



Published in final edited form as:

Am Heart J. 2010 November ; 160(5): 934–942. doi:10.1016/j.ahj.2010.07.023.

Physician diagnosis of overweight status predicts attempted and successful weight loss in patients with cardiovascular disease and central obesity

Siddharth Singh, MBBS MS^a, Virend K. Somers, MD PhD^{a,b}, Matthew M. Clark, PhD^c, Kristin Vickers-Douglas, PhD^c, Donald D. Hensrud, MD, MPH^{a,d}, Yoel Korenfeld, MD^{a,b}, and Francisco Lopez-Jimenez, MD MSc^{a,b}

^aDepartment of Internal Medicine, at Mayo Clinic Rochester, Minnesota

^bDivision of cardiovascular diseases, at Mayo Clinic Rochester, Minnesota

^cDepartment of Psychology and Psychiatry, at Mayo Clinic Rochester, Minnesota

^dDivision of Preventive, Occupational, and Aerospace Medicine, at Mayo Clinic Rochester, Minnesota

Abstract

Introduction—Despite the association of central obesity with adverse outcomes, most patients with CVD are unable to successfully lose weight. We undertook this analysis to evaluate the effect of motivational factors, and clinical factors, including physician diagnosis of overweight, on weight loss in patients with CVD and central obesity in the United States.

Methods and Results—We used data from the National Health and Nutrition Examination Survey (NHANES) 1999–2004. Waist circumference ≥ 102 cm in men and ≥ 88 cm in women were used to classify central obesity. We examined demographic, motivational and clinical determinants of attempted and successful weight loss using multivariable logistic regression. Successful weight loss was defined as $\geq 5\%$ weight loss in the preceding year. There were 907 respondents with CVD and central obesity of which 78% were aware of their overweight status and 80% were desirous to weigh less. Despite this awareness and desire, only 49% of centrally obese adults had attempted weight loss in the last year. Only 62% ($n=584$) reported that they had been informed that they were overweight by a physician. On multivariable analysis, physician diagnosis of overweight was a significant predictor of weight loss attempts (OR 2.42, 95% CI 1.44–4.09, $p=0.006$) and successful weight loss (OR 2.70, 95% CI 1.40–5.19, $p=0.001$).

Conclusion—In a nationally representative sample of adults with CVD and central obesity, physician diagnosis of overweight status emerged as a significant predictor of attempted and successful weight loss.

© 2010 Mosby, Inc. All rights reserved.

Corresponding Author: Dr. Francisco Lopez-Jimenez, M.D., MSc. Telephone: (507) 284-8087 Fax: (507) 266-7929 lopez@mayo.edu
Address: 200 1st St. SW, Rochester, MN, 55902 – USA..

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

INTRODUCTION

The prevalence of central obesity in the United States has risen markedly in the last few decades. (1) Central obesity has been linked to increased risk of coronary heart disease (CHD) and stroke, and it also been linked to poor outcomes in patients with different types of cardiovascular disease.(2,3) The American Heart Association and other professional societies recommend assessment of obesity using indices such as body mass index (BMI), waist circumference and waist to hip ratio. They also recommend weight reduction in all patients with coronary artery disease and $BMI \geq 25 \text{ kg/m}^2$.(4,5)

The relationship between BMI and CHD events and mortality in patients with established cardiovascular disease is complex, with a U-shaped relationship being observed in most cohorts. (6) Several studies have actually shown that abdominal obesity is more strongly associated with CHD risk factors and CHD events, than weight-related measurements such as BMI in people with (7-9) and without CHD (10,11). In light of existing findings, abdominal adiposity (or central obesity) may be a more important prognostic marker in patients with cardiovascular disease than BMI itself.

Unfortunately obesity in patients in cardiovascular disease is not commonly recognized, diagnosed or identified as a treatment goal, thus limiting the opportunity to establish effective lifestyle modifications and aim at weight reduction.(12) While the benefits of physician counseling for lifestyle change have been well documented (13), whether recognition overweight status by physicians in patients with cardiovascular disease is associated with actual weight loss is not clearly established. Published literature on predictors of weight loss in obese patients with cardiovascular disease is also scant.(14) Moreover, little is known about the role of motivational factors involved in weight loss (like awareness of overweight and desire to weigh less) in patients with cardiovascular disease. (15,16)

The goal of this analysis was to investigate patterns of weight loss in community-based adults with cardiovascular disease and central obesity. To accomplish this we investigated the effect of sociodemographic, motivational and clinical factors, including physician diagnosis of overweight, on weight loss in respondents in National Health and Nutritional Examination Survey (NHANES).

METHODS

Study Population

NHANES 1999-2004 included nationally representative cross sectional samples of civilian noninstitutionalized adults living in the United States. The procedures involved have been described and published elsewhere and are also available online.(17) Each of these surveys included a stratified multistage probability sample based on selection of counties, blocks, households, and persons within households.

In this analysis adults with history of cardiovascular disease and central obesity were included. We considered participants to have cardiovascular disease if they responded 'yes' to whether they had been told by a physician that they had had coronary heart disease, angina pectoris/angina, myocardial infarction, stroke or congestive heart failure. We defined central obesity in accordance with NCEP ATP III guidelines based on waist circumference $\geq 102\text{cm}$ for men and $\geq 88 \text{ cm}$ for women.(18) Respondents may or may not have been obese by BMI criteria ($BMI \geq 30 \text{ kg/m}^2$) to be included in this study. Standing height and weight were measured by trained observers in a mobile examination center using standardized techniques and equipment.

