Cardiovascular Disease Risk Among Young Urban Women

Elsa-Grace V. Giardina, MD, MS, Tracy K. Paul, MD,
Dena Hayes, MS, and Robert R. Sciacca, EngScD

Abstract

Background: Although young women are presumed to have low cardiovascular disease (CVD) risk and mortality, the mortality benefits secondary to ischemic heart disease have plateaued among young women, <50 years.

Materials and Methods: Women, 18–49 years ($n=595$) among all participants ($n=1,045$) in the Columbia University Heart Health in Action Study, were assessed for CVD risk burden, that is, presence of hypertension, diabetes mellitus, current tobacco use, hyperlipidemia, physical inactivity, and/or obesity. Anthropometrics (height, weight, waist circumference, and body mass index [BMI]); demographics; socioeconomic status, CVD risk factors, body size perception; knowledge and awareness of CV disease; and attitudes toward lifestyle perception were determined.

Results: Most were Hispanic (64.0%); non-Hispanic white (20.0%); or non-Hispanic black (8.7%), age = 35.9 ± 8.0 years. BMI was categorized as obese (≥ 30 kg/m², 27.0%; 160/592); overweight (25.0–29.1 kg/m², 29.1%; 172/592); normal weight (18.5–24.9, 41.7%; 247/592); and underweight (≤ 18.4 , 2.2%; 13/592). More than half (57.9%; 337/582) had CVD risks: 45.9% (267/582) had >1 CVD risk factor exclusive of obesity, including physical inactivity (18.4%), hypertension (17.2%), hyperlipidemia (11.3%), current tobacco use (9.8%), and diabetes (5.6%). Regardless of CVD risk burden, most knew blood pressure, blood sugar, and cholesterol. Women with increased CVD risk burden, however, were less likely to correctly identify body size (53.3% vs. 66.1%, $p=0.002$). Obese and overweight women with CVD risk factors exclusive of obesity were more likely to cite cost (23.4% vs. 10.7%, $p=0.003$) and fatigue (32.2% vs. 18.8%, $p=0.006$) as barriers to weight loss.

Conclusion: Among these young women, the majority had CVD risks and the CVD risk burden is high among young women, particularly among the overweight and obese and physically inactive. Strategies to encourage healthy lifestyles and reduce CVD risk factors among this vulnerable at-risk population are vital.

Keywords: cardiovascular health, obesity, health disparities

Introduction

MORTALITY FROM CARDIOVASCULAR DISEASE (CVD) in the United States has declined since the 1970s; nonetheless, the burden remains high considering that CVD accounted for almost 32% of deaths in 2010.¹ What is more, despite the decade's long benefits of declining mortality, it is predicted that the prevalence of CVD is expected to rise 10% between 2010 and 2030.² A slowing of decline in mortality benefits among younger adults has been observed and attributed to worsening lifestyle choices and behaviors, rather than deteriorating medical management of coronary heart disease.³ The slowing or plateauing of the decline in mortality from coronary heart disease, reported both in the United

States⁴ and worldwide⁵ is notable in young women.^{4–6} Among U.S. women, ages 35–54 years, the estimated annual percentage mortality change was –5.4% from 1980 until 1989, but increased to 1.5% from 2000 until 2002.⁴ In comparison, the annual mortality change for men of the same age was consistently better, that is, –6.2% from 1980 until 1989, and –0.5% from 2000 until 2002.⁴ Acute myocardial infarction hospitalization rates for young people have not declined over the past decade, and young women have more comorbidity, longer length of stay, and higher in-hospital mortality after acute myocardial infarction than young men.⁵

One consideration is that the change in the course of CVD mortality is attributable to an aging population. Another is that it parallels the rise of risk factors, particularly obesity

Division of Cardiology, Department of Medicine, Center for Women's Health, Columbia University Medical Center, New York, New York. Presented-in-part at the American Heart Association's Epidemiology and Prevention/Nutrition, Physical Activity and Metabolism, March 6, 2015.

