aerobic exercise on lipids and lipoproteins in adults with type 2 diabetes: A meta-analysis of randomized-controlled trials. *Public Health.* 2007; 121(9):643–655. DOI: 10.1016/j.puhe.2007.02.014 [PubMed: 17544042]
 17. Tambalis K, Panagiotakos DB, Kavouras SA, Sidossis LS. Responses of blood lipids to aerobic, resistance, and combined aerobic with resistance exercise training: A systematic review of current evidence. *Angiology.* 2009; 60(5):614–632. DOI: 10.1177/0003319708324927 [PubMed: 18974201]
 18. Kelley GA, Kelley KS, Roberts S, Haskell W. Comparison of aerobic exercise, diet or both on lipids and lipoproteins in adults: A meta-analysis of randomized controlled trials. *Clin Nutr.* 2012; 31(2):156–167. [PubMed: 22154987]
 19. Ruivo JA, Alcantara P. Hypertension and exercise. *Rev Port Cardiol.* 2012; 31(2):151–158. [PubMed: 22237005]
 20. Thompson D, Karpe F, Lafontan M, Frayn K. Physical activity and exercise in the regulation of human adipose tissue physiology. *Physiol Rev.* 2012; 92(1):157–191. [PubMed: 22298655]
 21. Buchholz, S.; Wilbur, J.; Halloway, S.; McDevitt, J.; Shoeny, M. Physical activity intervention studies and their relationship to body composition in healthy women. In: Smith, B., editor. *Annual review of nursing research.* Vol. 31. New York, NY: Springer Publishing Company; 2013.
 22. Mozaffarian D, Hao T, Rimm EB, Willett WC, Hu FB. Changes in diet and lifestyle and long-term weight gain in women and men. *N Engl J Med.* 2011; 364(25):2392–2404. DOI: 10.1056/NEJMoa1014296 [PubMed: 21696306]
 23. Wilbur J, McDevitt JH, Wang E, et al. Outcomes of a home-based walking program for African-American women. *Am J Health Promot.* 2008; 22(5):307–317. DOI: 10.4278/ajhp.22.5.307 [PubMed: 18517090]
 24. Wilbur J, Chandler P, Dancy B, Choi J, Plonczynski D. Environmental, policy and cultural factors related to physical activity in urban, African American women. *Women Health.* 2002; 36(2):17–28. DOI: 10.1300/J013v36n02_02 [PubMed: 12487138]
 25. Ingram D, Wilbur J, McDevitt J, Buchholz S. Women's walking program for African American women: Expectations and recommendations from participants as experts. *Women Health.* 2011; 51(6):566–582. DOI: 10.1080/03630242.2011.606357 [PubMed: 21973111]
 26. Palmer JR, Rosenberg L, Wise LA, Horton NJ, Adams-Campbell LL. Onset of natural menopause in African American women. *Am J Public Health.* 2003; 93(2):299–306. DOI: 10.2105/AJPH.93.2.299 [PubMed: 12554590]
 27. Matthews KA, Crawford SL, Chae CU, et al. Are changes in cardiovascular disease risk factors in midlife women due to chronological aging or to the menopausal transition? *J Am Coll Cardiol.* 2009; 54(25):2366–2373. DOI: 10.1016/j.jacc.2009.10.009 [PubMed: 20082925]
 28. Moreau KL, Hildreth KL, Meditz AL, Deane KD, Kohrt WM. Endothelial function is impaired across the stages of the menopause transition in healthy women. *J Clin Endocrinol Metab.* 2012; 97(12):4692–4700. DOI: 10.1210/jc.2012-2244 [PubMed: 22969140]

