BMJ Open

Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-016364
Article Type:	Research
Date Submitted by the Author:	10-Feb-2017
Complete List of Authors:	Ladapo, Joseph; University of California Los Angeles David Geffen School of Medicine, Medicine Coles, Adrian; Duke Clinical Research Institute Dolor, Rowena; Duke Clinical Research Institute Mark, Daniel; Duke Clinical Research Institute Cooper, Lawton; National Heart Lung and Blood Institute Lee, Kerry; Duke Clinical Research Institute Goldberg, Jonathan; Louis Stokes VA Medical Center Shapiro, Michael; Oregon Health and Science University Hoffmann, Udo; Massachusetts General Hospital, Radiology Douglas, Pamela; Duke Clinical Research Institute
Primary Subject Heading:	Cardiovascular medicine
Secondary Subject Heading:	Epidemiology
Keywords:	coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study

Joseph A. Ladapo, MD, PhD,[1] Adrian Coles, PhD,[2] Rowena J. Dolor, MD, MHS,[2] Daniel B. Mark, MD, MPH,[2] Lawton Cooper, MD,[3] Kerry L. Lee, PhD,[2] Jonathan Goldberg, MD,[4] Michael D. Shapiro, DO,[5] Udo Hoffmann, MD, MPH,[6] Pamela S. Douglas, MD[2]

[1]Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California; [2]Duke Clinical Research Institute, Duke University School of Medicine, Durham, North Carolina; [3]National Heart, Lung, and Blood Institute, Bethesda, Maryland; [4]Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio; [5]Oregon Health and Science University, Portland, Oregon; [6]Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Address correspondence to: Joseph A. Ladapo, MD, PhD; David Geffen School of Medicine at UCLA; Department of Medicine; Division of General Internal Medicine and Health Services Research; 911 Broxton Ave.; Los Angeles, CA 90024; Phone: 310-794-2728 Fax: 310-794-0732; Email: jladapo@mednet.ucla.edu

Word count: 2593

Support: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235

Prior presentation: Presented at American College of Cardiology Scientific Sessions on April 2, 2016

Number of Tables, Figures, and Appendices: 2 Tables, 2 Figures, 1 Appendix

ABSTRACT

Objectives—To evaluate potential gaps in preventive medical therapy and healthy lifestyle practices among symptomatic patients with suspected coronary artery disease (CAD) seeing primary care physicians and cardiologists, and how gaps vary by sociodemographic characteristics and baseline cardiovascular risk.

Design—Cross sectional study assessing potential preventive gaps

Participants—10,003 symptomatic outpatients evaluated by primary care physicians, cardiologists, or other specialists for suspected CAD.

Setting—PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) from 2010-2014.

Measures—Primary measures were absence of an antihypertensive, statin, or angiotensin-converting enzyme inhibitor/angiotensin receptor blocker for renal protection in patients with hypertension, dyslipidemia, or diabetes, respectively, and being sedentary, smoking, or being obese.

Results—Preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. Overall, 49% of patients were sedentary, 18% currently smoked, and 48% were obese. Women were significantly more likely to not take a statin for dyslipidemia and to be sedentary. Patients with lower socioeconomic status were also significantly more likely to not take a statin. Compared to Whites, Blacks were significantly more likely to be obese, while Asians were less likely to smoke or be obese. High-risk patients sometimes experienced larger preventive care gaps than low-risk patients.

Conclusions—Among contemporary, symptomatic patients with suspected CAD, significant gaps exist in preventive care and lifestyle practices, and high-risk patients sometimes had larger

gaps. Differences by sex, age, race/ethnicity, socioeconomic status, and geography are modest but contribute to disparities and have implications for improving population health.

Clinical Trial Registration—clinicaltrials.gov Identifier NCT01174550

Keywords: coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Abbreviations: CAD - coronary artery disease; CTA - computed tomographic angiography; PROMISE - PROspective Multicenter Imaging Study for Evaluation of Chest Pain; ACEi/ARB - angiotensin-converting enzyme inhibitor or angiotensin receptor blocker use; BMI - body mass index

Strengths and limitations of this study

- Studied 10,003 patients without diagnosed CAD whose physicians believed that noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD.
- Focused on 6 potential gaps in preventive care demonstrated to increase the risk of cardiovascular disease.
- Focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography.
- Measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results.

Preventive medical care and lifestyle practices reduce the risk of adverse cardiovascular events[1,2] and may influence how likely a patient is to present to their primary care physician or cardiologist with symptoms suggestive of coronary artery disease (CAD). In the United States, approximately 4 million of these patients are referred for outpatient cardiac stress testing or coronary computed tomographic angiography (CTA) each year.[3] Although most have significant risk factors for adverse cardiovascular events, such as hypertension, dyslipidemia, and diabetes,[4,5] little is known about their preventive medical and lifestyle practices prior to presentation, the extent to which these preventive measures differ from national recommendations and guidelines,[6-9] or their relationship with sociodemographic and socioeconomic disparities. Understanding these patterns and characterizing the magnitude of medical or lifestyle gaps—that is, the difference between recommended preventive care and actual preventive care—is a critical step toward preventing disease and reducing adverse cardiovascular events in this population, independent of the outcome of diagnostic testing. Further, if preventive care varies by sociodemographic characteristics, this variation may contribute to important health disparities and identify populations in need of specific targeting. To identify opportunities for improving preventive care in this population, we used data from symptomatic patients in the PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) to (1) evaluate potential gaps in preventive medical therapy among patients with hypertension, dyslipidemia, or diabetes; (2) determine the extent to which these gaps differed by patients' baseline risk; (3) evaluate gaps in healthy lifestyle practices, as defined by being sedentary, smoking, or being obese; and (4) determine which gaps vary by sex, age, race/ethnicity, socioeconomic status, and geography.

Methods

Study Design

Methods used in PROMISE have been described previously.[4,10] The study protocol was approved by the local or central institutional review board at each coordinating center and at each enrolling site in North America. We enrolled symptomatic outpatients without diagnosed CAD whose physicians believed that non-urgent, noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD. After providing written informed consent, 10,003 eligible patients were randomly assigned to either anatomical testing with CTA or functional testing with exercise electrocardiography, nuclear stress, or stress echocardiography.[10] Enrollment began on July 27, 2010, and was completed on September 19, 2013. All the patients were followed until October 31, 2014. Analyses were performed in 2016.

Gaps in Preventive Medications and Lifestyle Practices

At the time of enrollment, information about preventive medication use and lifestyle practices was collected by the clinical sites through patient report, chart review, and other clinical sources. We focused on 6 potential gaps in preventive care that have been demonstrated to increase the risk of cardiovascular disease[1,11]: absence of an antihypertensive medication in patients with hypertension, absence of a statin in patients with dyslipidemia, absence of an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ACEi/ARB) for renal protection in patients with diabetes, being sedentary, smoking, and being obese, as determined by a body mass index (BMI) exceeding 30. Because patients had to be eligible for randomization to either CTA or functional testing, no patients known to have renal dysfunction were enrolled.

Hypertension, Dyslipidemia, and Diabetes

Among our symptomatic patients, absence of antihypertensive medication in patients with hypertension was defined as a preventive care gap because of evidence that treating patients with this comorbidity reduces the risk of cardiovascular events[12] and because treatment is consistent with recommendations issued by the American Society of Hypertension, International Society of Hypertension,[13] and American Heart Association.[14] Absence of a statin in patients with dyslipidemia was considered a preventive care gap because statin use in primary and secondary prevention has been shown to reduce cardiovascular risk.[15,16] The median atherosclerotic cardiovascular disease (ASCVD) score in our population was 11.3% with an interquartile range (IQR) of 6.1% to 19.8%, well above the 10-year risk threshold of 7.5% for treatment in most participants.[17] Applying lower ASCVD thresholds for statin therapy has also been shown to be cost-effective.[18] Absence of an ACEi/ARB for renal protection in patients with diabetes was considered a preventive care gap because the vast majority of diabetics in our population were hypertensive (79.9%) and prophylactic use of ACEi/ARBs reduces the incidence of albuminuria,[19-21] which has been shown to be a risk factor for cardiovascular[22] and overall mortality in patients with diabetes.[23,24]

Physical Inactivity, Smoking, and Obesity

Being sedentary, smoking, and being obese have all been demonstrated to increase cardiovascular risk and therefore represent important gaps in preventive lifestyle practices.[1] We assessed the prevalence of these lifestyle practices across all patients in our cohort. To assess activity level, we asked, "During the past month, did you participate in any physical activities or exercise regularly (1 or more times per week)? Examples include: running, aerobics, golf,

gardening, walking, etc." (*yes* or *no*). To assess smoking, we asked, "Have you smoked in the past two weeks?" (*yes* or *no*).

Demographics and Socioeconomics

We focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography. Race/ethnicity was reported by the patient and categorized into the following mutually exclusive groups: White; Black; American Indian/Alaska Native, Native Hawaiian/Other Pacific Islanders; and Asian (not including any Hispanics) and Hispanics (from any racial/ethnic group).[25] Socioeconomic status was defined by the median household income of the patient's zip code based on data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates), similar to prior work.[26-29] Socioeconomic status was categorized into quartiles from lowest to highest median household income (low, medium-low, medium-high, and high). We used the following US Census categories for geographic regions: Northeast, Midwest, West, and South.

Statistical Analysis

Analyses were based on patient status at presentation for CAD evaluation. P values of less than 0.05 were considered significant. We estimated summary statistics for gaps in preventive care and lifestyle practices and constructed multivariable logistic regression models to assess the association of patients' sociodemographic characteristics (sex, age, race/ethnicity, socioeconomic status, and geography) at presentation with these gaps, while controlling for baseline risk (for blood pressure: systolic <140 mmHg and diastolic <90 mmHg, systolic 140 to 159 mmHg or diastolic 90 to 99 mmHg, and systolic ≥160 mmHg or diastolic ≥100 mmHg; for

ASCVD: <7.5%, 7.5% to <15%, and ≥15%), other clinical characteristics, and physician specialty (see Appendix Tables 2.1 and 2.2 for fully reported regression results). In addition to estimating covariate-adjusted odds ratios and their corresponding 95% confidence intervals, the fitted models were used to compute covariate-adjusted probabilities[30] (also known as "predictive margins") of gaps in preventive medication use and healthy lifestyle practices, with stratification by sociodemographic characteristics. In these analyses, the regression models predict proportions for each sociodemographic characteristic, while holding the distribution of all other covariates constant. We excluded 4% of patients in PROMISE from our multivariable analyses because we were unable to match their reported zip codes to US Census Bureau data. Statistical analyses were performed using SAS software, version 9.2 or higher (SAS Institute, Cary, NC).

Results

Symptomatic Patients: Characteristics and Baseline Risk

Characteristics of the 10,003 symptomatic patients (88% with chest pain/dyspnea, 12% with other symptoms) presenting to their primary care physicians, cardiologists, or other specialists are summarized in Table 1. The median age of the cohort was 60.0 years (IQR, 54.4-66.0 years), and 52.7% were women. Whites composed 77.4% of the cohort, and Blacks and Hispanics composed 10.8% and 7.7%, respectively. Asians composed 2.5% of the cohort, and people of other/unknown race/ethnicity composed 1.6% of the cohort. Patients in the lowest socioeconomic quartile lived in zip codes with a median household income less than $42,610, while patients in the highest socioeconomic quartile lived in zip codes with median household income of at least $71,059 annually.

Preventive Medical and Lifestyle Gaps

Overall, the prevalences of hypertension, dyslipidemia, and diabetes were 65.0% (N=6501), 67.7% (N=6767), and 21.4% (N=2144), respectively. Among these symptomatic patients, preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. In our examination of preventive lifestyle practices, 49% of all patients were sedentary, 18% were current smokers, and 48% were obese.

Association of Preventive Care Gaps with Sex, Age, and Race/Ethnicity

Adjusted odds ratios for the association between patient characteristics and preventive care gaps are presented in Table 2, and covariate-adjusted probabilities of preventive care gaps are presented in Figures 1 and 2. Women were significantly more likely than men to not take a statin for dyslipidemia (OR 1.33, 95% CI 1.18-1.50) and to be sedentary (OR 1.55, 95% CI 1.41-1.70). Older patients were significantly less likely than the youngest patients to not be taking a statin for dyslipidemia (65-79 years: OR 0.64, 95% CI 0.55-0.75; ≥80 years: OR 0.59, 95% CI 0.38-0.92) and to smoke (65-79 years: OR 0.23, 95% CI 0.19-0.27; ≥80 years: OR 0.04, 95% CI 0.01-0.13). There were no significant differences in preventive medications by patients' race/ethnicity, but differences existed in preventive lifestyle practices: compared to White patients, Blacks were significantly more likely to be obese (OR 1.55, 95% CI 1.31-1.84), while Asians were less likely to smoke (OR 0.49, 95% CI 0.30-0.80) or be obese (OR 0.16, 95% CI 0.11-0.24). There were no significant differences in preventive lifestyle practices of Hispanics compared to Whites.