Weight loss-related motivational and behavioral variables

Participants were administered interviewer-assisted questionnaire to ascertain their weight-related history and behaviors. In this study data from this questionnaire were used to create five binomial weight loss-related motivational and behavioral variables: awareness of one's overweight status, desire to weigh less, attempted weight loss in the past year, attempts at maintaining present weight and successful weight loss.

Respondents were asked if they considered themselves to be overweight, at the right weight or underweight. Respondents who considered themselves overweight may actually have been either overweight or obese based on measured BMI, but the term 'overweight' has been used for the purposes of this study. We classified centrally obese participants as being aware of their overweight status if considered themselves to be overweight. Participants were also asked if they would like to weigh less, stay the same, or weigh more. We identified centrally obese participants who responded that they wanted to weigh less as desirous of weigh less. Others were classified as not desiring weight loss. Participants who had attempted weight loss in the preceding year or who had experienced intentional weight loss in the preceding year were classified as having attempted weight loss. Participants who had tried to maintain their weight in the prior year were classified as having attempted to maintain their present weight.

Respondents were also asked to report their current weight and height, and their weight one year ago. Percent weight change was determined by taking the difference between the current and one year previous reported weight and dividing that by participant's weight one year previous. We considered participants who had lost $\geq 5\%$ of their reported weight in the last year and had intended or attempted weight loss as having experienced successful weight loss. (19-22) Participants who lost $\geq 5\%$ of their body weight, but had not intended/attempted weight loss were excluded from analysis that examined covariates of successful weight loss. Participants who had lost $< 5\%$ of weight or had gained weight in the last year were considered unsuccessful in weight loss. Participants were also asked at what age and weight they had been heaviest. This information was used to classify participants as those who had experienced successful weight loss in the past ($\geq 5\%$ of their maximum body weight prior to the last year) and those who had maintained this weight till the beginning of prior year. We also subtracted the age when respondents had been heaviest from their age one year previous to calculate the time interval that had elapsed since they had been at their maximum weight.

Respondents were also evaluated for whether they had been informed of their overweight status by physicians by asking them, "Has a doctor or other health professional ever told you that you were overweight?"

Sociodemographic and Clinical Variables

Sociodemographic information is routinely collected as a part of NHANES. We used information about participants' age, gender, ethnicity, household poverty income ratio and education level (more than high school or less). The poverty income ratio is the ratio of family income to the family's appropriate poverty threshold. We also used information from questions on smoking to classify participants as current, former (no cigarettes in last month) and never smokers (less than 100 lifetime cigarettes).

Respondents who reported that they had been informed by a health care provider that they had high blood pressure, or had systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or were taking antihypertensive medications were considered as hypertensive. Respondents with total cholesterol ≥ 240 mg/dl or low HDL cholesterol (< 40 mg/dl in men and < 50 mg/dl in women), or those who reported that they had been informed

by a physician that they had high cholesterol were classified as having hyperlipidemia. Respondents who reported that they had been told by a health care provider that they had diabetes, were taking medications for diabetes or had fasting blood glucose ≥ 126 mg/dl were classified as having diabetes.

Statistical Analysis

We analyzed demographic, socioeconomic, clinical and motivational predictors of attempted weight loss, attempts at maintaining weight loss and successful weight loss using multivariate logistic regression. In the first step estimates were adjusted for age and sex. In the next step, demographic, socioeconomic, clinical and motivational variables were adjusted for. These variables included age, sex, ethnicity, poverty income ratio, medical insurance status, education level, smoking status, BMI, history of significant weight loss in the past, physician diagnosis of overweight, diabetes, hypertension, hyperlipidemia, awareness of overweight and desire to weigh less. We used SAS version 9.1 (SAS Institute, Inc, Cary, NC) and SUDAAN version 10.0 (Research Triangle Park, NC) for this analysis. (23) Because of complex sampling design of NHANES appropriate sampling weights, adjusted for multiple cycles of NHANES, were used. No extramural funding was used to support this work. The authors are solely responsible for the design and conduct of this study, all study analyses, the drafting and editing of the paper and its final contents.

RESULTS

Of the 16,731 non pregnant adult participants with available data on clinical and motivational factors of interest, 1,648 reported that they had been told by a physician that they had one or more of qualifying cardiovascular conditions (CHD, heart attack, heart failure and stroke). Of these 923 had body measurements done which permitted calculation of BMI and assessment of central obesity. Of these 923 participants, 907 had data that allowed calculation of weight loss over the preceding year. The 907 participants formed our final sample. The mean age of this sample was 64 years \pm 0.82 (standard error). Distribution of demographic, socioeconomic, clinical and weight loss-related variables stratified by BMI ($<$ and ≥ 30 kg/m²) are shown in Table 1.