and consequent hypertension, diabetes mellitus, and physical inactivity accompanying weight gain.⁷ Changes in societal and environmental conditions have led to transformations in diet and physical activity, and not all the advances in prevention and medical treatments are shared equally across economic, racial/ethnic, and gender groups.⁸ Unfavorable developments in the major risk factors for coronary heart disease offer a potential explanation for the decline among young women. For one thing, cardiovascular health is being lost from childhood and young adulthood and adverse health behaviors are increasing, in particular, mounting rates of obesity,^{9,10} physical inactivity, smoking,¹¹ and diabetes.¹² A third consideration could be shifting U.S. demographics with higher rates of obesity and diabetes among some racial/ethnic groups.¹² An additional explanation may be inadequate knowledge and awareness that heart disease, the leading cause of death among women, is in large part related to lifestyle.^{13,14} It is not clear whether any of these considerations impact on young women. Accordingly, to gain insight into the attitudes of urban women, <50 years of age, we examined the Columbia University Heart Health in Action database to determine the extent of CVD risk burden, as well as perception of body size, knowledge, and awareness of CVD, and lifestyle behavior.¹⁵

Materials and Methods

Measures

The Columbia University Institutional Review Board approved the study and participants provided written informed consent before enrollment. Data from participants ($n = 595$) who were <50 years of age (18–49 years) and were enrolled in the Heart Health in Action database (total = 1,045 participants) were analyzed. Details of the database have been described.^{15,16} Participants were enrolled from April 2008 to December 2014. One goal was to document findings among a primary prevention group, and thus, women with preexisting events secondary to atherosclerosis were excluded; the exclusion criteria, based on high-risk Framingham Risk Score >20%,¹⁷ included known history of coronary artery disease, CVD procedure (angioplasty, bypass surgery, placement of stent), myocardial infarction, stroke, peripheral vascular disease, and transient ischemic attack; pregnant women or those <18 years of age were excluded. Data were analyzed for demographics, socioeconomic status, risk factors, body size perception, and knowledge and awareness of CVD.

All participants completed a baseline five-page standardized face-to-face questionnaire in English or Spanish adapted from the validated Centers for Disease Control and Prevention BRFSS.¹⁸ Self-report of current/ever diagnosis of diabetes mellitus, hypertension, hyperlipidemia, smoking, physical activity, and weight status was collected. Age, education, geographic area of residence, health insurance, income, and sources of information about nutrition and diet were collected. Race/ethnicity was defined by self-identification modeled after the U.S. census.¹⁹

A trained research assistant determined the following: (1) height (measured without shoes by using a tape measure [Tech-Med, 72"]); (2) waist circumference; (3) weight (determined using a calibrated portable electronic scale [TANITA digital weight scale]); and (4) blood pressure (using a man-

ual blood pressure cuff; Omron *Intelli Sense* [Portable] Model: HEM-711DLX). Body mass index (BMI) = [weight (kg)/height (m²)] was calculated from the measured weight and height and classified as follows: underweight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obese (>30 kg/m²).

Education

The number of years of education was categorized as follows: never attended school or attended <8 years (elementary); did attend 9–12 years (high school); and did attend >12 years, including college, vocational, or technical school (college).

Insurance and income

Health insurance status was categorized as Medicaid or state, Medicare, commercial or a health maintenance organization, self-pay, none, or other. Income was based upon zip code and household size.

Assessment of body size

Body size was evaluated from the validated Stunkard silhouette scale.²⁰ The nine-figure, sex-specific Stunkard rating scale was used as an adjunct to BMI to evaluate self-size awareness. Participants chose silhouettes from underweight, normal weight, overweight, and obese identified as *current*, *ideal*, and *healthy* body image²¹ that were compared to the calculated BMI. National guidelines and normative data link the Stunkard figures with BMI; the scale has been tested to have validity and test-retest reliability.^{22,23}

Knowledge and awareness

Three questions conceived by the American Heart Association and Healthy People 2010 (Chapter 12, Heart Disease and Stroke, 12.2 and 12.8)^{24,25} regarding knowledge of CVD were asked. First: what is the leading cause of death among women? Choices for "the leading cause of death": breast cancer, lung cancer, HIV/AIDS, heart disease (correct answer), or stroke. Second: what are the early warning symptoms of heart attack? Choices for "warning symptoms of a heart attack": shortness of breath, dizziness, chest pain or discomfort, significant fatigue, or all of the above (correct answer). Third: what are the actions to take if experiencing a heart attack? Choices for "actions to take if experiencing a heart attack": call 911 (correct answer), drive yourself to the hospital, asks a friend to drive you to the hospital, or make an appointment with the doctor.²⁵