Variation in Preventive Care Gaps Between Higher and Lower Risk Symptomatic Patients

The prevalence of preventive medical therapy gaps varied by patient risk. Among symptomatic patients with hypertension, those at the highest overall cardiovascular risk (ASCVD ≥15%) were less likely to not be on an antihypertensive than patients at the lowest overall cardiovascular risk (ASCVD <7.5%) (OR 0.45, 95% CI 0.34-0.58), but patients with the highest blood pressure (≥160/100) were more likely to not be on an antihypertensive than patients with the lowest blood pressure (<140/90) (OR 1.54, 95% CI 1.19-1.99). Among patients with dyslipidemia, those at the highest overall cardiovascular risk (OR 1.22, 95% CI 1.01-1.47) and with the highest blood pressure (OR 1.28, 95% CI 1.03-1.59) were more likely to not be on a statin, compared to patients with the lowest cardiovascular risk or lowest blood pressure. Among patients with diabetes, those at the highest overall cardiovascular risk were less likely to not be on an ACEi/ARB than patients at the lowest overall cardiovascular risk (OR 0.64, 95% CI 0.42-0.97) (Appendix Table 2.1).

Association of Preventive Care Gaps With Socioeconomic Status/Geography

Compared to symptomatic patients with the highest socioeconomic status, patients with a medium-high socioeconomic status were more likely to not receive an antihypertensive for hypertension (OR 1.25, 95% CI 1.01-1.55), while patients with the lowest socioeconomic status were more likely to not receive a statin for dyslipidemia (OR 1.20, 95% CI 1.02-1.41) (Table 2, Figure 2). Patients with lower socioeconomic status were also more likely to be sedentary (Low: OR 1.45, 95% CI 1.28-1.65; Medium-low: OR 1.20, 95% CI 1.07-1.36; Medium-high: OR 1.18, 95% CI 1.05-1.32) and smoke (Low: OR 2.00, 95% CI 1.68-2.38; Medium-low: OR 1.63, 95% CI 1.38-1.94; Medium-high: OR 1.52, 95% CI 1.28-1.80) than patients with the highest

socioeconomic status (Table 2), and these differences were more pronounced as socioeconomic status fell. Regional differences were common: compared to patients in the South, patients living in the West were more likely to not receive antihypertensives for hypertension (OR 1.32, 95% CI 1.08-1.63) and not receive statins for dyslipidemia (OR 1.31, 95% CI 1.13-1.52). Compared to patients in the South, patients in all other US regions were less likely to be sedentary (Midwest: OR 0.58, 95% CI 0.52-0.65; Northeast: OR 0.63, 95% CI 0.55-0.72; West: OR 0.68, 95% CI 0.61-0.77), and patients in the West were less likely to smoke (OR 0.76, 95% CI 0.65-0.90), while patients in the Midwest were more likely to be obese (OR 1.23, 95% CI 1.08-1.41).

Discussion

In the PROMISE trial population, we found that symptomatic patients presenting to their primary care physicians, cardiologists, or other specialists with suspected CAD have a high prevalence of risk factors for adverse cardiovascular events, with many of these risk factors representing missed opportunities to improve preventive medical care and lifestyle practices. We identified populations that should be targeted for interventions based on their sex, age, race/ethnicity, socioeconomic status, and geography. While some of the preventive care gaps were smaller in symptomatic patients at higher risk, others were larger or unassociated with baseline risk. Finally, our results support the notion that wider adherence to preventive medication and lifestyle practices may alter the epidemiology of chest pain presentations and reduce the incidence of evaluations for CAD.[31]

Our findings of gaps in preventive care and differences in these gaps across important sociodemographic characteristics complement the work of others. For example, in a study of patients with cardiovascular disease in the US Veterans Affairs health system, women were less

likely to receive a statin than men.[32] In another study of patients with peripheral artery disease, patients living in low socioeconomic status areas, as defined by median household income, were less likely to receive statins than patients living in higher socioeconomic status areas.[28] Racial/ethnic differences in exercise participation, smoking, and obesity have also been reported.[25,33] However, our work extends and broadens the findings of these studies because (1) our study focused on actively symptomatic patients, whose presentation may be attributable to gaps in prevention; and (2) we simultaneously accounted for a wider range of sociodemographic characteristics.

By assessing the relationship between baseline risk and preventive gaps, we showed that there was a trend toward lower preventive care gaps among symptomatic patients with high ASCVD scores but higher preventive care gaps among symptomatic patients with elevated blood pressure. Our data also reflect more recent care preventive patterns across a broad geographic and socioeconomic sample. Our explicit inclusion of multiple racial/ethnic groups—particularly Asians—is also an advance for research in cardiovascular disease disparities, where previous comparisons have often been limited to Whites and Blacks only.[29,33-35] Our findings of disparities in preventive care are therefore more comprehensive and robust.

Similar to other studies of gaps in preventive care, our results highlight the importance of public health and policy initiatives aimed at bolstering primary prevention. Policy initiatives, such as the Million Hearts campaign, now leverage public-private partnerships and large investments in state and community programs to improve aspirin use in patients with CAD, blood pressure control among patients with hypertension, cholesterol management, and smoking cessation.[36,37] In addition, our findings reinforce the potential benefits of public and private policies that eliminate marginal cost-sharing for cholesterol and hypertension screening, obesity

screening and counseling, and smoking cessation services.[38] Gaps in preventive care also highlight opportunities for making diagnostic testing a "teachable moment" for symptomatic patients in this population—and for the primary care physicians and cardiologists caring for them.

Our study has important limitations. There may have been patients whose hypertension or dyslipidemia were well-controlled with dietary changes and exercise alone. Among diabetics, we did not have clinical information about albuminuria, so there may have been patients for whom the benefit of ACEi/ARB therapy was uncertain. In addition, our measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results. Our use of BMI as a surrogate for body fatness and obesity identification is also vulnerable to misclassification, since sex, age, race/ethnicity, and muscle mass influence the relationship between BMI and excess fat.

In conclusion, among contemporary, symptomatic patients presenting to primary care physicians, cardiologists, and other specialists with suspected CAD, opportunities exist to bridge significant gaps in preventive care and lifestyle practices and reduce the incidence of future CAD. Differences by sex, age, race/ethnicity, socioeconomic status, and geography tend to be modest but contribute to disparities and identify populations that should be targeted for interventions.

Acknowledgments

Author Contributions: AC had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Study concept and design: JL, PD

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: AC, KL

Source of Funding: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235. The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The views expressed in this article do not necessarily represent the official views of the National Heart, Lung, and Blood Institute.

Disclosures: Dr. Ladapo's work is supported by the National Heart, Lung, and Blood Institute (K23 HL116787) and he serves as a consultant to CardioDx, Inc. Dr. Douglas has received grant support from HeartFlow and serves on a data and safety monitoring board for General Electric Healthcare; Dr. Hoffmann has received grant support from Siemens Healthcare and HeartFlow; Dr. Mark has received personal fees from Medtronic, CardioDx, and St. Jude Medical and grant support from Eli Lilly, Bristol-Myers Squibb, Gilead Sciences, AGA Medical, Merck, Oxygen

Biotherapeutics, and AstraZeneca. No financial disclosures were reported by the other authors of this paper.

All data are the property of the PROMISE Trial of Duke University. Study data is availability is limited and available upon request.

We are grateful for the contributions of the study participants and study team.

References

1. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):937-952.
2. 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(1):16-22.
3. Ladapo JA, Blecker S, Douglas PS. Physician decision making and trends in the use of cardiac stress testing in the United States: an analysis of repeated cross-sectional data. *Ann Intern Med.* 2014;161(7):482-490.
4. Douglas PS, Hoffmann U, Patel MR, et al. Outcomes of anatomical versus functional testing for coronary artery disease. *N Engl J Med.* 2015;372(14):1291-1300.
5. Ladapo JA, Goldfeld KS, Douglas PS. Projected morbidity and mortality from missed diagnoses of coronary artery disease in the United States. *Int J Cardiol.* 2015;195:250-252.
6. Young LH, Wackers FJ, Chyun DA, et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. *JAMA.* 2009;301(15):1547-1555.
7. Hachamovitch R, Nutter B, Hlatky MA, et al. Patient management after noninvasive cardiac imaging: results from SPARC (Study of Myocardial Perfusion and Coronary Anatomy Imaging Roles in Coronary Artery Disease). *J Am Coll Cardiol.* 2012;59(5):462-474.
8. Cheezum MK, Hulten EA, Smith RM, et al. Changes in preventive medical therapies and CV risk factors after CT angiography. *JACC: Cardiovascular Imaging.* 2013;6(5):574-581.
9. Hulten E, Bittencourt MS, Singh A, et al. Coronary artery disease detected by coronary computed tomographic angiography is associated with intensifcation of preventive medical therapy and lower low-density lipoprotein cholesterol. *Circulation: Cardiovascular Imaging.* 2014;7(4):629-638.
10. Douglas PS, Hoffmann U, Lee KL, et al. PROspective Multicenter Imaging Study for Evaluation of chest pain: rationale and design of the PROMISE trial. *Am Heart J.* 2014;167(6):796-803 e791.
11. Jackson R, Lawes CM, Bennett DA, Milne RJ, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet.* 2005;365(9457):434-441.
12. Turnbull F, Neal B, Ninomiya T, et al. Effects of different regimens to lower blood pressure on major cardiovascular events in older and younger adults: meta-analysis of randomised trials. *BMJ.* 2008;336(7653):1121-1123.
13. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community a statement by the American Society of Hypertension and the International Society of Hypertension. *J. Hypertens.* 2014;32(1):3-15.
14. Rosendorff C, Black HR, Cannon CP, et al. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on

Clinical Cardiology and Epidemiology and Prevention. *Circulation.* 2007;115(21):2761-2788.
15. LaRosa JC, He J, Vupputuri S. Effect of statins on risk of coronary disease: a meta-analysis of randomized controlled trials. *JAMA.* 1999;282(24):2340-2346.
16. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation.* 2002;106(25):3143-3421.
17. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2014;129(25 Suppl 2):S49-73.
18. Pandya A, Sy S, Cho S, Weinstein MC, Gaziano TA. Cost-effectiveness of 10-year risk thresholds for initiation of statin therapy for primary prevention of cardiovascular disease. *JAMA.* 2015;314(2):142-150.
19. Patel A, MacMahon S, Chalmers J, et al. Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet.* 2007;370(9590):829-840.
20. Ruggenenti P, Fassi A, Ilieva AP, et al. Preventing microalbuminuria in type 2 diabetes. *N Engl J Med.* 2004;351(19):1941-1951.
21. Schrier RW, Estacio RO, Esler A, Mehler P. Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int.* 2002;61(3):1086-1097.
22. Newman DJ, Mattock MB, Dawnay AB, et al. Systematic review on urine albumin testing for early detection of diabetic complications. *Health Technol Assess.* 2005;9(30):iii-vi, xiii-163.
23. Adler AI, Stevens RJ, Manley SE, Bilous RW, Cull CA, Holman RR. Development and progression of nephropathy in type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS 64). *Kidney Int.* 2003;63(1):225-232.
24. American Diabetes Association. 8. Cardiovascular disease and risk management. *Diabetes Care.* 2015;38 Suppl:S49-57.
25. Barbeau EM, Krieger N, Soobader MJ. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health.* 2004;94(2):269-278.
26. Rathore SS, Berger AK, Weinfurt KP, et al. Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation.* 2000;102(6):642-648.
27. Rao SV, Schulman KA, Curtis LH, Gersh BJ, Jollis JG. Socioeconomic status and outcome following acute myocardial infarction in elderly patients. *Arch Intern Med.* 2004;164(10):1128-1133.
28. Subherwal S, Patel MR, Tang F, et al. Socioeconomic disparities in the use of cardioprotective medications among patients with peripheral artery disease: an analysis of the American College of Cardiology's NCDR PINNACLE Registry. *J Am Coll Cardiol.* 2013;62(1):51-57.

29. Bucholz EM, Ma S, Normand SL, Krumholz HM. Race, socioeconomic status, and life expectancy after acute myocardial infarction. *Circulation.* 2015;132(14):1338-1346.
30. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics.* 1999;55(2):652-659.
31. Zoghbi GJ, Dorfman TA, Iskandrian AE. The effects of medications on myocardial perfusion. *J Am Coll Cardiol.* 2008;52(6):401-416.
32. Virani SS, Woodard LD, Ramsey DJ, et al. Gender disparities in evidence-based statin therapy in patients with cardiovascular disease. *Am J Cardiol.* 2015;115(1):21-26.
33. Folsom AR, Yatsuya H, Nettleton JA, et al. Community prevalence of ideal cardiovascular health, by the American Heart Association definition, and relationship with cardiovascular disease incidence. *J Am Coll Cardiol.* 2011;57(16):1690-1696.
34. Hertz RP, Unger AN, Cornell JA, Saunders E. Racial disparities in hypertension prevalence, awareness, and management. *Arch Intern Med.* 2005;165(18):2098-2104.
35. Diez Roux AV, Merkin SS, Arnett D, et al. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med.* 2001;345(2):99-106.
36. Frieden TR, Berwick DM. The "Million Hearts" initiative--preventing heart attacks and strokes. *N Engl J Med.* 2011;365(13):e27.
37. Sanghavi DM, Conway PH. Paying for prevention: a novel test of medicare value-based payment for cardiovascular risk reduction. *JAMA.* 2015;314(2):123-124.
38. Koh HK, Sebelius KG. Promoting prevention through the Affordable Care Act. *N Engl J Med.* 2010;363(14):1296-1299.