29. American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription. 8. Philadelphia, PA: Lippincott Williams & Wilkins; 2010.
30. American Diabetes Association. Physical activity/exercise and diabetes. *Diabetes Care*. 2004; 27:S58–62. http://care.diabetesjournals.org/content/27/suppl_1/s58.full. [PubMed: 14693927]
31. Wilbur J, Buchholz SW, Ingram DM, et al. Effectiveness, efficiency, duration, and costs of recruiting for an African American women's lifestyle physical activity program. *Res Nurs Health*. 2013; 36(5):487–499. DOI: 10.1002/nur.21550 [PubMed: 23775371]
32. U.S. Census Bureau. [Accessed April 4, 2014] State and county quick facts. <http://quickfacts.census.gov/qfd/states/17/>
33. Rikli, RE.; Jones, CJ. [Accessed May 9, 2014] Development and validation of a functional fitness test for community-residing older adults; *J Aging Phys Act*. 1999. p. 129-161.<http://gerontologist.oxfordjournals.org/content/33/2/255.full.pdf+html>
34. Go AS, Mozaffarian D, Roger VL, et al. Heart disease and stroke statistics--2013 update: A report from the American heart association. *Circulation*. 2013; 127(1):e6–e245. DOI: 10.1161/CIR.0b013e31828124ad [PubMed: 23239837]
35. National Heart Lung and Blood Institute. [Accessed September 11, 2013] Clinical guidelines on the identification, evaluation and treatment of overweight and obesity in adults: The evidence report. 1998. p. 98-4083.http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf
36. Wyatt SB, Akyzbekova EL, Wofford MR, et al. Prevalence, awareness, treatment, and control of hypertension in the Jackson heart study. *Hypertension*. 2008; 51(3):650–656. DOI: 10.1161/HYPERTENSIONAHA.107.100081 [PubMed: 18268140]
37. Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: The JNC 7 report. *JAMA*. 2003; 289(19):2560–2572. DOI: 10.1001/jama.289.19.2560 [PubMed: 12748199]
38. Leifheit-Limson EC, Spertus JA, Reid KJ, et al. Prevalence of traditional cardiac risk factors and secondary prevention among patients hospitalized for acute myocardial infarction (AMI): Variation by age, sex, and race. *J Womens Health (Larchmt)*. 2013; 22(8):659–666. [PubMed: 23841468]
39. Banks-Wallace J. Outcomes from walk the talk: A nursing intervention for black women. *ABNF J*. 2007; 18(1):19–24. [PubMed: 18402353]
40. Carson JA, Michalsky L, Latson B, et al. The cardiovascular health of urban African Americans: Diet-related results from the genes, nutrition, exercise, wellness, and spiritual growth (GoodNEWS) trial. *J Acad Nutr Diet*. 2012; 112(11):1852–1858. DOI: 10.1016/j.jand.2012.06.357 [PubMed: 22995059]
41. Hornbuckle LM, Liu PY, Ilich JZ, Kim JS, Arjmandi BH, Panton LB. Effects of resistance training and walking on cardiovascular disease risk in African-American women. *Med Sci Sports Exerc*. 2012; 44(3):525–533. DOI: 10.1249/MSS.0b013e31822e5a12 [PubMed: 21778912]
42. Parra-Medina D, Wilcox S, Wilson DK, Addy CL, Felton G, Poston MB. Heart healthy and ethnically relevant (HHER) lifestyle trial for improving diet and physical activity in underserved African American women. *Contemp Clin Trials*. 2010; 31(1):92–104. DOI: 10.1016/j.cct.2009.09.006 [PubMed: 19781665]
43. Peterson JA, Cheng AL. Heart and soul physical activity program for African American women. *West J Nurs Res*. 2011; 33(5):652–670. DOI: 10.1177/0193945910383706 [PubMed: 20966345]
44. Yancey A, McCarthy W, Harrison G, Wong W, Siegel J, Leslie J. Challenges in improving fitness: results of a community-based, randomized, controlled lifestyle change intervention. *J Womens Health*. 2006; 15:412–428. DOI: 10.1089/jwh.2006.15.412
45. Yanek LR, Becker DM, Moy TF, Gittelsohn J, Koffman DM. Project joy: Faith based cardiovascular health promotion for African American women. *Public Health Rep*. 2001; 116 (Suppl 1):68–81. DOI: 10.1093/phr/116.S1.68 [PubMed: 11889276]
46. Young DR, Stewart KJ. A church-based physical activity intervention for African American women. *Fam Community Health*. 2006; 29(2):103–117. DOI: 10.1097/00003727-200604000-00006 [PubMed: 16552288]
47. Zoellner J, Connell C, Powers A, Avis-Williams A, Yadrack K, Bogle ML. Does a six-month pedometer intervention improve physical activity and health among vulnerable African Americans? A feasibility study. *J Phys Act Health*. 2010; 7(2):224–231. [PubMed: 20484761]