Other measures

In addition, participants were queried about (1) concerns about weight and attempts to lose weight (increasing physical activity, changing eating habits, diet, medication, surgery, none, and other); (2) impediments to losing weight (difficulty, lack of time, cost, fatigue, family responsibilities, professional responsibilities, current illness or injury, do not know how, none, and other); and (3) sources of nutritional information (from healthcare professionals; books and periodicals, internet, friends and family, none, and other).

Statistical analysis

Analyses were carried out with SAS for 9.4 (SAS Institute, Cary, NC). The results are reported as means and standard deviations for continuous variables and as frequencies and percentages for categorical variables. Differences between women with and without CVD risk factors were assessed using Fisher's exact test or the Mantel-Haenszel chi-square test; logistic regression was used to adjust for the potential effect of education on the relationship between CVD risk factors and the outcome measures of interest (body size perceptions, knowledge and awareness of CVD, concerns about weight, attempts to lose weight, impediments to losing weight, and sources of nutritional information). For analyses related to concern about weight, trying to lose weight, and barriers to losing weight, obesity was excluded from the list of CVD risk factors. A p -value <0.05 was considered significant for all analyses.

Results

Records of participants from 18 to 49 years ($n = 595$), mean 35.9 ± 8.0 years, were reviewed. Most were Hispanic (64.0%); others were non-Hispanic white (20.0%), non-Hispanic black (8.7%), and Asian or other ethnic groups (7.2%) (Table 1). The mean income was $\$39,766 \pm \$19,934$. Insurance coverage included Medicaid (54.2%), commercial (34.8%), and self-pay (10.1%). The majority of participants completed at least some college, vocational, or technical training (327/587,

55.7%); years of education averaged 13.4 ± 3.7 years. More than half of the women were overweight or obese: obese (27.0%; 160/592; BMI ≥ 30 kg/m²); overweight (29.1%; 172/592; BMI 25.0–29.9 kg/m²); normal weight (41.7%; 247/592; BMI 18.5–24.9); and underweight (2.2%; 13/592; BMI ≤ 18.4); almost 40% of women had a waist circumference >35 inches.

CVD risk burden

CVD risk burden was based upon the presence or absence of hypertension, diabetes, smoking, hypercholesterolemia, physical inactivity (<30 minutes/day most days of the week), or obesity. Women with no CVD risk burden were the reference standard. More than half (57.9%; 337/582) had an increased CVD risk burden, including 22.5% (131/582) with multiple CVD risk factors (Fig. 1); 45.9% (267/582) had >1 CVD risk factor exclusive of obesity, including physical inactivity (18.4%), hypertension (17.2%), hyperlipidemia (11.3%), current tobacco use (9.8%), and diabetes mellitus (5.6%). A greater percentage of Hispanic women (58.0%) and non-Hispanic black women (78.9%) had increased CVD risk burden compared to non-Hispanic white women (45.4%), $p = 0.02$ and $p = 0.0001$, respectively.

Those with >12 years of education were less likely than those with 9–12 years of education to have an increased CVD risk burden (53.8% vs. 62.8%, $p = 0.04$); women with <8 years of education also had a greater percentage of increased CVD risk burden (64.8%), but the difference was not statistically significant.

Women with increased CVD risk

Most women regardless of CVD risk burden knew the risk of smoking (94.6%) as well as the status of their own blood pressure (92.6%), cholesterol (85.4%), and blood sugar (85.1%) (Table 2). Women with increased CVD risk burden were less likely to know the status of their cholesterol levels (82.9% vs. 88.9%), although the difference was of marginal significance ($p = 0.055$) (Table 2); the relationship was not significant after adjustment for education (odds ratio [OR] = 0.64, 95% confidence limits [CL] 0.39–1.06, $p = 0.08$). Women with increased CVD risk were less likely to correctly identify their body size (53.3% vs. 66.1%, $p = 0.002$); the relationship remained significant after adjustment for educational levels (OR = 0.61, 95% CL 0.43–0.86, $p = 0.005$). Only 42.6% knew the leading cause of death among women, while 72.0% knew the warning symptoms of a heart attack. Knowledge of CVD was not significantly affected by CVD risk burden with 42.1% of women with risk factors knowing the leading cause of death among women versus 43.2% of women without risk factors and 71.0% of women with risk factors knowing symptoms of a heart attack versus 73.8% of women without risk factors.