FIGURE LEGENDS

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

Table 1. Demographics and Presenting Characteristics for All Patients

Characteristic	All Patients (N=10003)
Female (%)	5270/10003 (52.7%)
Median age (IQR), years	60.0 (54.4-66.0)
Age (%), years	
45-64	7111/10003 (71.1%)
65-79	2711/10003 (27.1%)
80+	181/10003 (1.8%)
Race/ethnicity (%)	
Hispanic or Latino	767/9945 (7.7%)
Not Hispanic or Latino-White	7693/9945 (77.4%)
Not Hispanic or Latino-Black	1071/9945 (10.8%)
Not Hispanic or Latino-Asian	250/9945 (2.5%)
Not Hispanic or Latino-Other	164/9945 (1.6%)
Socioeconomic status (minimum, maximum income), $[a]	
Low	11118, 42610
Medium-low	42613, 54149
Medium-high	54167, 71034
High	71059, 184338
US region[b]	
Midwest	2208/9690 (22.8%)
Northeast	1439/9690 (14.9%)
South	3999/9690 (41.3%)
West	2044/9690 (21.1%)
Cardiac risk factors	
BMI ≥ 30 (%) (median 29.7, IQR 26.3-33.9)	4724/9907 (47.7%)
Hypertension (%)	6501/10002 (65.0%)
Diabetes (%)	2144/10002 (21.4%)
Dyslipidemia (%)	6767/10002 (67.7%)
Family history of premature CAD (%)	3202/9970 (32.1%)
Peripheral arterial disease or cerebrovascular disease (%)	552/10003 (5.5%)
CAD risk equivalent (%)	2531/10003 (25.3%)

Characteristic	All Patients (N=10003)
Metabolic syndrome (%)	3772/10003 (37.7%)
Current tobacco use (%)	1773/10000 (17.7%)
Regular exercise (%)	5116/9982 (51.3%)
History of depression (%)	2058/10000 (20.6%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.14) [10003]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (11.75) [9901]
Medication use (%)	
Aspirin	4280/9569 (44.7%)
Statin	4389/9569 (45.9%)
Beta-blocker	2399/9569 (25.1%)
ACE inhibitor or ARB	4194/9569 (43.8%)
Primary presenting symptoms (%)	
Chest pain	7272/9996 (72.7%)
Dyspnea	1490/9996 (14.9%)
Other	1234/9996 (12.3%)
Type of angina (%)	
Typical	1166/10003 (11.7%)
Atypical	7773/10003 (77.7%)
Non-cardiac	1064/10003 (10.6%)
Physician specialty (%)	
Cardiology	8662/10003 (86.6%)
Internal medicine	565/10003 (5.6%)
Other	776/10003 (7.8%)

[a]Median household income (in US $) is used as a surrogate for socioeconomic status.

[b]143 patients had missing zip code data, and 170 patients had zip codes that were not reported in 2010 Census ACS data.

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; CAD, coronary artery disease; IQR, interquartile range.

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline

	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.37	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.42
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age, years									
45-64	14.7	--	--	39.1	--	--	33.3	--	--
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
Race/ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43	1.32 (0.88 - 1.98)	0.18	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic status[e]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37	1.20 (1.02 - 1.41)	0.027	30	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.79
High	13.9	--	--	35.5	--	--	34.3	--	--

	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
US region[e]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.85
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--

[a]Commonly used antihypertensives include angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[b]Only patients with hypertension included in the analysis (N=6501).

[c]Only patients with dyslipidemia included in the analysis (N=6767).

[d]Only patients with diabetes included in the analysis (N=2144).

[e]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline Cont.

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
45-64	48.7	--	--	21.7	--	--	51.0	--	--
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
Race/ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.93 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic status[b]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454

Outcome	Sedentary			Current Smoking			Obese[a]		
	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value
High	41.4	--	--	11.5	--	--	42.3	--	--
US region[b]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.97 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--

[a]Obese defined as BMI ≥ 30.

[b]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

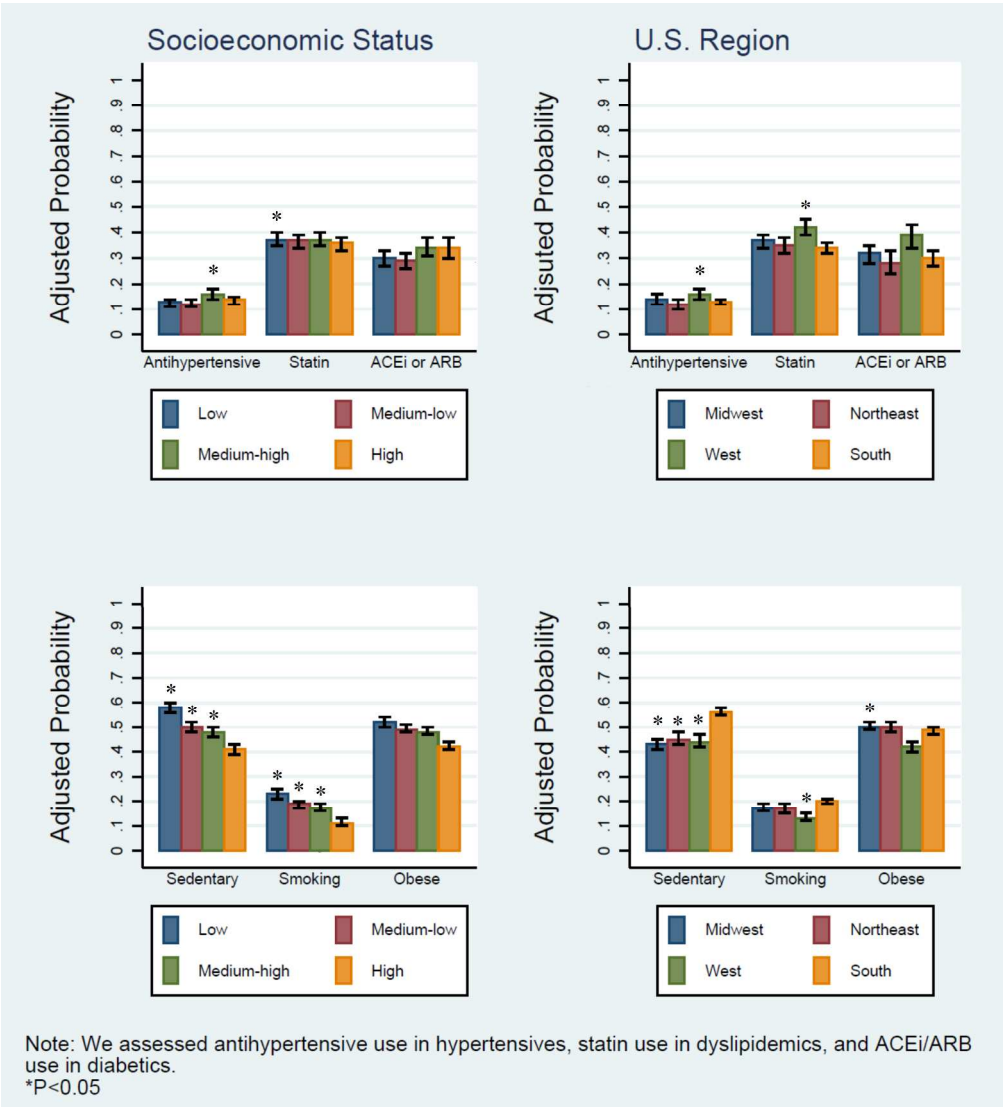

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

787x868mm (96 x 96 DPI)

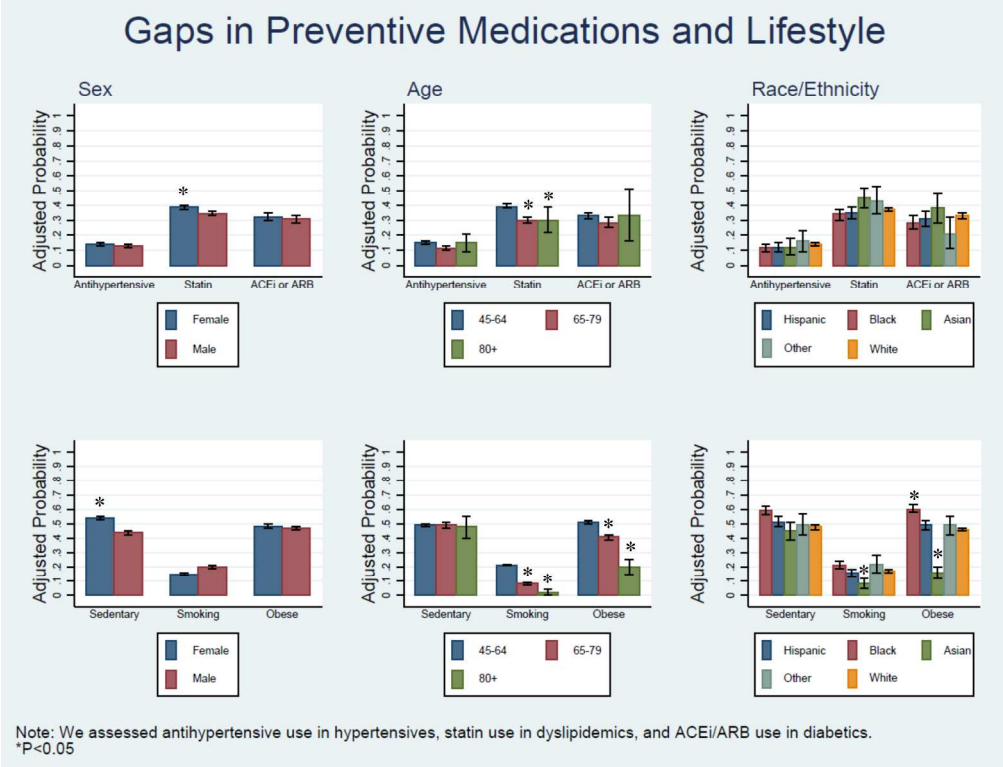

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Tables 2 and 3. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

315x241mm (240 x 240 DPI)

Supplementary Appendix

Table 1.1. Demographics and Baseline Characteristics for Patients With Hypertension

Characteristic	Patients With Hypertension (N=6501)
Female (%)	3509/6501 (54.0%)
Age (%), y	
45-64	4522/6501 (69.6%)
65-79	1849/6501 (28.4%)
80+	130/6501 (2.0%)
Race/ethnicity (%)	
Hispanic or Latino	531/6471 (8.2%)
Not Hispanic or Latino-White	4813/6471 (74.4%)
Not Hispanic or Latino-Black	885/6471 (13.7%)
Not Hispanic or Latino-Asian	142/6471 (2.2%)
Not Hispanic or Latino-Other	100/6471 (1.5%)
Socioeconomic status (minimum, maximum income), $*	
Low	(11792,42610)
Medium-low	(42613,54149)
Medium-high	(54167,71034)
High	(71059,180815)
US region	
Midwest	1395/6316 (22.1%)
Northeast	965/6316 (15.3%)
South	2736/6316 (43.3%)
West	1220/6316 (19.3%)
Cardiac risk factors	
BMI ≥ 30 (%)	3538/6439 (54.9%)
Diabetes (%)	1712/6501 (26.3%)
Dyslipidemia (%)	4408/6501 (67.8%)
Family history of premature CAD (%)	2050/6481 (31.6%)
Peripheral arterial disease or cerebrovascular disease (%)	424/6501 (6.5%)
CAD risk equivalent (%)	1992/6501 (30.6%)
Metabolic syndrome (%)	3080/6501 (47.4%)
Current tobacco use (%)	1025/6499 (15.8%)
Regular exercise (%)	3060/6487 (47.2%)
History of depression (%)	1381/6499 (21.2%)

Characteristic	Patients With Hypertension (N=6501)
Risk Scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.21) [6501]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	17 (12.72) [6434]
Medication use (%)	
Aspirin	2956/6363 (46.5%)
Statin	3057/6363 (48.0%)
Beta-blocker	2126/6363 (33.4%)
ACE inhibitor or ARB	4041/6363 (63.5%)
Primary presenting symptoms (%)	
Chest pain	4653/6498 (71.6%)
Dyspnea	1027/6498 (15.8%)
Other	818/6498 (12.6%)
Type of angina (%)	
Typical	802/6501 (12.3%)
Atypical	5044/6501 (77.6%)
Non-cardiac	655/6501 (10.1%)
Physician specialty (%)	
Cardiology	5592/6501 (86.0%)
Internal Medicine	380/6501 (5.8%)
Other	529/6501 (8.1%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.2. Demographics and Baseline Characteristics for Patients With Dyslipidemia

Characteristic	Patients with Dyslipidemia (N=6767)
Female (%)	3632/6767 (53.7%)
Age (%), y	
45-64	4824/6767 (71.3%)
65-79	1827/6767 (27.0%)
80+	116/6767 (1.7%)
Race/ethnicity (%)	
Hispanic or Latino	516/6728 (7.7%)
Not Hispanic or Latino-White	5270/6728 (78.3%)
Not Hispanic or Latino-Black	618/6728 (9.2%)
Not Hispanic or Latino-Asian	207/6728 (3.1%)
Not Hispanic or Latino-Other	117/6728 (1.7%)
Socioeconomic status (minimum, maximum income)*	
Low	(11118,42610)
Medium-low	(42613,54149)
Medium-high	(54175,71034)
High	(71059,184338)
US region	
Midwest	1543/6572 (23.5%)
Northeast	1004/6572 (15.3%)
South	2569/6572 (39.1%)
West	1456/6572 (22.2%)
Cardiac risk factors	
BMI ≥ 30 (%)	3257/6701 (48.6%)
Hypertension (%)	4408/6767 (65.1%)
Diabetes (%)	1656/6767 (24.5%)
Family history of premature CAD (%)	2310/6746 (34.2%)
Peripheral arterial disease or cerebrovascular disease (%)	420/6767 (6.2%)
CAD risk equivalent (%)	1940/6767 (28.7%)
Metabolic syndrome (%)	3181/6767 (47.0%)
Current tobacco use (%)	1016/6765 (15.0%)
Regular exercise (%)	3520/6749 (52.2%)
History of depression (%)	1498/6765 (22.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.11) [6767]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (12.26) [6698]