48. Fitzgibbon ML, Stolley M, Schiffer L, et al. Obesity reduction black intervention trial (ORBIT): Design and baseline characteristics. *J Womens Health (Larchmt)*. 2008; 17(7):1099–1110. DOI: 10.1089/jwh.2007.0614 [PubMed: 18774895]
49. Osthega Y, Nwankwo T, Sorlie PD, Wolz M, Zipf G. Assessing the validity of the Omron HEM-907XL oscillometric blood pressure measurement device in a national survey environment. *J Clin Hypertens (Greenwich)*. 2010; 12(1):22–28. doi:10.1111/j.1751-7176.2009.00199.x. [PubMed: 20047626]
50. Pckering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans and experimental animals, part 1: blood pressure measurement in humans: a statement for professionals from the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. *Hypertension*. 2005; 45:142–61. doi: 10.1161/01.CIR.0000154900.76284.F6. [PubMed: 15611362]
51. Alere. [Accessed January 25, 2013] Cholestech LDX system. <http://www.alere.com/us/en/brands/cholesteck.html> Updated 2010
52. Seca 813. [Accessed May 9, 2014] http://www.seca.com/english/us/home/products/details/seca/product/flat_scales_265/seca_813/ Updated 2010

Table 1

Equipment and Procedure for Measuring Cardiovascular Risk Factors

Measure	Equipment	Procedure
Blood pressure	<ul style="list-style-type: none"> • Omron HEM-907XL automated BP machine (Omron, n.d.) • Validated by mercury sphygmomanometer comparisons⁴⁹ 	<ul style="list-style-type: none"> • Seated at rest for 15–30 minutes • Confirmed no ingestion of caffeine or smoking within 15 minutes • Three recorded from the arm with the highest blood pressure.⁵⁰
Cholesterol	<ul style="list-style-type: none"> • Cholestech LDX machine⁵¹ • Quality control samples analyzed with each new shipment and lot of reagents 	<ul style="list-style-type: none"> • Fasting fingerstick blood samples • Confirmed fasting for four hours
Body composition	<ul style="list-style-type: none"> • Weight using Seca Robusta 813 High-Capacity Digital Scale⁵² • Standing height using a stadiometer 	<ul style="list-style-type: none"> • Light clothing and no shoes • Reported to the nearest .20 pound

Table 2

Cardiovascular Risk Factors and Awareness, Treatment, and Control of Hypertension and High LDL Cholesterol by Study Sample (N =297) and National Data for African American Women or Men and Women combined

	Study Sample		National Data ^a	p-Value
	n	Data		
Cardiovascular risk factors				
Blood pressure				
Systolic blood pressure, M (SD)	297	126.8 (15.1)	NA	
Diastolic blood pressure, M (SD)	297	80.2 (9.1)	NA	
Hypertension, n (%)	297	173 (58.2)	46.1%	<.001
Cholesterol (mg/dL)				
Total cholesterol 200 mg/dL, n (%)	296	88 (29.7)	40.7%	<.001
HDL, M (SD)	297	52.4 (16.1)	M=57.4	<.001
HDL < 40 mg/dL, n (%)	295	74 (25.1)	10.3%	<.001
LDL, M (SD)	264	107.1 (34.8)	M=115.5	<.001
LDL 130 mg/DL, n (%)	264	66 (25.0)	33.6%	< .01
Hypercholesterolemia ^b , n (%)	264	101 (38.3)	34.2% ^c	NS
Current smoking, n (%)	296	30 (10.1)	15.4% ^d	<.05
Diabetes, n (%)	297	41 (13.8)	14.6%	NS
Body composition				
BMI (kg/m ²), M (SD)	297	35.5 (7.6)	NA	
Overweight and obesity (≥ 25), n (%)	297	281 (94.6)	81.9%	<.001
Obese (≥ 30), n (%)	297	222 (74.7)	57.5%	<.001

NA designates not available, NS designates not significant

^aNational data are from NHANES 2009–2012 unless identified otherwise.

^bDefinitions vary slightly between data sets

^cNHANES 2009–2010 for African American women and men.

^dNational Health Interview Survey 2010–2012.

Table 3

Awareness, Treatment, and Control of Hypertension and Hypercholesterolemia

Risk Factor		Percentage of Those with Risk Factor		Percentage of Those Aware/Treated ^a	
Risk Factor	n	Study Sample	National Data	Study Sample	National Data
Hypertension ^b (<i>n</i> = 173)					
Aware	153	88.4	88.5		
Treated	147	84.9	82.3	96.1	93.0
Controlled	89	51.4	55.9	60.5	67.9
Hypercholesterolemia ^c (<i>n</i> = 101)					
Aware	74	73.2	64.2		
Treated	34	33.0 [*]	63.8	45.9 [*]	99.4
Controlled	25	24.8 [*]	45.3	73.5	71.0

* *p* < .001.^aPercent of *Aware* who were *Treated* and percent of *Treated* who were *Controlled*.^bNational Data from NHANES 2007–2012.^cNational Data from NHANES 2009–2010 for African American women and men combined.