Weight concerns

Overall, 55.7% of women were concerned about their weight and 54.3% were trying to lose weight. Among overweight and obese women, these percentages rose to 75.7% and 72.9%, respectively. With the latter group, those with increased CVD risk burden were more concerned about their weight (80.3% vs. 63.7%, $p = 0.003$), but were

TABLE 1. CHARACTERISTICS OF PARTICIPANTS

No. of subjects	595
Race ethnicity, n (%)	
Hispanic	381 (64.0)
Non-Hispanic black	52 (8.7)
Non-Hispanic white	119 (20.0)
Asian	36 (6.1)
Other	7 (1.2)
Age, mean $\pm$ SD, years	35.9 ± 8.0
Age, range, years	18–49
Years of education, mean $\pm$ SD	13.4 ± 3.7
Elementary (≤ 8 years), n (%)	54 (9.2)
High School (9–12 years), n (%)	206 (35.1)
College (≥ 12 years), n (%)	327 (55.7)
Body mass index, kg/m ² , mean $\pm$ SD	27.2 ± 6.4
Family income (\$)	$39,766 \pm 19,934$
Insurance, n (%)	
Medicaid	318 (54.2)
Medicare	6 (1.0)
Private pay	204 (34.8)
Self-pay	59 (10.1)
Self-reported traditional cardiovascular risk factors, n (%)	
Diabetes mellitus	32 (5.6)
Hypertension	99 (17.2)
Hyperlipidemia	65 (11.3)
Current tobacco use	58 (9.8)
Lack of physical activity	109 (18.4)
Measured waist size ≥ 35 inches, n (%)	233 (39.7)
Body mass index, kg/m ² , n (%)	
Underweight (≤ 18.4)	13 (2.2)
Normal weight (18.5–24.9)	247 (41.7)
Overweight (25.0–29.9)	172 (29.1)
Obese (≥ 30.0)	160 (27.0)

SD, standard deviation.

FIG. 1. The percentage of participants with CVD risk factors (**A**) and type of risk factor (**B**). (**A**) The percentage of participants with 1 risk factor, >1 risk factor, and multiple risk factors. (**B**) The percent of participants with individual risk factors.

not more likely to be trying to lose weight (75.7% vs. 65.6%, $p=0.07$). For overweight and obese women, these relationships were significant after adjustment for education (concerned about their weight: OR=2.52, 95% CL 1.45–4.37, $p=0.001$; trying to lose weight: OR=2.31, 95% CL 1.64–3.25, $p<0.0001$). However, women with CVD risk factors excluding obesity were not more likely to be concerned about their weight (77.1% vs. 74.2%) or trying to lose weight (73.7% vs. 72.2%).

Barriers to weight loss

Among a list of potential barriers to weight loss, overweight and obese women with CVD risk factors exclusive of obesity were more likely to cite cost (23.4% vs. 10.7%, $p=0.003$) and fatigue (32.2% vs. 18.8%, $p=0.006$) (Fig. 2).

Educational levels had little effect on the relationship between CVD risk factors and these impediments to weight loss (cost: OR=2.53, 95% CL 1.36–4.70, $p=0.003$; fatigue: OR=2.13, 95% CL 1.25–3.62, $p=0.005$).

Nutritional information

The majority of women, regardless of CVD risk burden, reported reading nutrition labels either routinely (42.3%) or sometimes (33.6%). Concerning sources of nutrition information, women with increased CVD risk were less likely to obtain nutrition facts from reading books or periodicals (44.4% vs. 55.5%, $p=.009$) (Fig. 3). However, when adjusted for education, the relationship was no longer significant (OR=0.71, 95% CL 0.50–1.01, $p=0.06$).