Characteristic	Patients with Dyslipidemia (N=6767)
Medication use (%)	
Aspirin	3161/6570 (48.1%)
Statin	4178/6570 (63.6%)
Beta-blocker	1655/6570 (25.2%)
ACE inhibitor or ARB	2943/6570 (44.8%)
Primary presenting symptoms (%)	
Chest pain	4851/6761 (71.7%)
Dyspnea	1033/6761 (15.3%)
Other	877/6761 (13.0%)
Type of angina (%)	
Typical	801/6767 (11.8%)
Atypical	5268/6767 (77.8%)
Non-cardiac	698/6767 (10.3%)
Physician specialty (%)	
Cardiology	5858/6767 (86.6%)
Internal Medicine	371/6767 (5.5%)
Other	538/6767 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.3. Demographics and Baseline Characteristics for Patients With Diabetes

Characteristic	Patients with Diabetes (N=2144)
Female (%)	1151/2144 (53.7%)
Age (%), y	
45-64	1488/2144 (69.4%)
65-79	630/2144 (29.4%)
80+	26/2144 (1.2%)
Race/ethnicity (%)	
Hispanic or Latino	256/2132 (12.0%)
Not Hispanic or Latino-White	1414/2132 (66.3%)
Not Hispanic or Latino-Black	345/2132 (16.2%)
Not Hispanic or Latino-Asian	75/2132 (3.5%)
Not Hispanic or Latino-Other	42/2132 (2.0%)
Socioeconomic status (minimum, maximum income)*	
Low	(14586,42610)
Medium-low	(42641,54149)
Medium-high	(54260,71034)
High	(71059,139779)
US region	
Midwest	414/2074 (20.0%)
Northeast	348/2074 (16.8%)
South	916/2074 (44.2%)
West	396/2074 (19.1%)
Cardiac risk factors	
BMI ≥ 30 (%)	1463/2117 (69.1%)
Hypertension (%)	1712/2144 (79.9%)
Dyslipidemia (%)	1656/2144 (77.2%)
Family history of premature CAD (%)	655/2140 (30.6%)
Peripheral arterial disease or cerebrovascular disease (%)	165/2144 (7.7%)
CAD risk equivalent (%)	2144/2144 (100.0%)
Metabolic syndrome (%)	1822/2144 (85.0%)
Current tobacco use (%)	318/2144 (14.8%)
Regular exercise (%)	926/2142 (43.2%)
History of depression (%)	516/2142 (24.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	54 (20.26) [2144]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	24 (15.25) [2111]
Medication use (%)	

Characteristic	Patients with Diabetes (N=2144)
Aspirin	1098/2118 (51.8%)
Statin	1291/2118 (61.0%)
Beta-blocker	619/2118 (29.2%)
ACE inhibitor or ARB	1444/2118 (68.2%)
Primary presenting symptoms (%)	
Chest pain	1518/2144 (70.8%)
Dyspnea	375/2144 (17.5%)
Other	251/2144 (11.7%)
Type of angina (%)	
Typical	296/2144 (13.8%)
Atypical	1653/2144 (77.1%)
Non-cardiac	195/2144 (9.1%)
Physician specialty (%)	
Cardiology	1830/2144 (85.4%)
Internal Medicine	142/2144 (6.6%)
Other	172/2144 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 2.1. Prevalence and Adjusted Odds of No Medication Use at Baseline

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Key Risk Factors									
Hypertension	13.8	--	--	33.3	1.08 (0.92 - 1.28)	0.334	20.2	0.07 (0.05 - 0.09)	< 0.001
Dyslipidemia	13.1	1.31 (1.08 - 1.59)	0.007	36.4	--	--	29.8	1.27 (0.92 - 1.74)	0.148
Diabetes	8.07	0.67 (0.52 - 0.85)	< 0.001	25.5	0.51 (0.43 - 0.60)	< 0.001	31.8	--	--
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.370	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.420
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age									
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30.0	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
45-64	14.7	--	--	39.1	--	--	33.3	--	--
Race/Ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43.0	1.32 (0.88 - 1.98)	0.180	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic Status[5]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37.0	1.20 (1.02 - 1.41)	0.027	30.0	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.790
High	13.9	--	--	35.5	--	--	34.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
US Region[5]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35.0	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.850
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--
Cardiac Risk Factors at Baseline[6]									
BMI ≥ 30	12.1	0.71 (0.58 - 0.85)	< 0.001	34.9	0.93 (0.80 - 1.07)	0.285	27.7	0.58 (0.43 - 0.78)	< 0.001
Regular exercise	13.7	0.89 (0.76 - 1.04)	0.151	37.2	1.04 (0.94 - 1.17)	0.444	31.8	0.78 (0.62 - 0.99)	0.041
Current tobacco use	14.2	1.11 (0.89 - 1.37)	0.356	39.5	1.09 (0.93 - 1.27)	0.287	35.4	1.24 (0.89 - 1.71)	0.204
Family History of Premature CAD	13.0	0.90 (0.77 - 1.07)	0.226	36.3	0.98 (0.87 - 1.09)	0.672	31.2	0.91 (0.71 - 1.16)	0.433
Peripheral arterial disease or cerebrovascular disease	12.2	0.99 (0.72 - 1.37)	0.948	25.3	0.66 (0.52 - 0.84)	< 0.001	28.8	1.08 (0.71 - 1.64)	0.720
Metabolic syndrome	11.4	1.09 (0.87 - 1.35)	0.463	33.8	1.22 (1.04 - 1.43)	0.015	27.6	0.94 (0.64 - 1.40)	0.774
History of depression	13.6	0.98 (0.81 - 1.18)	0.794	37.0	1.00 (0.87 - 1.13)	0.955	34.6	1.12 (0.86 - 1.47)	0.389
ASCVD pooled cohort risk prediction categories									
High (>=15)	10.5	0.45 (0.34 - 0.58)	< 0.001	31.6	1.22 (1.01 - 1.47)	0.036	27.1	0.64 (0.42 - 0.97)	0.034
Intermediate (7.5 - 14.99)	13.2	0.63 (0.51 - 0.77)	< 0.001	37.4	1.07 (0.93 - 1.24)	0.330	39.3	0.90 (0.60 - 1.34)	0.588
Low (< 7.5)	19.7	--	--	41.3	--	--	41.3	--	--
Blood Pressure categories									
High (≥160/100)	15.3	1.54 (1.19 - 1.99)	0.001	39.6	1.28 (1.03 - 1.59)	0.023	25.2	1.14 (0.74 - 1.77)	0.556
Intermediate (≥140-159/90-99)	16.3	1.58 (1.34 - 1.86)	< 0.001	36.3	1.08 (0.95 - 1.22)	0.241	27.5	1.02 (0.79 - 1.32)	0.884
Low (<140/90)	12.1	--	--	36.1	--	--	34.9	--	--
Medication Use at Baseline									
Antihypertensive				31.0	0.64 (0.53 - 0.77)	< 0.001	14.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Statin	10.0	0.53 (0.45 - 0.64)	< 0.001				27.0	0.51 (0.39 - 0.67)	< 0.001
ACEi or ARB	0.00	--	--	29.0	0.82 (0.70 - 0.96)	0.011			
Primary Presenting Symptom									
Chest pain	14.2	0.90 (0.72 - 1.12)	0.340	37.2	1.08 (0.92 - 1.27)	0.356	32.6	0.95 (0.66 - 1.35)	0.754
Dyspnea	11.1	0.79 (0.59 - 1.06)	0.118	34.9	1.09 (0.89 - 1.33)	0.419	28.7	0.90 (0.59 - 1.37)	0.617
Other	14.7	--	--	34.3	--	--	32.1	--	--
Type of Angina									
Atypical	13.9	0.92 (0.72 - 1.18)	0.515	36.7	1.03 (0.87 - 1.24)	0.712	32.1	0.95 (0.64 - 1.40)	0.788
Typical	11.1	0.76 (0.55 - 1.06)	0.107	35.4	1.04 (0.83 - 1.31)	0.720	30.4	0.94 (0.58 - 1.52)	0.802
Non-cardiac	15.8	--	--	35.6	--	--	31.4	--	--
Cardiac Specialist									
Cardiologist	13.5	0.83 (0.67 - 1.03)	0.099	36.3	0.94 (0.80 - 1.10)	0.406	31.6	0.94 (0.68 - 1.30)	0.723
Non-Cardiologist	15.2	--	--	37.4	--	--	32.8	--	--

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

[1] Commonly used antihypertensives include ACE inhibitors, ARBs, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[2] Only patients with hypertension included in the analysis (N=6501).

[3] Only patients with dyslipidemia included in the analysis (N=6767).

[4] Only patients with diabetes included in the analysis (N=2144).

[5] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[6] Reference group is patients without risk factor.

Table 2.2. Prevalence and Adjusted Odds of Lifestyle Choices at Baseline

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
45-64	48.7	--	--	21.7	--	--	51.0	--	--
Race/Ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.93 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic Status[5]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454
High	41.4	--	--	11.5	--	--	42.3	--	--
US Region[2]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.97 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--
Cardiac Risk Factors at Baseline[3]									
Current tobacco use	58.3	1.73 (1.54 - 1.94)	< 0.001	--	--	--	40.2	0.47 (0.41 - 0.54)	< 0.001
BMI ≥ 30	56.2	1.64 (1.47 - 1.82)	< 0.001	14.9	0.48 (0.41 - 0.55)	< 0.001	--	--	--

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Hypertension	52.8	1.32 (1.20 - 1.45)	< 0.001	15.8	0.62 (0.55 - 0.70)	< 0.001	54.9	1.19 (1.06 - 1.33)	0.003
Diabetes	56.8	1.12 (0.99 - 1.26)	0.078	14.8	0.61 (0.51 - 0.72)	< 0.001	69.1	0.48 (0.40 - 0.56)	< 0.001
Dyslipidemia	47.8	0.91 (0.83 - 1.01)	0.068	15.0	0.53 (0.47 - 0.60)	< 0.001	48.6	0.41 (0.37 - 0.46)	< 0.001
Family History of Premature CAD	45.2	0.78 (0.71 - 0.85)	< 0.001	18.3	1.07 (0.95 - 1.21)	0.248	48.3	1.05 (0.94 - 1.17)	0.400
Peripheral arterial disease or cerebrovascular disease	57.8	1.33 (1.11 - 1.60)	0.003	21.9	1.61 (1.28 - 2.03)	< 0.001	45.6	0.78 (0.62 - 0.97)	0.028
Metabolic syndrome	56.0	1.10 (0.97 - 1.24)	0.157	16.3	1.43 (1.20 - 1.69)	< 0.001	83.3	27.77 (23.74 - 32.48)	< 0.001
History of depression	53.3	1.09 (0.98 - 1.21)	0.119	23.0	1.52 (1.33 - 1.74)	< 0.001	53.2	1.25 (1.10 - 1.42)	< 0.001
ASCVD pooled cohort risk prediction ≥ 7.5%	49.7	1.08 (0.97 - 1.20)	0.170	19.2	2.45 (2.12 - 2.83)	< 0.001	49.4	0.89 (0.78 - 1.02)	0.094
Primary Presenting Symptom									
Chest pain	48.5	1.09 (0.95 - 1.24)	0.209	18.5	0.92 (0.77 - 1.09)	0.315	46.9	0.96 (0.82 - 1.13)	0.626
Dyspnea	52.2	1.27 (1.08 - 1.49)	0.004	13.8	0.73 (0.58 - 0.92)	0.007	53.0	1.23 (1.01 - 1.50)	0.036
Other	46.0	--	--	17.8	--	--	45.5	--	--
Type of Angina									
Atypical	48.8	1.08 (0.94 - 1.25)	0.256	17.9	0.96 (0.80 - 1.16)	0.682	47.7	0.92 (0.78 - 1.09)	0.335
Typical	50.4	1.14 (0.95 - 1.37)	0.157	16.5	0.85 (0.66 - 1.09)	0.193	49.4	0.88 (0.70 - 1.09)	0.237
Non-cardiac	46.5	--	--	18.0	--	--	45.7	--	--
Cardiac Specialist									
Cardiologist	48.7	1.00 (0.89 - 1.14)	0.951	17.7	1.03 (0.87 - 1.21)	0.746	47.6	1.07 (0.92 - 1.24)	0.407
Non-Cardiologist	49.2	--	--	17.9	--	--	48.7	--	--

[1] Obese defined as BMI ≥ 30.