Seventy eight percent of the 907 centrally obese participants (n=665) were aware of their overweight status. Of the respondents who were aware of their overweight status, about 97% (n=643/665) wanted to weigh less, as opposed to only 23% (n=48/241) of respondents who did not consider themselves to be overweight (p < 0.0001). Fifty seven percent (n=389/691) of individuals who wanted to weigh less, had actually attempted weight loss in the last year, as compared to 17% (n=32/215) of those who did not desire to weigh less (p < 0.0001). Desire to weigh less was also associated with respondents trying to maintain their body weight in the preceding year. Fifty-five percent (n=358/690) of people desiring weight loss had tried to maintain their weight in the last year, compared to only 20% (n=36/215) of people who did not desire weight loss (p < 0.0001). Among those who were aware of their overweight status, 13.3% had lost $\geq 5\%$ weight in the last year (n= 101/639), unlike 14.7% respondents who did not consider themselves overweight (n=24/197) (p=0.70). Of those who were desirous of weighing less, 13.3% (104/661) had lost $\geq 5\%$ weight in the last year, as opposed to 15.2% (21/175) of those who were not desirous of weighing less (p=0.62).

Mean weight change in the whole sample during the preceding year was $+0.87\% \pm 0.59\%$ (0.53 kg \pm 1.14 kg), although 31% (n=279) of the sample had lost weight in the preceding year. Mean weight loss among those who had lost any weight was $8.43\% \pm 0.51\%$ (8.20 kg \pm 0.60 kg).

Age and sex-adjusted and multivariate predictors of attempted weight loss, attempts at weight maintenance and successful weight loss are shown in Tables 2 and 3. In age and sex-adjusted models Hispanic ethnicity, increasing income, diabetes, hypertension, increasing BMI, not having experienced significant weight loss prior to preceding year and desiring weight loss were significantly associated with successful weight loss. In multivariate models, Hispanic ethnicity, physician diagnosis of overweight, hypertension and not having experienced significant weight loss prior to preceding year were significant predictors of a weight loss $\geq 5\%$.

BMI calculated by using self reported weight one year prior was associated with weight change. Mean percent weight change in those with BMI $< 30 \text{ kg/m}^2$ was $+2.8\%$, $30\text{-}40 \text{ kg/m}^2$ -0.26% and for BMI $> 40 \text{ kg/m}^2$ -5.24% (p for trend < 0.0001). In age and sex-adjusted models, BMI one year prior was significantly predictive of successful weight loss as well (results not shown). Mean weight change among those who had been told by physicians that they were overweight was $-1.06 \text{ kg} \pm 1.58 \text{ kg}$, as compared to $-0.20 \text{ kg} \pm 1.33 \text{ kg}$ in those who had not been informed by physicians about their overweight status ($p = < 0.001$). Respondents who reported that they had been informed by physicians of their overweight status were almost three times as likely to be successful in having lost $\geq 5\%$ of their body weight over the preceding year (2.78, 95% CI 1.37-5.63, $p = 0.006$).

Given that respondents reporting that a physician or health care provider had informed them of their overweight status emerged as an important predictor of successful weight loss, we also examined which demographic and clinical factors were associated with respondent-reported physician diagnosis of overweight. Results are shown in Table 4. Respondents with diabetes and a higher BMI were significantly more likely to report that they had been told by physician that they were overweight.

DISCUSSION

Our results suggest that weight loss in centrally obese cardiovascular patients entails complex clinical and cognitive determinants. Despite the impact of central obesity on cardiovascular health, only 59% of respondents in this nationally representative sample had attempted weight loss in the preceding year. Furthermore, of these only 26% of participants had been successful in losing $\geq 5\%$ of their body weight. New tailored effective interventions need to be developed for this prevalent and refractory problem of abdominal obesity.

About two-thirds of respondents reported that they had been informed of their overweight status by physicians. Our results are keeping with existing literature that suggests poor documentation of obesity as a diagnosis, and also poor documentation of an obesity management plan in overweight patients with cardiovascular disease, especially after MI. (12) In this analysis younger, more obese and diabetic participants were more likely to report that they had been diagnosed with overweight by physicians. This becomes more important in light of our finding that adults who reported that they had been told by their physician that they were overweight, were more likely to attempt weight loss and successfully lose weight. Data from Behavioral Risk Factor Surveillance Survey (BRFSS) have shown that physician advice about weight loss is associated with increased attempts at losing weight. (24-26) Our analysis extends findings from prior population-based studies by showing that physicians diagnosis of overweight was associated with significant ($\geq 5\%$) weight loss in the preceding year. (27)

Interestingly, Hispanic Americans in the sample had higher odds of being successful at having significant weight loss. Often research has shown that under-represented groups will have more negative health behaviors that will result in worse health outcomes. (28) More

investigation to explore ethnic differences in successful weight loss in CVD patients is needed.