Discussion

Reports from the United States and worldwide describe a flattening of the decrease in CVD mortality among young adults that may be the first warning of worsening lifestyle choices and behaviors rather than declining medical management of coronary heart disease.^{3,6,7} While young women with a favorable cardiovascular profile²⁶ have a low risk for mortality from heart disease, in contrast, nearly half the participants in this report had an increased CVD risk burden, including 22.5% with multiple CVD risks (Fig. 1). Among these young women, excessive weight was the most frequent risk and more than 29% were overweight and 27% were obese.

Considerable evidence confirms that excessive weight is associated with increased rates of total mortality. Youths who are overweight during childhood are 11–30 times more likely to be obese in young adulthood and the relationship between CVD risk factors and overweight is present as early as 9 years.²⁷ Overall, the risk of death rises with increasing BMI. With the reference of normal BMI of 22.5–24.9 kg/m², among women the hazard ratios rise from 1.13 for a BMI of 25.0 to 29.9 kg/m² to 1.88 for a BMI of 35.0 to 39.9 kg/m².^{28,29} A recent review of 3,992 non-Hispanic white participants³⁰ found that excess bodyweight was positively associated with CVD and type-2 diabetes. Moreover, the effect of excess weight on years of life lost was greatest for young individuals and decreased with age.³⁰ About 6.1 (4.6–7.6) years of life were lost for young, obese women, aged 20–39 years, compared to 0.9 (0.1–1.7) years for those aged 60–79 years. Now, there is evidence that excessive weight among mothers carries additional threats since pre-pregnancy obesity

TABLE 2. KNOWLEDGE OF CARDIOVASCULAR DISEASE RISK FACTORS

	No risk factors (%)	One or more risk factors (%)	p
Know their own blood pressure	229/243 (94.2)	308/336 (91.7)	0.26
Know their own cholesterol	216/243 (88.9)	277/334 (82.9)	0.055
Know their own blood sugar	211/243 (86.8)	280/333 (84.1)	0.41
Know risk of smoking	229/242 (94.6)	318/336 (94.6)	1.0

FIG. 2. The percent of overweight/obese participants and impediments to weightloss. Impediments to losing weight among participants without and with CVD risk burden. CVD, cardiovascular disease.

predicts adverse metabolic risk, including increased risk of ischemic stroke and myocardial infarction in the years after childbirth.^{31,32} Furthermore, young obese women put their children at risk.³³ Cardiac and vasculature structural changes of offspring resulting from maternal over-nutrition include endothelial dysfunction,³⁴ inflammation,³⁵ increased sym-

thetic tone,³⁶ and myocardial fibrosis.³⁷ Excessive weight is associated with inflammatory and procoagulant states induced by the secretion of adipocytokines, such as angiotensinogen, tumor necrosis factor- α , and interleukin-6.

Moreover, in addition to excess weight, physical inactivity is prominent among the participants. Higher levels of

FIG. 3. The percent of participants and sources of health education. Sources of health nutrition information among those without and with CVD risk burden.

physical fitness appear to delay all-cause mortality primarily due to lowered rates of CVD and cancer.³⁸ It has been estimated that excess weight (defined as a BMI of >25) and physical inactivity (less than 3.5 hours of exercise weekly) together could account for 31% of all premature deaths, 59% of deaths from CVD, and 21% of deaths from cancer among nonsmoking women.^{38,39} Findings of risk associated with both physical inactivity and abnormal weight status are problematic for women like the participants described in this report.

Despite reports documenting increased awareness of CVD, substantial proportions of women remain unaware of heart disease risk¹⁴ and do not highlight it as a major health concern.⁴⁰ Lack of awareness is most persistent among high-risk populations, including racial/ethnic minority women, like many here, where less than 50% of participants recognized that heart disease is the leading cause of death among U.S. women. Educational interventions need to be targeted at racial/ethnic minority women since general awareness of CVD risk among women is associated with preventive action.¹⁴ In this regard, it is encouraging that 72.0% knew the warning signs of a heart attack.