[2] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[3] Reference group is patients without risk factor.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any pre-specified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed	

		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13
Generalisability	21	Discuss the generalisability (external validity) of the study results	13
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-016364.R1
Article Type:	Research
Date Submitted by the Author:	13-Jun-2017
Complete List of Authors:	Ladapo, Joseph; University of California Los Angeles David Geffen School of Medicine, Medicine Coles, Adrian; Duke Clinical Research Institute Dolor, Rowena; Duke Clinical Research Institute Mark, Daniel; Duke Clinical Research Institute Cooper, Lawton; National Heart Lung and Blood Institute Lee, Kerry; Duke Clinical Research Institute Goldberg, Jonathan; Louis Stokes VA Medical Center Shapiro, Michael; Oregon Health and Science University Hoffmann, Udo; Massachusetts General Hospital, Radiology Douglas, Pamela; Duke Clinical Research Institute
Primary Subject Heading:	Cardiovascular medicine
Secondary Subject Heading:	Epidemiology
Keywords:	coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Joseph A. Ladapo, MD, PhD,[1] Adrian Coles, PhD,[2] Rowena J. Dolor, MD, MHS,[2] Daniel B. Mark, MD, MPH,[2] Lawton Cooper, MD,[3] Kerry L. Lee, PhD,[2] Jonathan Goldberg, MD,[4] Michael D. Shapiro, DO,[5] Udo Hoffmann, MD, MPH,[6] Pamela S. Douglas, MD[2]

[1]Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California; [2]Duke Clinical Research Institute, Duke University School of Medicine, Durham, North Carolina; [3]National Heart, Lung, and Blood Institute, Bethesda, Maryland; [4]Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio; [5]Oregon Health and Science University, Portland, Oregon; [6]Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Address correspondence to: Joseph A. Ladapo, MD, PhD; David Geffen School of Medicine at UCLA; Department of Medicine; Division of General Internal Medicine and Health Services Research; 911 Broxton Ave.; Los Angeles, CA 90024; Phone: 310-794-2728 Fax: 310-794-0732; Email: jladapo@mednet.ucla.edu

Word count: 2593

Support: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235

Prior presentation: Presented at American College of Cardiology Scientific Sessions on April 2, 2016

Number of Tables, Figures, and Appendices: 2 Tables, 2 Figures, 1 Appendix

ABSTRACT

Objectives—To evaluate potential gaps in preventive medical therapy and healthy lifestyle practices among symptomatic patients with suspected coronary artery disease (CAD) seeing primary care physicians and cardiologists, and how gaps vary by sociodemographic characteristics and baseline cardiovascular risk.

Design—Cross sectional study assessing potential preventive gaps

Participants—10,003 symptomatic outpatients evaluated by primary care physicians, cardiologists, or other specialists for suspected CAD.

Setting—PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) from 2010-2014.

Measures—Primary measures were absence of an antihypertensive, statin, or angiotensin-converting enzyme inhibitor/angiotensin receptor blocker for renal protection in patients with hypertension, dyslipidemia, or diabetes, respectively, and being sedentary, smoking, or being obese.

Results—Preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. Overall, 49% of patients were sedentary, 18% currently smoked, and 48% were obese. Women were significantly more likely to not take a statin for dyslipidemia and to be sedentary. Patients with lower socioeconomic status were also significantly more likely to not take a statin. Compared to Whites, Blacks were significantly more likely to be obese, while Asians were less likely to smoke or be obese. High-risk patients sometimes experienced larger preventive care gaps than low-risk patients.

Conclusions—Among contemporary, symptomatic patients with suspected CAD, significant gaps exist in preventive care and lifestyle practices, and high-risk patients sometimes had larger

gaps. Differences by sex, age, race/ethnicity, socioeconomic status, and geography are modest but contribute to disparities and have implications for improving population health.

Clinical Trial Registration—clinicaltrials.gov Identifier NCT01174550

Keywords: coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Abbreviations: CAD - coronary artery disease; CTA - computed tomographic angiography; PROMISE - PROspective Multicenter Imaging Study for Evaluation of Chest Pain; ACEi/ARB - angiotensin-converting enzyme inhibitor or angiotensin receptor blocker use; BMI - body mass index

Strengths and limitations of this study

- Studied 10,003 patients without diagnosed CAD whose physicians believed that noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD.
- Focused on 6 potential gaps in preventive care demonstrated to increase the risk of cardiovascular disease.
- Focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography.
- Measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results.

Preventive medical care and lifestyle practices reduce the risk of adverse cardiovascular events[1,2] and may influence how likely a patient is to present to their primary care physician or cardiologist with symptoms suggestive of coronary artery disease (CAD). In the United States, approximately 4 million of these patients are referred for outpatient cardiac stress testing or coronary computed tomographic angiography (CTA) each year.[3] Although most have significant risk factors for adverse cardiovascular events, such as hypertension, dyslipidemia, and diabetes,[4,5] little is known about their preventive medical and lifestyle practices prior to presentation, the extent to which these preventive measures differ from national recommendations and guidelines,[6-9] or their relationship with sociodemographic and socioeconomic disparities. Understanding these patterns and characterizing the magnitude of medical or lifestyle gaps—that is, the difference between recommended preventive care and actual preventive care—is a critical step toward preventing disease and reducing adverse cardiovascular events in this population, independent of the outcome of diagnostic testing. Further, if preventive care varies by sociodemographic characteristics, this variation may contribute to important health disparities and identify populations in need of specific targeting. To identify opportunities for improving preventive care in this population, we used data from symptomatic patients in the PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) to (1) evaluate potential gaps in preventive medical therapy among patients with hypertension, dyslipidemia, or diabetes; (2) determine the extent to which these gaps differed by patients' baseline risk; (3) evaluate gaps in healthy lifestyle practices, as defined by being sedentary, smoking, or being obese; and (4) determine which gaps vary by sex, age, race/ethnicity, socioeconomic status, and geography.

Methods

Study Design

Methods used in PROMISE have been described previously.[4,10] The study protocol was approved by the local or central institutional review board at each coordinating center and at each enrolling site in North America. We enrolled symptomatic outpatients without diagnosed CAD whose physicians believed that non-urgent, noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD. After providing written informed consent, 10,003 eligible patients were randomly assigned to either anatomical testing with CTA or functional testing with exercise electrocardiography, nuclear stress, or stress echocardiography.[10] Enrollment began on July 27, 2010, and was completed on September 19, 2013. All the patients were followed until October 31, 2014. Analyses were performed in 2016.

Gaps in Preventive Medications and Lifestyle Practices

At the time of enrollment, information about preventive medication use and lifestyle practices was collected by the clinical sites through patient report, chart review, and other clinical sources. We focused on 6 potential gaps in preventive care that have been demonstrated to increase the risk of cardiovascular disease[1,11]: absence of an antihypertensive medication in patients with hypertension, absence of a statin in patients with dyslipidemia, absence of an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ACEi/ARB) for renal protection in patients with diabetes, being sedentary, smoking, and being obese, as determined by a body mass index (BMI) exceeding 30. Because patients had to be eligible for randomization to either CTA or functional testing, no patients known to have renal dysfunction were enrolled.

Hypertension, Dyslipidemia, and Diabetes

Because PROMISE was a pragmatic trial, diagnoses were identified and defined by physicians at the participating clinics rather than with study-specific criteria. Among our symptomatic patients, absence of antihypertensive medication in patients with hypertension was defined as a preventive care gap because of evidence that treating patients with this comorbidity reduces the risk of cardiovascular events[12] and because treatment is consistent with recommendations issued by the American Society of Hypertension, International Society of Hypertension,[13] and American Heart Association.[14] Absence of a statin in patients with dyslipidemia was considered a preventive care gap because statin use in primary and secondary prevention has been shown to reduce cardiovascular risk.[15,16] The median atherosclerotic cardiovascular disease (ASCVD) score in our population was 11.3% with an interquartile range (IQR) of 6.1% to 19.8%, well above the 10-year risk threshold of 7.5% for treatment in most participants.[17] Applying lower ASCVD thresholds for statin therapy has also been shown to be cost-effective.[18] Absence of an ACEi/ARB for renal protection in patients with diabetes was considered a preventive care gap because the vast majority of diabetics in our population were hypertensive (79.9%) and prophylactic use of ACEi/ARBs reduces the incidence of albuminuria,[19-21] which has been shown to be a risk factor for cardiovascular[22] and overall mortality in patients with diabetes.[23,24]

Physical Inactivity, Smoking, and Obesity

Being sedentary, smoking, and being obese have all been demonstrated to increase cardiovascular risk and therefore represent important gaps in preventive lifestyle practices.[1] We assessed the prevalence of these lifestyle practices across all patients in our cohort. To assess

activity level, we asked, "During the past month, did you participate in any physical activities or exercise regularly (1 or more times per week)? Examples include: running, aerobics, golf, gardening, walking, etc." (*yes* or *no*). To assess smoking, we asked, "Have you smoked in the past two weeks?" (*yes* or *no*).

Demographics and Socioeconomics

We focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography. Race/ethnicity was reported by the patient and categorized into the following mutually exclusive groups: White; Black; American Indian/Alaska Native, Native Hawaiian/Other Pacific Islanders; and Asian (not including any Hispanics) and Hispanics (from any racial/ethnic group).[25] Socioeconomic status was defined by the median household income of the patient's zip code based on data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates), similar to prior work.[26-29] Socioeconomic status was categorized into quartiles from lowest to highest median household income (low, medium-low, medium-high, and high). We used the following US Census categories for geographic regions: Northeast, Midwest, West, and South.

Statistical Analysis

Analyses were based on patient status at presentation for CAD evaluation. P values of less than 0.05 were considered significant. We estimated summary statistics for gaps in preventive care and lifestyle practices and constructed multivariable logistic regression models to assess the association of patients' sociodemographic characteristics (sex, age, race/ethnicity, socioeconomic status, and geography) at presentation with these gaps, while controlling for

baseline risk (for blood pressure: systolic <140 mmHg and diastolic <90 mmHg, systolic 140 to 159 mmHg or diastolic 90 to 99 mmHg, and systolic ≥160 mmHg or diastolic ≥100 mmHg; for ASCVD: <7.5%, 7.5% to <15%, and ≥15%), other clinical characteristics, and physician specialty (see Appendix Tables 2.1 and 2.2 for fully reported regression results). In addition to estimating covariate-adjusted odds ratios and their corresponding 95% confidence intervals, the fitted models were used to compute covariate-adjusted probabilities[30] (also known as "predictive margins") of gaps in preventive medication use and healthy lifestyle practices, with stratification by sociodemographic characteristics. In these analyses, the regression models predict proportions for each sociodemographic characteristic, while holding the distribution of all other covariates constant. We excluded 4% of patients in PROMISE from our multivariable analyses because we were unable to match their reported zip codes to US Census Bureau data. Statistical analyses were performed using SAS software, version 9.2 or higher (SAS Institute, Cary, NC).

Results

Symptomatic Patients: Characteristics and Baseline Risk

Characteristics of the 10,003 symptomatic patients (88% with chest pain/dyspnea, 12% with other symptoms) presenting to their primary care physicians, cardiologists, or other specialists are summarized in Table 1. The median age of the cohort was 60.0 years (IQR, 54.4-66.0 years), and 52.7% were women. Whites composed 77.4% of the cohort, and Blacks and Hispanics composed 10.8% and 7.7%, respectively. Asians composed 2.5% of the cohort, and people of other/unknown race/ethnicity composed 1.6% of the cohort. Patients in the lowest socioeconomic quartile lived in zip codes with a median household income less than $42,610,

while patients in the highest socioeconomic quartile lived in zip codes with median household income of at least $71,059 annually.

Preventive Medical and Lifestyle Gaps

Overall, the prevalences of hypertension, dyslipidemia, and diabetes were 65.0% (N=6501), 67.7% (N=6767), and 21.4% (N=2144), respectively. Among these symptomatic patients, preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. In our examination of preventive lifestyle practices, 49% of all patients were sedentary, 18% were current smokers, and 48% were obese.

Association of Preventive Care Gaps with Sex, Age, and Race/Ethnicity

Adjusted odds ratios for the association between patient characteristics and preventive care gaps are presented in Table 2, and covariate-adjusted probabilities of preventive care gaps are presented in Figures 1 and 2. Women were significantly more likely than men to not take a statin for dyslipidemia (OR 1.33, 95% CI 1.18-1.50) and to be sedentary (OR 1.55, 95% CI 1.41-1.70). Older patients were significantly less likely than the youngest patients to not be taking a statin for dyslipidemia (65-79 years: OR 0.64, 95% CI 0.55-0.75; ≥80 years: OR 0.59, 95% CI 0.38-0.92) and to smoke (65-79 years: OR 0.23, 95% CI 0.19-0.27; ≥80 years: OR 0.04, 95% CI 0.01-0.13). There were no significant differences in preventive medications by patients' race/ethnicity, but differences existed in preventive lifestyle practices: compared to White patients, Blacks were significantly more likely to be obese (OR 1.55, 95% CI 1.31-1.84), while Asians were less likely to smoke (OR 0.49, 95% CI 0.30-0.80) or be obese (OR 0.16, 95% CI

0.11-0.24). There were no significant differences in preventive lifestyle practices of Hispanics compared to Whites.

Variation in Preventive Care Gaps Between Higher and Lower Risk Symptomatic Patients

The prevalence of preventive medical therapy gaps varied by patient risk. Among symptomatic patients with hypertension, those at the highest overall cardiovascular risk (ASCVD ≥15%) were less likely to not be on an antihypertensive than patients at the lowest overall cardiovascular risk (ASCVD <7.5%) (OR 0.45, 95% CI 0.34-0.58), but patients with the highest blood pressure (≥160/100) were more likely to not be on an antihypertensive than patients with the lowest blood pressure (<140/90) (OR 1.54, 95% CI 1.19-1.99). Among patients with dyslipidemia, those at the highest overall cardiovascular risk (OR 1.22, 95% CI 1.01-1.47) and with the highest blood pressure (OR 1.28, 95% CI 1.03-1.59) were more likely to not be on a statin, compared to patients with the lowest cardiovascular risk or lowest blood pressure. Among patients with diabetes, those at the highest overall cardiovascular risk were less likely to not be on an ACEi/ARB than patients at the lowest overall cardiovascular risk (OR 0.64, 95% CI 0.42-0.97) (Appendix Table 2.1).