Mean weight loss in our sample is small and consistent with the study published by Fadl and colleagues who reported only slight weight loss (0.2 %) in post-MI patients after one year. They also found that degree of weight loss in MI survivors was dependent on participants' initial grade of obesity. In our analysis as well, participants who had a BMI ≥ 30 kg/m² one year before they were surveyed lost more weight than participants with BMI < 30 kg/m². This could be due to greater social pressures to lose weight, or even greater differential recall of one's weight a year ago by more overweight respondents. It is important also to look at motivational status of these respondents. The majority, almost 90% of centrally obese participants with a BMI > 30 kg/m² were aware of their overweight status and wanted to weigh less; but only about half of these obese adults attempted to lose weight. Thus it appears that obese adults with cardiac disease and central obesity know that losing weight would be beneficial, but for unknown reasons most do not start a weight loss program. In a survey of adults in the community we found that while many overweight and obese adults wanted to lose weight, only a very small proportion combined caloric restriction and physical activity into their weight loss attempts.(29)

Motivational factors (awareness of overweight and desire to weigh less) emerged as important determinants of attempts at losing weight and not gaining weight in both age and sex-adjusted and multivariate models. However, no significant association of motivational factors with successful weight loss was found in this analysis. Intuitively, lack of an association of successful weight loss in the preceding year with self-perception of overweight and desire to weigh less, which was assessed at the time of interview, might be expected. The motivational variables reported here are analogous to the stages of change (precontemplation, contemplation, preparation, action and maintenance) as described in the Transtheoretical Model, which is well supported in smoking literature.(30,31) However, few studies have shown that the Transtheoretical Model might lack predictive utility for weight loss. To the best of our knowledge, this is the first analysis that explores the association of motivational factors with successful weight loss in patients with cardiovascular disease. Previously Kant and colleagues have reported association between motivational factors (except successful weight loss) in overweight adolescents using data from NHANES.(32)

Respondents who achieved ≥ 5 % weight losses ever were less likely to experience significant weight loss over the past year. Moreover, successful weight loss in the preceding year had a direct relationship with elapsed time since participants had reached their maximum weight. This supports existing literature from NHANES and National Weight Control Registry which suggests that weight regain is more common in those who had lost a greater percentage of their body weight.(33)

Our study is not without limitations. The question used to assess participants' self perception about overweight status is subject to self-interpretation, and information about what the word 'overweight' meant to respondents was not collected. We used self-reported body weights for calculating weight loss, and these are subject to errors and reporting biases which could vary by age, gender, ethnicity and overweight status.(34) Temporal or causal relationship of physician diagnosis with weight loss attempts cannot be assumed, even though the association may be strong. Our study and the available data lack information on mechanisms by which physician diagnosis could have led to increased weight loss attempts and successful weight loss. The survey question only asked whether the respondents had been informed of their overweight status by a physician. Information about the physician encounter where respondents were informed about their overweight status is not available in

NHANES. Hence it cannot be concluded if making a diagnosis of overweight was accompanied with a discussion of behaviors to promote weight loss.

Motivational factors were assessed at the time of interviewing and not a year prior to the interview before initiation of weight loss attempts. Hence, temporal transition between stages of change, per the Transtheroretical Model proposed by Prochaska and colleagues cannot be verified. Moreover, standardized instruments to measure each stage of change were not employed in NHANES. An important limitation of our analysis is that motivation of respondents to weigh less may have influenced their recall about physician diagnosis of overweight. In a cross-sectional study of outpatients, Flocke et al have shown that only 43-44% of patients actually were able to recall that a physician had given them advice about diet and exercise(35). Although demographic factors were not associated with recall, the time physician spent counseling was predictive of recall. Details on motivational characteristics were not evaluated in this study.

Our study also does not examine association of motivational factors and weight loss with depression and dysthymia in the community.(36) Unfortunately, depressive symptoms were evaluated in respondents aged 20-39 years in NHANES, and data on most cardiovascular patients was not available. Self-efficacy, an important factor that facilitates behavioral change, measures people's beliefs about their capabilities to produce designated levels of performance and a powerful predictor of successful weight loss and weight maintenance, (33) was not measured in NHANES.

Inspite of these limitations, our results underscore the important role that physicians may play in promoting weight loss in patients with cardiovascular disease. Increased recognition of obesity in cardiovascular patients and counseling by physicians may promote weight loss. Only randomized clinical trials may confirm a causal relationship and dose response between office-based physician counseling and weight loss in patients with CHD. Ideally, those studies should also identify the mechanisms through which a relatively brief office-based recommendation may induce behavioral change, and compare different ways to deliver the advice.

CONCLUSION

Our study adds to the growing literature about diagnosis and treatment of obesity in a broad spectrum of patients with cardiovascular disease. Physician diagnosis of overweight was associated not only with participants recognizing themselves as overweight; it was also predictive of participants desiring and attempting weight loss, participants trying to not gain weight and actually succeeding in losing their weight in a 12-month period. More research using prospective design is needed to confirm these associations.

ABBREVIATIONS

NHANES	National Health and Nutritional Examination Survey
NCHS	National Center for Health Statistics
BMI	Body mass index
ATP	Adult Treatment Panel
CHD	Coronary Heart Disease