In this young cohort, the risk burden was increased among Hispanic women, non-Hispanic black women, and those with <12 years of education. Although aware of most conventional CVD risk factors, including individual blood pressure, cholesterol, and blood sugar, they were less likely to correctly identify body size. And despite personal weight concerns and body dissatisfaction, they are disadvantaged by misperception of size and barriers to realize weight loss. Among the potential obstacles to weight loss, we found overweight and obese women with CVD risk factors were likely to cite cost of food (23.4% vs. 10.7%, $p=0.003$) and fatigue as an impediment to increase physical activity (32.2% vs. 18.8%, $p=0.006$) (Fig. 2). A 20-year review of the Nurses' Health Study II found that 73% of coronary heart disease cases and 46% of clinical CVD risk factor cases were attributable to inattention to a healthy lifestyle.⁴¹ Compared to the Nurses' Health Study where study participants are health professionals, risk factors and outcomes are likely to be even worse for women like these who are disadvantaged by fewer years of education, are more overweight and obese, and do not benefit from overall care that health professionals are likely to practice.⁴¹ Programs with culturally appropriate agendas, including self-monitoring,⁴² nutrition and exercise education,^{43,44} behavior modification, problem solving, and relapse prevention, may improve lifestyle choices.

Limitations

We used a gender-specific, self-report questionnaire that is subject to recall and social desirability. Most participants are Hispanic, living in an urban area, and may not be representative of the general population. Moreover, participants were responding to inquiries about nutrition, weight perception, and lifestyle attitudes. Because of its cross-sectional design, we cannot draw conclusions about causal relationships between the variables examined.

Conclusion

In conclusion, CVD continues to rise among young women in parallel with the growing burden of cardiometabolic

risk factors such as obesity, diabetes, physical inactivity, and hypertension. The current findings illustrate the CVD risk burden among young urban women to underscore that some meaningful health advances fall short of proportional positive outcomes in young adults. As prevention is a critically effective strategy, efforts should continually aim to increase awareness and attitudes of CVD risk for young adults, particularly racial/ethnic minorities. Strategies to prevent the rise of risk factors such as obesity and physical inactivity require an appreciation and understanding of choices, daily obstacles, and barriers facing young women. The findings of a high frequency of CVD risk factors and tendencies that are unfavorable to optimal health can guide strategies to prevent CVD risk factors beginning during young adulthood and fully manifesting their consequences during maturity.

Acknowledgments

Supported, in part, by the Department of Health and Human Services (1HHCWHO5003-01-11); Edwina and Charles Adler Foundation, Kinnelon, New Jersey; and the National Center for Advancing Translational Sciences, National Institutes of Health, through Grant No. UL1 TR000040, formerly the National Center for Research Resources, Grant No. UL1 RR024156. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. The content is the responsibility of the authors and the funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of data; and preparation, review, or approval of the article.

Author Disclosure Statement

No competing financial interests exist.

References

1. Go AS, Mozaffarian D, Roger VL, et al. Executive summary: Heart disease and stroke statistics—2014 update: A report from the American Heart Association. *Circulation* 2014;129:399–410.
2. Heidenreich PA, Albert NM, Allen LA, et al. Forecasting the impact of heart failure in the United States: A policy statement from the American Heart Association. *Circ Heart Fail* 2013;6:606–619.
3. Ford ES, Ajani UA, Croft JB, et al. Explaining the decrease in U.S. deaths from coronary disease, 1980–2000. *N Engl J Med* 2007;356:2388–2398.
4. Ford ES, Capewell S. Coronary heart disease mortality among young adults in the U.S. from 1980 through 2002: Concealed leveling of mortality rates. *J Am Coll Cardiol* 2007;50:2128–2132.
5. Gupta A, Wang Y, Spertus JA, et al. Trends in acute myocardial infarction in young patients and differences by sex and race, 2001 to 2010. *J Am Coll Cardiol* 2014;64:337–345.
6. O'Flaherty M, Ford E, Allender S, Scarborough P, Capewell S. Coronary heart disease trends in England and Wales from 1984 to 2004: Concealed leveling of mortality rates among young adults. *Heart* 2008;94:178–181.
7. Rosamond W, Flegal K, Friday G, et al. Heart disease and stroke statistics—2007 update: A report from the