For the combined endpoint of death, myocardial infarction, or hospitalization for unstable angina, there was no association between having a treatment gap and the risk of an adverse event among patients with hypertension or diabetes. However, for patients with dyslipidemia, the absence of a treatment gap was associated with a lower risk of an adverse event (HR 0.74, 95% CI 0.55-0.98).

Association of Preventive Care Gaps With Socioeconomic Status/Geography

Compared to symptomatic patients with the highest socioeconomic status, patients with a medium-high socioeconomic status were more likely to not receive an antihypertensive for hypertension (OR 1.25, 95% CI 1.01-1.55), while patients with the lowest socioeconomic status were more likely to not receive a statin for dyslipidemia (OR 1.20, 95% CI 1.02-1.41) (Table 2, Figure 2). Patients with lower socioeconomic status were also more likely to be sedentary (Low: OR 1.45, 95% CI 1.28-1.65; Medium-low: OR 1.20, 95% CI 1.07-1.36; Medium-high: OR 1.18, 95% CI 1.05-1.32) and smoke (Low: OR 2.00, 95% CI 1.68-2.38; Medium-low: OR 1.63, 95% CI 1.38-1.94; Medium-high: OR 1.52, 95% CI 1.28-1.80) than patients with the highest socioeconomic status (Table 2), and these differences were more pronounced as socioeconomic status fell. Regional differences were common: compared to patients in the South, patients living in the West were more likely to not receive antihypertensives for hypertension (OR 1.32, 95% CI 1.08-1.63) and not receive statins for dyslipidemia (OR 1.31, 95% CI 1.13-1.52). Compared to patients in the South, patients in all other US regions were less likely to be sedentary (Midwest: OR 0.58, 95% CI 0.52-0.65; Northeast: OR 0.63, 95% CI 0.55-0.72; West: OR 0.68, 95% CI 0.61-0.77), and patients in the West were less likely to smoke (OR 0.76, 95% CI 0.65-0.90), while patients in the Midwest were more likely to be obese (OR 1.23, 95% CI 1.08-1.41).

Discussion

In the PROMISE trial population, we found that symptomatic patients presenting to their primary care physicians, cardiologists, or other specialists with suspected CAD have a high prevalence of risk factors for adverse cardiovascular events, with many of these risk factors representing missed opportunities to improve preventive medical care and lifestyle practices. We identified populations that should be targeted for interventions based on their sex, age, race/ethnicity,

socioeconomic status, and geography. While some of the preventive care gaps were smaller in symptomatic patients at higher risk, others were larger or unassociated with baseline risk. Finally, our results support the notion that wider adherence to preventive medication and lifestyle practices may alter the epidemiology of chest pain presentations and reduce the incidence of evaluations for CAD.[31]

Our findings of gaps in preventive care and differences in these gaps across important sociodemographic characteristics complement the work of others. For example, in a study of patients with cardiovascular disease in the US Veterans Affairs health system, women were less likely to receive a statin than men.[32] In another study of patients with peripheral artery disease, patients living in low socioeconomic status areas, as defined by median household income, were less likely to receive statins than patients living in higher socioeconomic status areas.[28] Racial/ethnic differences in exercise participation, smoking, and obesity have also been reported.[25,33] However, our work extends and broadens the findings of these studies because (1) our study focused on actively symptomatic patients, whose presentation may be attributable to gaps in prevention; and (2) we simultaneously accounted for a wider range of sociodemographic characteristics.

By assessing the relationship between baseline risk and preventive gaps, we showed that there was a trend toward lower preventive care gaps among symptomatic patients with high ASCVD scores but higher preventive care gaps among symptomatic patients with elevated blood pressure. Our data also reflect more recent care preventive patterns across a broad geographic and socioeconomic sample. Our explicit inclusion of multiple racial/ethnic groups—particularly Asians—is also an advance for research in cardiovascular disease disparities, where previous

comparisons have often been limited to Whites and Blacks only.[29,33-35] Our findings of disparities in preventive care are therefore more comprehensive and robust.

Similar to other studies of gaps in preventive care, our results highlight the importance of public health and policy initiatives aimed at bolstering primary prevention. Policy initiatives, such as the Million Hearts campaign, now leverage public-private partnerships and large investments in state and community programs to improve aspirin use in patients with CAD, blood pressure control among patients with hypertension, cholesterol management, and smoking cessation.[36,37] In addition, our findings reinforce the potential benefits of public and private policies that eliminate marginal cost-sharing for cholesterol and hypertension screening, obesity screening and counseling, and smoking cessation services.[38] Gaps in preventive care also highlight opportunities for making diagnostic testing a "teachable moment" for symptomatic patients in this population—and for the primary care physicians and cardiologists caring for them. We did not examine the association of gaps in care with subsequent imaging, CAD diagnosis, or invasive coronary angiography. In prior work, we showed that new initiation of an aspirin, statin, beta-blocker, or ACEi/ARB was not associated with the rate of adverse cardiovascular events over a median follow-up period of 25 months in adjusted models.[39] We have also reported that absence of hypertension, dyslipidemia, and tobacco use are associated with a lower rate of adverse cardiovascular events.[40] We also found that treatment gaps among patients with hypertension or diabetes were not associated with an increased risk of adverse cardiovascular events. In contrast, treatment gaps among patients with dyslipidemia were associated with an increased risk of adverse cardiovascular events.

Our study has important limitations. There may have been patients whose hypertension or dyslipidemia were well-controlled with dietary changes and exercise alone. Among diabetics, we

did not have clinical information about albuminuria, so there may have been patients for whom the benefit of ACEi/ARB therapy was uncertain. In addition, our measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results. Our use of BMI as a surrogate for body fatness and obesity identification is also vulnerable to misclassification, since sex, age, race/ethnicity, and muscle mass influence the relationship between BMI and excess fat.

In conclusion, among contemporary, symptomatic patients presenting to primary care physicians, cardiologists, and other specialists with suspected CAD, opportunities exist to bridge significant gaps in preventive care and lifestyle practices and reduce the incidence of future CAD. Differences by sex, age, race/ethnicity, socioeconomic status, and geography tend to be modest but contribute to disparities and identify populations that should be targeted for interventions.

Acknowledgments

Author Contributions: AC had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Study concept and design: JL, PD

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: AC, KL

Source of Funding: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235. The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The views expressed in this article do not necessarily represent the official views of the National Heart, Lung, and Blood Institute.

Disclosures: Dr. Ladapo's work is supported by the National Heart, Lung, and Blood Institute (K23 HL116787) and he serves as a consultant to CardioDx, Inc. Dr. Douglas has received grant support from HeartFlow and serves on a data and safety monitoring board for General Electric Healthcare; Dr. Hoffmann has received grant support from Siemens Healthcare and HeartFlow; Dr. Mark has received personal fees from Medtronic, CardioDx, and St. Jude Medical and grant support from Eli Lilly, Bristol-Myers Squibb, Gilead Sciences, AGA Medical, Merck, Oxygen

Biotherapeutics, and AstraZeneca. No financial disclosures were reported by the other authors of this paper.

All data are the property of the PROMISE Trial of Duke University. Study data is availability is limited and available upon request.

We are grateful for the contributions of the study participants and study team.

References

1. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):937-952.
2. 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(1):16-22.
3. Ladapo JA, Blecker S, Douglas PS. Physician decision making and trends in the use of cardiac stress testing in the United States: an analysis of repeated cross-sectional data. *Ann Intern Med.* 2014;161(7):482-490.
4. Douglas PS, Hoffmann U, Patel MR, et al. Outcomes of anatomical versus functional testing for coronary artery disease. *N Engl J Med.* 2015;372(14):1291-1300.
5. Ladapo JA, Goldfeld KS, Douglas PS. Projected morbidity and mortality from missed diagnoses of coronary artery disease in the United States. *Int J Cardiol.* 2015;195:250-252.
6. Young LH, Wackers FJ, Chyun DA, et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. *JAMA.* 2009;301(15):1547-1555.
7. Hachamovitch R, Nutter B, Hlatky MA, et al. Patient management after noninvasive cardiac imaging: results from SPARC (Study of Myocardial Perfusion and Coronary Anatomy Imaging Roles in Coronary Artery Disease). *J Am Coll Cardiol.* 2012;59(5):462-474.
8. Cheezum MK, Hulten EA, Smith RM, et al. Changes in preventive medical therapies and CV risk factors after CT angiography. *JACC: Cardiovascular Imaging.* 2013;6(5):574-581.
9. Hulten E, Bittencourt MS, Singh A, et al. Coronary artery disease detected by coronary computed tomographic angiography is associated with intensifcation of preventive medical therapy and lower low-density lipoprotein cholesterol. *Circulation: Cardiovascular Imaging.* 2014;7(4):629-638.
10. Douglas PS, Hoffmann U, Lee KL, et al. PROspective Multicenter Imaging Study for Evaluation of chest pain: rationale and design of the PROMISE trial. *Am Heart J.* 2014;167(6):796-803 e791.
11. Jackson R, Lawes CM, Bennett DA, Milne RJ, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet.* 2005;365(9457):434-441.
12. Turnbull F, Neal B, Ninomiya T, et al. Effects of different regimens to lower blood pressure on major cardiovascular events in older and younger adults: meta-analysis of randomised trials. *BMJ.* 2008;336(7653):1121-1123.
13. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community a statement by the American Society of Hypertension and the International Society of Hypertension. *J. Hypertens.* 2014;32(1):3-15.
14. Rosendorff C, Black HR, Cannon CP, et al. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on

Clinical Cardiology and Epidemiology and Prevention. *Circulation.* 2007;115(21):2761-2788.
15. LaRosa JC, He J, Vupputuri S. Effect of statins on risk of coronary disease: a meta-analysis of randomized controlled trials. *JAMA.* 1999;282(24):2340-2346.
16. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation.* 2002;106(25):3143-3421.
17. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2014;129(25 Suppl 2):S49-73.
18. Pandya A, Sy S, Cho S, Weinstein MC, Gaziano TA. Cost-effectiveness of 10-year risk thresholds for initiation of statin therapy for primary prevention of cardiovascular disease. *JAMA.* 2015;314(2):142-150.
19. Patel A, MacMahon S, Chalmers J, et al. Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet.* 2007;370(9590):829-840.
20. Ruggenenti P, Fassi A, Ilieva AP, et al. Preventing microalbuminuria in type 2 diabetes. *N Engl J Med.* 2004;351(19):1941-1951.
21. Schrier RW, Estacio RO, Esler A, Mehler P. Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int.* 2002;61(3):1086-1097.
22. Newman DJ, Mattock MB, Dawnay AB, et al. Systematic review on urine albumin testing for early detection of diabetic complications. *Health Technol Assess.* 2005;9(30):iii-vi, xiii-163.
23. Adler AI, Stevens RJ, Manley SE, Bilous RW, Cull CA, Holman RR. Development and progression of nephropathy in type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS 64). *Kidney Int.* 2003;63(1):225-232.
24. American Diabetes Association. 8. Cardiovascular disease and risk management. *Diabetes Care.* 2015;38 Suppl:S49-57.
25. Barbeau EM, Krieger N, Soobader MJ. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health.* 2004;94(2):269-278.
26. Rathore SS, Berger AK, Weinfurt KP, et al. Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation.* 2000;102(6):642-648.
27. Rao SV, Schulman KA, Curtis LH, Gersh BJ, Jollis JG. Socioeconomic status and outcome following acute myocardial infarction in elderly patients. *Arch Intern Med.* 2004;164(10):1128-1133.
28. Subherwal S, Patel MR, Tang F, et al. Socioeconomic disparities in the use of cardioprotective medications among patients with peripheral artery disease: an analysis of the American College of Cardiology's NCDR PINNACLE Registry. *J Am Coll Cardiol.* 2013;62(1):51-57.

29. Bucholz EM, Ma S, Normand SL, Krumholz HM. Race, socioeconomic status, and life expectancy after acute myocardial infarction. *Circulation.* 2015;132(14):1338-1346.
30. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics.* 1999;55(2):652-659.
31. Zoghbi GJ, Dorfman TA, Iskandrian AE. The effects of medications on myocardial perfusion. *J Am Coll Cardiol.* 2008;52(6):401-416.
32. Virani SS, Woodard LD, Ramsey DJ, et al. Gender disparities in evidence-based statin therapy in patients with cardiovascular disease. *Am J Cardiol.* 2015;115(1):21-26.
33. Folsom AR, Yatsuya H, Nettleton JA, et al. Community prevalence of ideal cardiovascular health, by the American Heart Association definition, and relationship with cardiovascular disease incidence. *J Am Coll Cardiol.* 2011;57(16):1690-1696.
34. Hertz RP, Unger AN, Cornell JA, Saunders E. Racial disparities in hypertension prevalence, awareness, and management. *Arch Intern Med.* 2005;165(18):2098-2104.
35. Diez Roux AV, Merkin SS, Arnett D, et al. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med.* 2001;345(2):99-106.
36. Frieden TR, Berwick DM. The "Million Hearts" initiative--preventing heart attacks and strokes. *N Engl J Med.* 2011;365(13):e27.
37. Sanghavi DM, Conway PH. Paying for prevention: a novel test of medicare value-based payment for cardiovascular risk reduction. *JAMA.* 2015;314(2):123-124.
38. Koh HK, Sebelius KG. Promoting prevention through the Affordable Care Act. *N Engl J Med.* 2010;363(14):1296-1299.
39. Ladapo JA, Hoffmann U, Lee KL, Coles A, Huang M, Mark DB, Dolor RJ, Pelberg RA, Budoff M, Sigurdsson G, Severance HW, Douglas PS. Changes in Medical Therapy and Lifestyle After Anatomical or Functional Testing for Coronary Artery Disease. *Journal of the American Heart Association.* 2016;5(10).
40. Fordyce CB, Douglas PS, Roberts RS, Hoffmann U, Al-Khalidi HR, Patel MR, Granger CB, Kostis J, Mark DB, Lee KL, Udelson JE, Prospective Multicenter Imaging Study for Evaluation of Chest Pain I. Identification of Patients With Stable Chest Pain Deriving Minimal Value From Noninvasive Testing: The PROMISE Minimal-Risk Tool, A Secondary Analysis of a Randomized Clinical Trial. *JAMA Cardiol.* 2017;2(4):400-408.