References

1. Li C, Ford ES, McGuire LC, Mokdad AH. Increasing trends in waist circumference and abdominal obesity among US adults. *Obesity* (Silver Spring, Md Jan;2007 15(1):216–24.
2. Dagenais GR, Yi Q, Mann JF, Bosch J, Pogue J, Yusuf S. Prognostic impact of body weight and abdominal obesity in women and men with cardiovascular disease. *Am Heart J* Jan;2005 149(1):54–60. [PubMed: 15660034]
3. Zhang C, Rexrode KM, van Dam RM, Li TY, Hu FB. Abdominal obesity and the risk of all-cause, cardiovascular, and cancer mortality: sixteen years of follow-up in US women. *Circulation* Apr 1;2008 117(13):1658–67. [PubMed: 18362231]
4. Smith SC Jr, Blair SN, Bonow RO, Brass LM, Cerqueira MD, Dracup K, et al. AHA/ACC Scientific Statement: AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update: A statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation* Sep 25;2001 104(13):1577–9. [PubMed: 11571256]
5. Guidelines for management of ischaemic stroke and transient ischaemic attack 2008. *Cerebrovasc Dis* 2008;25(5):457–507. [PubMed: 18477843]
6. Romero-Corral A, Montori VM, Somers VK, Korinek J, Thomas RJ, Allison TG, et al. Association of bodyweight with total mortality and with cardiovascular events in coronary artery disease: a systematic review of cohort studies. *Lancet* Aug 19;2006 368(9536):666–78. [PubMed: 16920472]
7. Peiris AN, Sothmann MS, Hoffmann RG, Hennes MI, Wilson CR, Gustafson AB, et al. Adiposity, fat distribution, and cardiovascular risk. *Ann Intern Med* Jun 1;1989 110(11):867–72. [PubMed: 2655520]
8. Rexrode KM, Carey VJ, Hennekens CH, Walters EE, Colditz GA, Stampfer MJ, et al. Abdominal adiposity and coronary heart disease in women. *Jama* Dec 2;1998 280(21):1843–8. [PubMed: 9846779]
9. Lakka HM, Lakka TA, Tuomilehto J, Salonen JT. Abdominal obesity is associated with increased risk of acute coronary events in men. *Eur Heart J* May;2002 23(9):706–13. [PubMed: 11977996]
10. Kanaya AM, Vittinghoff E, Shlipak MG, Resnick HE, Visser M, Grady D, et al. Association of total and central obesity with mortality in postmenopausal women with coronary heart disease. *Am J Epidemiol* Dec 15;2003 158(12):1161–70. [PubMed: 14652301]
11. Kragelund C, Hassager C, Hildebrandt P, Torp-Pedersen C, Kober L. Impact of obesity on long-term prognosis following acute myocardial infarction. *Int J Cardiol* Jan;2005 98(1):123–31. [PubMed: 15676176]
12. Lopez-Jimenez F, Malinski M, Gutt M, Sierra-Johnson J, Aude Y Wady, Rimawi AA, et al. Recognition, diagnosis and management of obesity after myocardial infarction. *Int J Obes (Lond)* Jan;2005 29(1):137–41. [PubMed: 15520829]
13. Lang, RS.; Hensrud, DD. *Clinical preventive medicine*. 2nd ed. American Medical Association; Chicago: 2004. American Medical Association; p. 59-67.
14. Fadl YY, Krumholz HM, Kosiborod M, Masoudi FA, Peterson PN, Reid KJ, et al. Predictors of weight change in overweight patients with myocardial infarction. *Am Heart J* Oct;2007 154(4):711–7. [PubMed: 17892997]
15. Clark MM, King TK. Eating self-efficacy and weight cycling: a prospective clinical study. *Eat Behav* Sep;2000 1(1):47–52. [PubMed: 15001066]
16. Clark MM, Cargill BR, Medeiros ML, Pera V. Changes in self-efficacy following obesity treatment. *Obes Res* Mar;1996 4(2):179–81. [PubMed: 8681051]
17. NHANES III Reference Manuals. [December 8, 2008]. 1994 Available from:http://www.cdc.gov/nchs/about/major/nhanes/NHANESIII_Reference_Manuals.htm
18. Grundy SM, Brewer HB Jr, Cleeman JI, Smith SC Jr, Lenfant C, for the Conference Participants. Definition of Metabolic Syndrome: Report of the National Heart, Lung, and Blood Institute/ American Heart Association Conference on Scientific Issues Related to Definition. *Circulation* January 27;2004 109(3):433–8. 2004. [PubMed: 14744958]