- American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation* 2007;115:e69–e171.
8. Havranek EP, Mujahid MS, Barr DA, et al. Social determinants of risk and outcomes for cardiovascular disease: A scientific statement from the American Heart Association. *Circulation* 2015;132:873–898.
 9. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999–2000. *JAMA* 2002;288:1728–1732.
 10. Flegal KM, Carroll MD, Ogden CL, Johnson CL. Prevalence and trends in obesity among US adults, 1999–2000. *JAMA* 2002;288:1723–1727.
 11. Shay CM, Ning H, Allen NB, et al. Status of cardiovascular health in US adults: Prevalence estimates from the National Health and Nutrition Examination Surveys (NHANES) 2003–2008. *Circulation* 2012;125:45–56.
 12. Cowie CC, Rust KF, Ford ES, et al. Full accounting of diabetes and pre-diabetes in the U.S. population in 1988–1994 and 2005–2006. *Diabetes Care* 2009;32:287–294.
 13. Stampfer MJ, Hu FB, Manson JE, Rimm EB, Willett WC. Primary prevention of coronary heart disease in women through diet and lifestyle. *N Engl J Med* 2000;343:16–22.
 14. Mosca L, Mochari H, Christian A, et al. National study of women's awareness, preventive action, and barriers to cardiovascular health. *Circulation* 2006;113:525–534.
 15. Giardina EG, Sciacca RR, Foody JM, et al. The DHHS Office on Women's Health Initiative to Improve Women's Heart Health: Focus on knowledge and awareness among women with cardiometabolic risk factors. *J Womens Health (Larchmt)* 2011;20:893–900.
 16. Flink LE, Sciacca RR, Bier ML, Rodriguez J, Giardina EG. Women at risk for cardiovascular disease lack knowledge of heart attack symptoms. *Clin Cardiol* 2013;36:133–138.
 17. Grundy SM, Balady GJ, Criqui MH, et al. Primary prevention of coronary heart disease: Guidance from Framingham: A statement for healthcare professionals from the AHA Task Force on Risk Reduction. American Heart Association. *Circulation* 1998;97:1876–1887.
 18. Pfaff D, Philippova M, Buechner SA, et al. T-cadherin loss induces an invasive phenotype in human keratinocytes and squamous cell carcinoma (SCC) cells in vitro and is associated with malignant transformation of cutaneous SCC in vivo. *Br J Dermatol* 2010;163:353–363.
 19. Office of Management and Budget. Race and Ethnic Standards for Federal Statistics and Administrative Reporting. (Directive No. 15). *Fed Reg* 1978;43:19269.
 20. Stunkard AJ, Sorensen T, Schulsinger F. Use of the Danish Adoption Register for the study of obesity and thinness. *Res Publ Assoc Res Nerv Ment Dis* 1983;60:115–120.
 21. Lynch E, Liu K, Spring B, Hankinson A, Wei GS, Greenland P. Association of ethnicity and socioeconomic status with judgments of body size: The Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Am J Epidemiol* 2007;165:1055–1062.
 22. Bulik CM, Wade TD, Heath AC, Martin NG, Stunkard AJ, Eaves LJ. Relating body mass index to figural stimuli: Population-based normative data for Caucasians. *Int J Obes Relat Metab Disord* 2001;25:1517–1524.
 23. Sanchez-Johnsen LA, Fitzgibbon ML, Martinovich Z, Stolley MR, Dyer AR, Van Horn L. Ethnic differences in correlates of obesity between Latin-American and black Women. *Obes Res* 2004;12:652–660.
 24. Keppel KG, Percy JN. Healthy People 2000: An assessment based on the Health Status Indicators for the United States and each state. *Healthy People 2000 Stat Notes* 2000:1–31.
 25. Veazie MA, Galloway JM, Matson-Koffman D, et al. Taking the initiative: Implementing the American Heart Association Guide for Improving Cardiovascular Health at the Community Level: Healthy People 2010 Heart Disease and Stroke Partnership Community Guideline Implementation and Best Practices Workgroup. *Circulation* 2005;112:2538–2554.
 26. Liu K, Daviglus ML, Loria CM, et al. Healthy lifestyle through young adulthood and the presence of low cardiovascular disease risk profile in middle age: The Coronary Artery Risk Development in (Young) Adults (CARDIA) study. *Circulation* 2012;125:996–1004.
 27. Thompson DR, Obarzanek E, Franko DL, et al. Childhood overweight and cardiovascular disease risk factors: The National Heart, Lung, and Blood Institute Growth and Health Study. *J Pediatr* 2007;150:18–25.
 28. Berrington de Gonzalez A, Hartge P, Cerhan JR, et al. Body-mass index and mortality among 1.46 million white adults. *N Engl J Med* 2010;363:2211–2219.
 29. Kitahara CM, Flint AJ, Berrington de Gonzalez A, et al. Association between class III obesity (BMI of 40–59 kg/m²) and mortality: A pooled analysis of 20 prospective studies. *PLoS Med* 2014;11:e1001673.
 30. Grover SA, Kaouache M, Rempel P, et al. Years of life lost and healthy life-years lost from diabetes and cardiovascular disease in overweight and obese people: A modelling study. *Lancet Diabetes Endocrinol* 2015;3:114–122.
 31. Schmiegelow MD, Andersson C, Kober L, et al. Pre-pregnancy obesity and associations with stroke and myocardial infarction in women in the years after childbirth: A nationwide cohort study. *Circulation* 2014;129:330–337.
 32. Schmiegelow MD, Andersson C, Kober L, et al. Associations between body mass index and development of metabolic disorders in fertile women—a nationwide cohort study. *J Am Heart Assoc* 2014;3:e000672.
 33. Reynolds RM, Allan KM, Raja EA, et al. Maternal obesity during pregnancy and premature mortality from cardiovascular event in adult offspring: Follow-up of 1 323 275 person years. *BMJ* 2013;347:f4539.
 34. Samuelsson AM, Matthews PA, Argenton M, et al. Diet-induced obesity in female mice leads to offspring hyperphagia, adiposity, hypertension, and insulin resistance: A novel murine model of developmental programming. *Hypertension* 2008;51:383–392.
 35. Yan X, Huang Y, Wang H, et al. Maternal obesity induces sustained inflammation in both fetal and offspring large intestine of sheep. *Inflamm Bowel Dis* 2011;17:1513–1522.
 36. Samuelsson AM, Morris A, Igosheva N, et al. Evidence for sympathetic origins of hypertension in juvenile offspring of obese rats. *Hypertension* 2010;55:76–82.
 37. Huang Y, Yan X, Zhao JX, et al. Maternal obesity induces fibrosis in fetal myocardium of sheep. *Am J Physiol Endocrinol Metab* 2010;299:E968–E975.
 38. Blair SN, Kohl HW, 3rd, Paffenbarger RS, Jr., Clark DG, Cooper KH, Gibbons LW. Physical fitness and all-cause