FIGURE LEGENDS

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

Table 1. Demographics and Presenting Characteristics for All Patients

Characteristic	All Patients (N=10003)
Female (%)	5270/10003 (52.7%)
Median age (IQR), years	60.0 (54.4-66.0)
Age (%), years	
45-64	7111/10003 (71.1%)
65-79	2711/10003 (27.1%)
80+	181/10003 (1.8%)
Race/ethnicity (%)	
Hispanic or Latino	767/9945 (7.7%)
Not Hispanic or Latino-White	7693/9945 (77.4%)
Not Hispanic or Latino-Black	1071/9945 (10.8%)
Not Hispanic or Latino-Asian	250/9945 (2.5%)
Not Hispanic or Latino-Other	164/9945 (1.6%)
Socioeconomic status (minimum, maximum income), $[a]	
Low	11118, 42610
Medium-low	42613, 54149
Medium-high	54167, 71034
High	71059, 184338
US region[b]	
Midwest	2208/9690 (22.8%)
Northeast	1439/9690 (14.9%)
South	3999/9690 (41.3%)
West	2044/9690 (21.1%)
Cardiac risk factors	
BMI ≥ 30 (%) (median 29.7, IQR 26.3-33.9)	4724/9907 (47.7%)
Hypertension (%)	6501/10002 (65.0%)
Diabetes (%)	2144/10002 (21.4%)
Dyslipidemia (%)	6767/10002 (67.7%)
Family history of premature CAD (%)	3202/9970 (32.1%)
Peripheral arterial disease or cerebrovascular disease (%)	552/10003 (5.5%)
CAD risk equivalent (%)	2531/10003 (25.3%)

Characteristic	All Patients (N=10003)
Metabolic syndrome (%)	3772/10003 (37.7%)
Current tobacco use (%)	1773/10000 (17.7%)
Regular exercise (%)	5116/9982 (51.3%)
History of depression (%)	2058/10000 (20.6%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.14) [10003]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (11.75) [9901]
Medication use (%)	
Aspirin	4280/9569 (44.7%)
Statin	4389/9569 (45.9%)
Beta-blocker	2399/9569 (25.1%)
ACE inhibitor or ARB	4194/9569 (43.8%)
Primary presenting symptoms (%)	
Chest pain	7272/9996 (72.7%)
Dyspnea	1490/9996 (14.9%)
Other	1234/9996 (12.3%)
Type of angina (%)	
Typical	1166/10003 (11.7%)
Atypical	7773/10003 (77.7%)
Non-cardiac	1064/10003 (10.6%)
Physician specialty (%)	
Cardiology	8662/10003 (86.6%)
Internal medicine	565/10003 (5.6%)
Other	776/10003 (7.8%)

[a]Median household income (in US $) is used as a surrogate for socioeconomic status.

[b]143 patients had missing zip code data, and 170 patients had zip codes that were not reported in 2010 Census ACS data.

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; CAD, coronary artery disease; IQR, interquartile range.

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline

	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.37	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.42
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age, years									
45-64	14.7	--	--	39.1	--	--	33.3	--	--
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
Race/ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43	1.32 (0.88 - 1.98)	0.18	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic status[e]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37	1.20 (1.02 - 1.41)	0.027	30	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.79
High	13.9	--	--	35.5	--	--	34.3	--	--

Patient Characteristic	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value
US region[e]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.85
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--

[a]Commonly used antihypertensives include angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[b]Only patients with hypertension included in the analysis (N=6501).

[c]Only patients with dyslipidemia included in the analysis (N=6767).

[d]Only patients with diabetes included in the analysis (N=2144).

[e]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline Cont.

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
45-64	48.7	--	--	21.7	--	--	51.0	--	--
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
Race/ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.93 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic status[b]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
High	41.4	--	--	11.5	--	--	42.3	--	--
US region[b]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.97 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--

[a]Obese defined as BMI ≥ 30.

[b]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

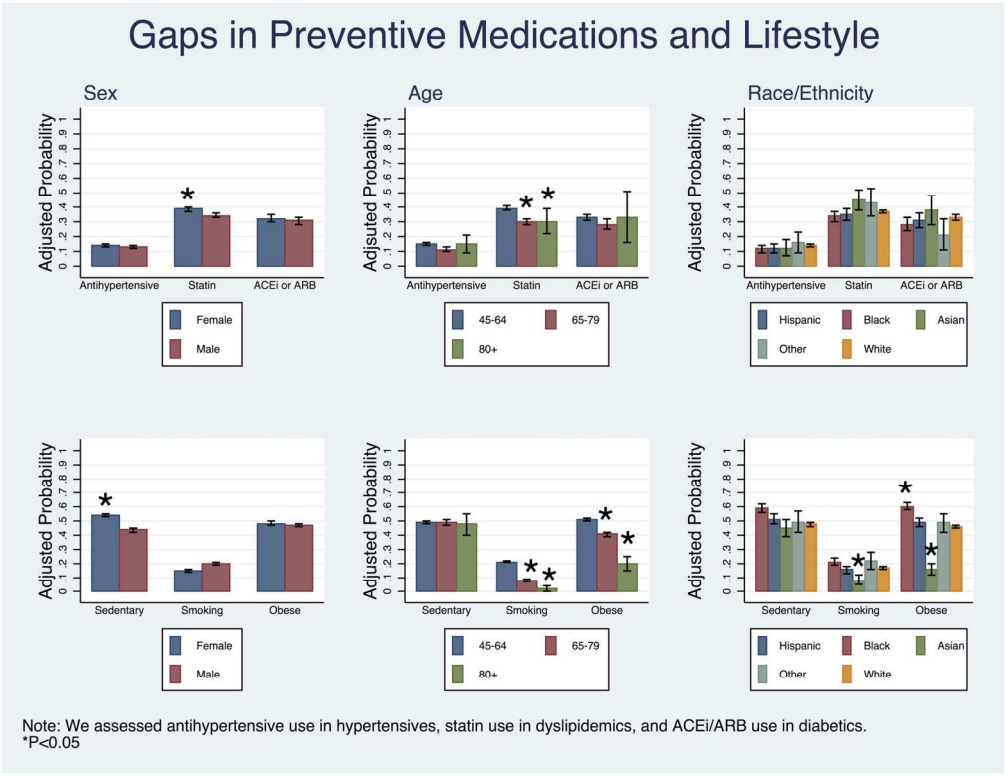

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

158x121mm (300 x 300 DPI)

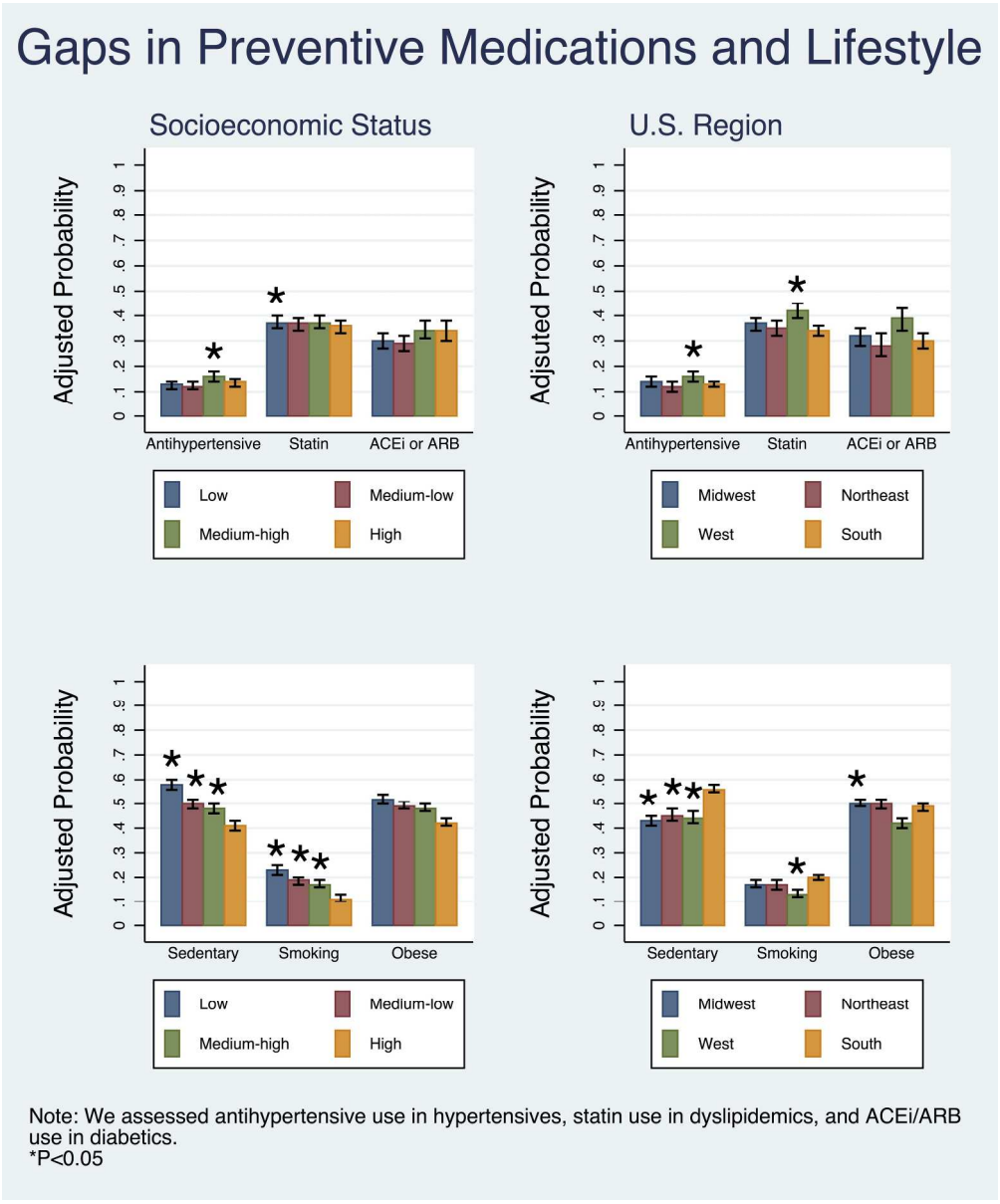

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

248x298mm (300 x 300 DPI)

Supplementary Appendix

Table 1.1. Demographics and Baseline Characteristics for Patients With Hypertension

Characteristic	Patients With Hypertension (N=6501)
Female (%)	3509/6501 (54.0%)
Age (%), y	
45-64	4522/6501 (69.6%)
65-79	1849/6501 (28.4%)
80+	130/6501 (2.0%)
Race/ethnicity (%)	
Hispanic or Latino	531/6471 (8.2%)
Not Hispanic or Latino-White	4813/6471 (74.4%)
Not Hispanic or Latino-Black	885/6471 (13.7%)
Not Hispanic or Latino-Asian	142/6471 (2.2%)
Not Hispanic or Latino-Other	100/6471 (1.5%)
Socioeconomic status (minimum, maximum income), $*	
Low	(11792,42610)
Medium-low	(42613,54149)
Medium-high	(54167,71034)
High	(71059,180815)
US region	
Midwest	1395/6316 (22.1%)
Northeast	965/6316 (15.3%)
South	2736/6316 (43.3%)
West	1220/6316 (19.3%)
Cardiac risk factors	
BMI ≥ 30 (%)	3538/6439 (54.9%)
Diabetes (%)	1712/6501 (26.3%)
Dyslipidemia (%)	4408/6501 (67.8%)
Family history of premature CAD (%)	2050/6481 (31.6%)
Peripheral arterial disease or cerebrovascular disease (%)	424/6501 (6.5%)
CAD risk equivalent (%)	1992/6501 (30.6%)
Metabolic syndrome (%)	3080/6501 (47.4%)
Current tobacco use (%)	1025/6499 (15.8%)
Regular exercise (%)	3060/6487 (47.2%)
History of depression (%)	1381/6499 (21.2%)

Characteristic	Patients With Hypertension (N=6501)
Risk Scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.21) [6501]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	17 (12.72) [6434]
Medication use (%)	
Aspirin	2956/6363 (46.5%)
Statin	3057/6363 (48.0%)
Beta-blocker	2126/6363 (33.4%)
ACE inhibitor or ARB	4041/6363 (63.5%)
Primary presenting symptoms (%)	
Chest pain	4653/6498 (71.6%)
Dyspnea	1027/6498 (15.8%)
Other	818/6498 (12.6%)
Type of angina (%)	
Typical	802/6501 (12.3%)
Atypical	5044/6501 (77.6%)
Non-cardiac	655/6501 (10.1%)
Physician specialty (%)	
Cardiology	5592/6501 (86.0%)
Internal Medicine	380/6501 (5.8%)
Other	529/6501 (8.1%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.2. Demographics and Baseline Characteristics for Patients With Dyslipidemia