19. Lavie CJ, Milani RV. Effects of cardiac rehabilitation, exercise training, and weight reduction on exercise capacity, coronary risk factors, behavioral characteristics, and quality of life in obese coronary patients. *Am J Cardiol* Feb 15;1997 79(4):397–401. [PubMed: 9052338]
20. Eilat-Adar S, Eldar M, Goldbourt U. Association of intentional changes in body weight with coronary heart disease event rates in overweight subjects who have an additional coronary risk factor. *Am J Epidemiol* Feb 15;2005 161(4):352–8. [PubMed: 15692079]
21. Lavie CJ, Milani RV, Artham SM, Patel DA, Ventura HO. The obesity paradox, weight loss, and coronary disease. *Am J Med* Dec;2009 122(12):1106–14. [PubMed: 19682667]
22. Lavie CJ, Milani RV, Ventura HO. Obesity and cardiovascular disease: risk factor, paradox, and impact of weight loss. *J Am Coll Cardiol* May 26;2009 53(21):1925–32. [PubMed: 19460605]
23. Research Triangle Park N, inventor SUDAAN Research Triangle release 9.0.32007
24. Galuska DA, Will JC, Serdula MK, Ford ES. Are health care professionals advising obese patients to lose weight? *Jama* Oct 27;1999 282(16):1576–8. [PubMed: 10546698]
25. Sciamanna CN, Tate DF, Lang W, Wing RR. Who reports receiving advice to lose weight? Results from a multistate survey. *Arch Intern Med* Aug 14–28;2000 160(15):2334–9. [PubMed: 10927731]
26. Bish CL, Blanck HM, Serdula MK, Marcus M, Kohl HW, Khan LK. Diet and physical activity behaviors among Americans trying to lose weight: 2000 Behavioral Risk Factor Surveillance System. *Obes Res* Mar;2005 13(3):596–607. [PubMed: 15833946]
27. Rodondi N, Humair JP, Ghali WA, Ruffieux C, Stoianov R, Seematter-Bagnoud L, et al. Counselling overweight and obese patients in primary care: a prospective cohort study. *Eur J Cardiovasc Prev Rehabil* Apr;2006 13(2):222–8. [PubMed: 16575276]
28. Murray CJ, Kulkarni SC, Michaud C, Tomijima N, Bulzacchelli MT, Iandiorio TJ, et al. Eight Americas: investigating mortality disparities across races, counties, and race-counties in the United States. *PLoS Med* Sep;2006 3(9):e260. [PubMed: 16968116]
29. Kottke TE, Clark MM, Aase LA, Brandel CL, Brekke MJ, Brekke LN, et al. Self-reported weight, weight goals, and weight control strategies of a midwestern population. *Mayo Clin Proc* Feb;2002 77(2):114–21. [PubMed: 11838644]
30. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. *Am J Health Promot* Sep-Oct;1997 12(1):38–48. [PubMed: 10170434]
31. Grimshaw GM, Stanton A. Tobacco cessation interventions for young people. *Cochrane Database Syst Rev*. 2006;(4) CD003289.
32. Kant AK, Miner P. Physician advice about being overweight: association with self-reported weight loss, dietary, and physical activity behaviors of US adolescents in the National Health and Nutrition Examination Survey, 1999–2002. *Pediatrics* Jan;2007 119(1):e142–7. [PubMed: 17200241]
33. McGuire MT, Wing RR, Klem ML, Lang W, Hill JO. What predicts weight regain in a group of successful weight losers? *J Consult Clin Psychol* Apr;1999 67(2):177–85. [PubMed: 10224727]
34. Gillum RF, Sempos CT. Ethnic variation in validity of classification of overweight and obesity using self-reported weight and height in American women and men: the Third National Health and Nutrition Examination Survey. *Nutr J* 2005;4:27. [PubMed: 16209706]
35. Flocke SA, Stange KC. Direct observation and patient recall of health behavior advice. *Prev Med* Mar;2004 38(3):343–9. [PubMed: 14766118]
36. Clark MM, Hanna BK, Mai JL, Graszler KM, Krochta JG, McAlpine DE, et al. Sexual abuse survivors and psychiatric hospitalization after bariatric surgery. *Obes Surg* Apr;2007 17(4):465–9. [PubMed: 17608258]

table 1

Demographic, socioeconomic, clinical and motivational characteristics in centrally obese adults with cardiovascular disease by BMI group *

	BMI < 30 N=389	BMI ≥ 30 N=518
	N (%)	N (%)
Age categories, in years		
Less than 50	25 (12)	70 (20)
50-65	81 (28)	166 (35)
More than 65	283 (60)	282 (45)
Gender		
Male	173 (42)	252 (47)
female	216 (58)	266 (53)
Ethnicity		
Caucasian	261 (85)	287 (77)
Hispanic	76 (7)	94 (6)
African American	45 (6)	124 (14)
Others	7 (2)	13 (3)
Poverty income ratio		
Less than 1	58 (11)	112 (20)
1-2	119 (30)	144 (28)
2-3	59 (16)	81 (18)
3-4	44 (14)	44 (13)
More than 4	77 (29)	93 (21)
Education		
Less than high school	261 (61)	354 (63)
High school or more	128 (39)	164 (37)
Smoker		
Current smoker	60 (23)	69 (16)
Former smoker	164 (38)	233 (44)
Never smoker	165 (40)	216 (40)
Medically Insured		
No	29 (8)	47 (9)
yes	358 (92)	463 (91)
Diabetes		
No	305 (82)	336 (68)
yes	82 (18)	182 (32)
Hypertension		
No	99 (29)	102 (23)
Yes	290 (71)	416 (77)
Hyperlipidemia		
No	151 (38)	197 (39)

	BMI < 30 N=389	BMI ≥ 30 N=518
	N (%)	N (%)
Yes	238 (62)	321 (61)
Aware of overweight status		
No	187 (39)	54 (9)
Yes	201 (61)	464 (91)
Desirous of weighing less		
No	167 (34)	48 (9)
Yes	221 (66)	470 (91)
Attempted weight loss		
No	267 (63)	218 (41)
Yes	122 (37)	300 (59)
Tried to Maintain Weight		
No	259 (59)	254 (46)
Yes	130 (41)	263 (54)
Lost ≥ 5% weight		
No	294 (85)	411 (87)
Yes	47 (15)	78 (13)

table 2

Age and sex-adjusted odds ratios for attempted weight loss, attempts at not gaining weight and successful weight loss.