- mortality. A prospective study of healthy men and women. JAMA 1989;262:2395–2401.
39. Hu FB, Willett WC, Li T, Stampfer MJ, Colditz GA, Manson JE. Adiposity as compared with physical activity in predicting mortality among women. N Engl J Med 2004; 351:2694–2703.
40. Rodriguez F, Foody JM. Is cardiovascular disease in young women overlooked? Womens Health (Lond Engl) 2013;9: 213–215.
41. Chomistek AK, Chiuve SE, Eliassen AH, Mukamal KJ, Willett WC, Rimm EB. Healthy lifestyle in the primordial prevention of cardiovascular disease among young women. J Am Coll Cardiol 2015;65:43–51.
42. Crerand CE, Wadden TA, Foster GD, Sarwer DB, Paster LM, Berkowitz RI. Changes in obesity-related attitudes in women seeking weight reduction. Obesity 2007;15:740–747.
43. Fabricatore AN, Wadden TA, Womble LG, et al. The role of patients' expectations and goals in the behavioral and pharmacological treatment of obesity. Int J Obes (Lond) 2007;31:1739–1745.
44. Pronk NP, Wing RR. Physical activity and long-term maintenance of weight loss. Obes Res. 1994;2:587–599.
- Address correspondence to:
Elsa-Grace V. Giardina, MD, MS
Division of Cardiology
Department of Medicine
Center for Women's Health
Columbia University Medical Center
622 W. 168th Street
New York, NY 10032
E-mail: evg1@cumc.columbia.edu