	Attempted weight loss OR (95% CI)	Tried to maintain weight OR (95% CI)	Successful weight loss OR (95% CI)
Age categories			
Less than 50	1.49 (0.85-2.62)	1.29 (0.71-2.34)	0.81 (0.35-1.86)
50-65	1.95 (1.34-2.82)	1.48 (1.00-2.19)	1.57 (0.93-2.66)
More than 65 (<i>reference</i>)	-	-	-
Gender			
Male (<i>reference</i>)	-	-	-
Female	1.20 (0.86-1.68)	0.77(0.60-0.98)	1.23 (0.75-2.03)
Ethnicity			
Caucasian (<i>reference</i>)	-	-	-
Hispanic American	0.99 (0.50-1.94)	0.66 (0.36-1.18)	3.29 (1.91-5.66)
African American	1.18 (0.76-1.83)	0.85 (0.57-1.28)	1.85 (0.87- 3.93)
Others	2.24 (0.58-8.66)	1.10 (0.42-2.86)	2.61 (0.99-6.85)
Poverty income ratio			
Less than 1 (<i>reference</i>)	-	-	-
1-2	1.11 (0.68-1.79)	1.06 (0.66-1.69)	0.77 (0.34-1.73)
2-3	1.41 (0.87-2.28)	2.08 (1.33-3.25)	0.42 (0.19-0.96)
3-4	1.05 (0.53-2.06)	1.97 (1.02-3.79)	0.11 (0.03-0.39)
More than 4	1.55 (0.90-2.69)	2.42 (1.47-3.99)	0.69 (0.29-1.61)
Medically Insured			
No (<i>reference</i>)	-	-	-
Yes	1.76 (0.91-3.42)	2.10 (1.08-4.06)	0.80 (0.31-2.11)
Education			
Less than high school(<i>reference</i>)	-	-	-
More than high school	1.42 (1.00-2.03)	1.82 (1.28-2.59)	1.09 (0.58-2.04)
Smoking status			
Never smoker(<i>reference</i>)	-	-	-
Former smoker	1.70 (1.08-2.67)	1.15 (0.77-1.95)	0.59 (0.36-0.97)
Current smoker	0.96 (0.55-1.68)	0.88 (0.51-1.51)	0.92 (0.44-1.91)
BMI			
Less than 30 (<i>reference</i>)	-	-	-
30-40	1.66 (1.07-2.56)	1.40 (0.90-2.17)	4.30 (1.98-9.32)
More than 40	5.50 (1.78-17.00)	1.72 (0.88-3.36)	19.19 (6.38 - 57.67)
Successful weight loss in past			
No (<i>reference</i>)	-	-	-
yes	1.03 (0.73-1.46)	1.15 (0.81-1.63)	2.79 (1.66-4.70)
Time since maximum weight (years)	0.98 (0.97-0.99)	0.99 (0.98-1.0)	1.01 (0.99-1.02)
Physician diagnosis of overweight			

	Attempted weight loss OR (95% CI)	Tried to maintain weight OR (95% CI)	Successful weight loss OR (95% CI)
No (<i>reference</i>)	-	-	-
yes	3.18 (2.32-4.37)	2.31 (1.55-3.45)	2.23 (1.30-3.81)
Diabetes			
No (<i>reference</i>)	-	-	-
Yes	1.53(1.00-2.34)	1.18(0.81-1.72)	1.90 (1.14-3.17)
Hypertension			
No (<i>reference</i>)	-	-	-
Yes	1.43 (0.88-2.33)	0.94 (0.59-1.47)	2.80 (1.16-6.75)
Dyslipidemia			
No(<i>reference</i>)	-	-	-
Yes	1.06 (0.67-1.67)	0.83 (0.52-1.33)	0.63 (0.34-1.14)
Awareness of overweight			
No (<i>reference</i>)	-	-	-
Yes	4.57 (2.71-7.70)	2.98 (1.97-4.51)	0.82 (0.42-1.59)
Desirous of weighing less			
No (<i>reference</i>)	-	-	-
Yes	5.47 (3.14-9.54)	4.71 (2.97-7.46)	0.71 (0.35-1.41)

table 3

Multivariable logistic regression for attempts at losing weight, attempts at maintaining weight and successful weight loss.

covariate	Attempted weight loss N=802 OR (95% CI)	Tried to maintain weight N=803 OR (95% CI)	Successful weight loss N=740 OR (95% CI)
Age categories			
Less than 50	1.47 (0.66- 3.25)	1.19 (0.56-2.53)	0.97 (0.32-2.94)
50-65	1.69 (1.11-2.56)	1.30 (0.80-2.11)	1.99 (0.96-4.13)
More than 65 (<i>reference</i>)	-	-	-
Gender			
Male (<i>reference</i>)	-	-	-
Female	1.31 (0.93-1.86)	0.84 (0.58-1.20)	1.04 (0.51-2.13)
Ethnicity			
Caucasian (<i>reference</i>)	-	-	-
Hispanic American	1.21 (0.55-2.66)	0.73 (0.39-1.36)	2.57 (1.27-5.19)
African American	1.58 (0.95-2.62)	1.13 (0.66-1.93)	1.54(0.64-3.71)
Others	2.40 (0.77-7.50)	0.71 (0.36-1.39)	2.03 (0.84-4.90)
Poverty income ratio			
Less than 1 (<i>reference</i>)	-	-	-
1-2	1.09 (0.63-1.89)	0.76 (0.46-1.25)	1.08 (0.50-2.34)
2-3	1.10(0.55-2.20)	1.37 (0.84- 2.22)	0.59 (0.24-1.44)
3-4	1.06 (0.49-2.29)	1.35 (0.66-2.75)	0.12 (0.03-0.50)
More than 4	1.31 (0.60-2.90)	1.38 (0.73-2.62)	0.72 (0.28-1.85)
Education			
Less than high school (<i>reference</i>)	-	-	-
More than high school	1.33 (0.87- 2.04)	1.56 (1.07-2.27)	1.36 (0.65- 2.84)
Smoking status			
Never smoker (<i>reference</i>)	-	-	-
Former smoker	1.63 (0.97-2.73)	0.98 (0.61-1.57)	0.58 (0.34-0.98)
Current smoker	1.28 (0.67-2.48)	1.08 (0.62-1.89)	0.89 (0.41-1.96)
Medically Insured			
No (<i>reference</i>)	-	-	-
Yes	1.40(0.63-3.08)	1.96(0.90-4.28)	1.02 (0.37-2.82)
BMI category			
25-30 (<i>reference</i>)	-	-	-
30-40	1.11 (0.64-1.93)	0.91 (0.56-1.48)	0.56 (0.30-1.05)
More than 40	1.43 (0.53-3.85)	0.99 (0.48-2.01)	0.46 (0.14-1.49)
History of significant weight loss in past (>5 percent)			
Yes (<i>reference</i>)	-	-	-
No	1.04 (0.66-1.64)	1.21 (0.80-1.83)	4.69 (2.45-8.96)
Time that has elapsed since maximum weight (years)	1.0 (0.98-1.01)	1.0 (0.99-1.01)	1.02 (1.0-1.4)

covariate	Attempted weight loss N=802 OR (95% CI)	Tried to maintain weight N=803 OR (95% CI)	Successful weight loss N=740 OR (95% CI)
Physician diagnosis of overweight			
No (<i>reference</i>)	-	-	-
yes	2.31 (1.33-4.00)	2.49 (1.72-3.62)	2.78 (1.37-5.63)
Diabetes			
No (<i>reference</i>)	-	-	-
Yes	1.19(0.71-1.98)	1.12 (0.69-1.82)	1.45 (0.83-2.53)
Hypertension			
No (<i>reference</i>)	-	-	-
Yes	1.10(0.67-1.82)	0.72 (0.45-1.15)	2.39 (1.00-5.72)
Hyperlipidemia			
No (<i>reference</i>)	-	-	-
Yes	1.18 (0.80-1.75)	0.88 (0.58-1.32)	0.93 (0.49-1.74)
Awareness of overweight			
No (<i>reference</i>)	-	-	-
yes	1.38 (0.58-3.28)	0.64 (0.26-1.54)	0.92(0.27-3.12)
Desirous of weighing less			
No (<i>reference</i>)	-	-	-
Yes	3.37(1.51-7.52)	5.11 (2.25-11.61)	0.89 (0.26-3.05)

All models are adjusted for age, gender, ethnicity, poverty income ratio, education, smoking, Insurance status, BMI, diabetes, hypertension, hyperlipidemia, history of cardiovascular disease, weight loss history, awareness of overweight and desire to weigh less

table 4

Predictors of physician diagnosis of overweight in centrally obese patients with CVD

	Physician informed participants they were overweight (n=560) n (%)	Physician did not inform them that they were overweight (n=347) n (%)	P
Age categories			
Less than 50	66 (18)	29 (15)	0.40
50 to 65	172 (33)	75 (30)	
More than 65	322 (49)	243 (55)	
Gender			
Male	270 (47)	155 (43)	0.29
Female	290 (53)	192 (57)	
Ethnicity			
Caucasian	318 (79)	230 (83)	0.40
Hispanic	115 (7)	55 (5)	
African American	113 (12)	56 (9)	
Others	14 (2)	6 (3)	
Poverty income ratio			
Less than 1	109 (16)	61 (15)	0.49
1-2	158 (30)	105 (27)	
2-3	88 (17)	52 (17)	
3-4	50 (11)	38 (16)	
More than 4	105 (25)	65 (25)	
Education			
Less than high school	375 (34)	240 (64)	0.80
High school or more	185 (38)	107 (36)	
Medically Insured			
Yes	498 (91)	323 (92)	0.68
No	52 (9)	24 (8)	
Smoker			
Current smoker	72 (16)	57 (23)	0.06
Former smoker	256 (44)	141 (38)	
Never smoker	232 (40)	149 (39)	
Self reported BMI kg/m²			
Less than 30	186 (34)	263 (75)	<0.0001
30 -40	327 (55)	78(24)	
More than 40	46 (11)	4 (1)	
Actual BMI kg/m²			
Less than 30	24 (141)	72 (248)	<0.0001
30 -40	65 (354)	27 (94)	
More than 40	12 (65)	2 (5)	
Diabetes			

	Physician informed participants they were overweight (n=560) n (%)	Physician did not inform them that they were overweight (n=347) n (%)	P
No	68 (359)	83 (282)	0.0001
Yes	32 (200)	17 (64)	
Hypertension			
No	22(110)	32(91)	0.01
Yes	78(450)	68(256)	
Dyslipidemia			
No	35(199)	198 (57)	0.09
Yes	65(361)	149 (43)	