Characteristic	Patients with Dyslipidemia (N=6767)
Female (%)	3632/6767 (53.7%)
Age (%), y	
45-64	4824/6767 (71.3%)
65-79	1827/6767 (27.0%)
80+	116/6767 (1.7%)
Race/ethnicity (%)	
Hispanic or Latino	516/6728 (7.7%)
Not Hispanic or Latino-White	5270/6728 (78.3%)
Not Hispanic or Latino-Black	618/6728 (9.2%)
Not Hispanic or Latino-Asian	207/6728 (3.1%)
Not Hispanic or Latino-Other	117/6728 (1.7%)
Socioeconomic status (minimum, maximum income)*	
Low	(11118,42610)
Medium-low	(42613,54149)
Medium-high	(54175,71034)
High	(71059,184338)
US region	
Midwest	1543/6572 (23.5%)
Northeast	1004/6572 (15.3%)
South	2569/6572 (39.1%)
West	1456/6572 (22.2%)
Cardiac risk factors	
BMI ≥ 30 (%)	3257/6701 (48.6%)
Hypertension (%)	4408/6767 (65.1%)
Diabetes (%)	1656/6767 (24.5%)
Family history of premature CAD (%)	2310/6746 (34.2%)
Peripheral arterial disease or cerebrovascular disease (%)	420/6767 (6.2%)
CAD risk equivalent (%)	1940/6767 (28.7%)
Metabolic syndrome (%)	3181/6767 (47.0%)
Current tobacco use (%)	1016/6765 (15.0%)
Regular exercise (%)	3520/6749 (52.2%)
History of depression (%)	1498/6765 (22.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.11) [6767]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (12.26) [6698]

Characteristic	Patients with Dyslipidemia (N=6767)
Medication use (%)	
Aspirin	3161/6570 (48.1%)
Statin	4178/6570 (63.6%)
Beta-blocker	1655/6570 (25.2%)
ACE inhibitor or ARB	2943/6570 (44.8%)
Primary presenting symptoms (%)	
Chest pain	4851/6761 (71.7%)
Dyspnea	1033/6761 (15.3%)
Other	877/6761 (13.0%)
Type of angina (%)	
Typical	801/6767 (11.8%)
Atypical	5268/6767 (77.8%)
Non-cardiac	698/6767 (10.3%)
Physician specialty (%)	
Cardiology	5858/6767 (86.6%)
Internal Medicine	371/6767 (5.5%)
Other	538/6767 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.3. Demographics and Baseline Characteristics for Patients With Diabetes

Characteristic	Patients with Diabetes (N=2144)
Female (%)	1151/2144 (53.7%)
Age (%), y	
45-64	1488/2144 (69.4%)
65-79	630/2144 (29.4%)
80+	26/2144 (1.2%)
Race/ethnicity (%)	
Hispanic or Latino	256/2132 (12.0%)
Not Hispanic or Latino-White	1414/2132 (66.3%)
Not Hispanic or Latino-Black	345/2132 (16.2%)
Not Hispanic or Latino-Asian	75/2132 (3.5%)
Not Hispanic or Latino-Other	42/2132 (2.0%)
Socioeconomic status (minimum, maximum income)*	
Low	(14586,42610)
Medium-low	(42641,54149)
Medium-high	(54260,71034)
High	(71059,139779)
US region	
Midwest	414/2074 (20.0%)
Northeast	348/2074 (16.8%)
South	916/2074 (44.2%)
West	396/2074 (19.1%)
Cardiac risk factors	
BMI ≥ 30 (%)	1463/2117 (69.1%)
Hypertension (%)	1712/2144 (79.9%)
Dyslipidemia (%)	1656/2144 (77.2%)
Family history of premature CAD (%)	655/2140 (30.6%)
Peripheral arterial disease or cerebrovascular disease (%)	165/2144 (7.7%)
CAD risk equivalent (%)	2144/2144 (100.0%)
Metabolic syndrome (%)	1822/2144 (85.0%)
Current tobacco use (%)	318/2144 (14.8%)
Regular exercise (%)	926/2142 (43.2%)
History of depression (%)	516/2142 (24.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	54 (20.26) [2144]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	24 (15.25) [2111]
Medication use (%)	

Characteristic	Patients with Diabetes (N=2144)
Aspirin	1098/2118 (51.8%)
Statin	1291/2118 (61.0%)
Beta-blocker	619/2118 (29.2%)
ACE inhibitor or ARB	1444/2118 (68.2%)
Primary presenting symptoms (%)	
Chest pain	1518/2144 (70.8%)
Dyspnea	375/2144 (17.5%)
Other	251/2144 (11.7%)
Type of angina (%)	
Typical	296/2144 (13.8%)
Atypical	1653/2144 (77.1%)
Non-cardiac	195/2144 (9.1%)
Physician specialty (%)	
Cardiology	1830/2144 (85.4%)
Internal Medicine	142/2144 (6.6%)
Other	172/2144 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 2.1. Prevalence and Adjusted Odds of No Medication Use at Baseline

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Key Risk Factors									
Hypertension	13.8	--	--	33.3	1.08 (0.92 - 1.28)	0.334	20.2	0.07 (0.05 - 0.09)	< 0.001
Dyslipidemia	13.1	1.31 (1.08 - 1.59)	0.007	36.4	--	--	29.8	1.27 (0.92 - 1.74)	0.148
Diabetes	8.07	0.67 (0.52 - 0.85)	< 0.001	25.5	0.51 (0.43 - 0.60)	< 0.001	31.8	--	--
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.370	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.420
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age									
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30.0	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
45-64	14.7	--	--	39.1	--	--	33.3	--	--
Race/Ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43.0	1.32 (0.88 - 1.98)	0.180	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic Status[5]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37.0	1.20 (1.02 - 1.41)	0.027	30.0	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.790
High	13.9	--	--	35.5	--	--	34.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
US Region[5]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35.0	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.850
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--
Cardiac Risk Factors at Baseline[6]									
BMI ≥ 30	12.1	0.71 (0.58 - 0.85)	< 0.001	34.9	0.93 (0.80 - 1.07)	0.285	27.7	0.58 (0.43 - 0.78)	< 0.001
Regular exercise	13.7	0.89 (0.76 - 1.04)	0.151	37.2	1.04 (0.94 - 1.17)	0.444	31.8	0.78 (0.62 - 0.99)	0.041
Current tobacco use	14.2	1.11 (0.89 - 1.37)	0.356	39.5	1.09 (0.93 - 1.27)	0.287	35.4	1.24 (0.89 - 1.71)	0.204
Family History of Premature CAD	13.0	0.90 (0.77 - 1.07)	0.226	36.3	0.98 (0.87 - 1.09)	0.672	31.2	0.91 (0.71 - 1.16)	0.433
Peripheral arterial disease or cerebrovascular disease	12.2	0.99 (0.72 - 1.37)	0.948	25.3	0.66 (0.52 - 0.84)	< 0.001	28.8	1.08 (0.71 - 1.64)	0.720
Metabolic syndrome	11.4	1.09 (0.87 - 1.35)	0.463	33.8	1.22 (1.04 - 1.43)	0.015	27.6	0.94 (0.64 - 1.40)	0.774
History of depression	13.6	0.98 (0.81 - 1.18)	0.794	37.0	1.00 (0.87 - 1.13)	0.955	34.6	1.12 (0.86 - 1.47)	0.389
ASCVD pooled cohort risk prediction categories									
High (>=15)	10.5	0.45 (0.34 - 0.58)	< 0.001	31.6	1.22 (1.01 - 1.47)	0.036	27.1	0.64 (0.42 - 0.97)	0.034
Intermediate (7.5 - 14.99)	13.2	0.63 (0.51 - 0.77)	< 0.001	37.4	1.07 (0.93 - 1.24)	0.330	39.3	0.90 (0.60 - 1.34)	0.588
Low (< 7.5)	19.7	--	--	41.3	--	--	41.3	--	--
Blood Pressure categories									
High (≥160/100)	15.3	1.54 (1.19 - 1.99)	0.001	39.6	1.28 (1.03 - 1.59)	0.023	25.2	1.14 (0.74 - 1.77)	0.556
Intermediate (≥140-159/90-99)	16.3	1.58 (1.34 - 1.86)	< 0.001	36.3	1.08 (0.95 - 1.22)	0.241	27.5	1.02 (0.79 - 1.32)	0.884
Low (<140/90)	12.1	--	--	36.1	--	--	34.9	--	--
Medication Use at Baseline									
Antihypertensive				31.0	0.64 (0.53 - 0.77)	< 0.001	14.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Statin	10.0	0.53 (0.45 - 0.64)	< 0.001				27.0	0.51 (0.39 - 0.67)	< 0.001
ACEi or ARB	0.00	--	--	29.0	0.82 (0.70 - 0.96)	0.011			
Primary Presenting Symptom									
Chest pain	14.2	0.90 (0.72 - 1.12)	0.340	37.2	1.08 (0.92 - 1.27)	0.356	32.6	0.95 (0.66 - 1.35)	0.754
Dyspnea	11.1	0.79 (0.59 - 1.06)	0.118	34.9	1.09 (0.89 - 1.33)	0.419	28.7	0.90 (0.59 - 1.37)	0.617
Other	14.7	--	--	34.3	--	--	32.1	--	--
Type of Angina									
Atypical	13.9	0.92 (0.72 - 1.18)	0.515	36.7	1.03 (0.87 - 1.24)	0.712	32.1	0.95 (0.64 - 1.40)	0.788
Typical	11.1	0.76 (0.55 - 1.06)	0.107	35.4	1.04 (0.83 - 1.31)	0.720	30.4	0.94 (0.58 - 1.52)	0.802
Non-cardiac	15.8	--	--	35.6	--	--	31.4	--	--
Cardiac Specialist									
Cardiologist	13.5	0.83 (0.67 - 1.03)	0.099	36.3	0.94 (0.80 - 1.10)	0.406	31.6	0.94 (0.68 - 1.30)	0.723
Non-Cardiologist	15.2	--	--	37.4	--	--	32.8	--	--

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

[1] Commonly used antihypertensives include ACE inhibitors, ARBs, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[2] Only patients with hypertension included in the analysis (N=6501).

[3] Only patients with dyslipidemia included in the analysis (N=6767).

[4] Only patients with diabetes included in the analysis (N=2144).

[5] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[6] Reference group is patients without risk factor.

36/bmjopen-2017-016360 on 29 September 2017. Downloaded from

Table 2.2. Prevalence and Adjusted Odds of Lifestyle Choices at Baseline

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
45-64	48.7	--	--	21.7	--	--	51.0	--	--
Race/Ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.96 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic Status[5]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454
High	41.4	--	--	11.5	--	--	42.3	--	--
US Region[2]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.96 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--
Cardiac Risk Factors at Baseline[3]									
Current tobacco use	58.3	1.73 (1.54 - 1.94)	< 0.001	--	--	--	40.2	0.46 (0.41 - 0.54)	< 0.001
BMI ≥ 30	56.2	1.64 (1.47 - 1.82)	< 0.001	14.9	0.48 (0.41 - 0.55)	< 0.001	--	--	--

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Hypertension	52.8	1.32 (1.20 - 1.45)	< 0.001	15.8	0.62 (0.55 - 0.70)	< 0.001	54.9	1.19 (1.06 - 1.33)	0.003
Diabetes	56.8	1.12 (0.99 - 1.26)	0.078	14.8	0.61 (0.51 - 0.72)	< 0.001	69.1	0.48 (0.40 - 0.56)	< 0.001
Dyslipidemia	47.8	0.91 (0.83 - 1.01)	0.068	15.0	0.53 (0.47 - 0.60)	< 0.001	48.6	0.41 (0.37 - 0.46)	< 0.001
Family History of Premature CAD	45.2	0.78 (0.71 - 0.85)	< 0.001	18.3	1.07 (0.95 - 1.21)	0.248	48.3	1.05 (0.94 - 1.17)	0.400
Peripheral arterial disease or cerebrovascular disease	57.8	1.33 (1.11 - 1.60)	0.003	21.9	1.61 (1.28 - 2.03)	< 0.001	45.6	0.78 (0.62 - 0.97)	0.028
Metabolic syndrome	56.0	1.10 (0.97 - 1.24)	0.157	16.3	1.43 (1.20 - 1.69)	< 0.001	83.3	27.77 (23.74 - 32.48)	< 0.001
History of depression	53.3	1.09 (0.98 - 1.21)	0.119	23.0	1.52 (1.33 - 1.74)	< 0.001	53.2	1.25 (1.10 - 1.42)	< 0.001
ASCVD pooled cohort risk prediction ≥ 7.5%	49.7	1.08 (0.97 - 1.20)	0.170	19.2	2.45 (2.12 - 2.83)	< 0.001	49.4	0.89 (0.78 - 1.02)	0.094
Primary Presenting Symptom									
Chest pain	48.5	1.09 (0.95 - 1.24)	0.209	18.5	0.92 (0.77 - 1.09)	0.315	46.9	0.96 (0.82 - 1.13)	0.626
Dyspnea	52.2	1.27 (1.08 - 1.49)	0.004	13.8	0.73 (0.58 - 0.92)	0.007	53.0	1.23 (1.01 - 1.50)	0.036
Other	46.0	--	--	17.8	--	--	45.5	--	--
Type of Angina									
Atypical	48.8	1.08 (0.94 - 1.25)	0.256	17.9	0.96 (0.80 - 1.16)	0.682	47.7	0.92 (0.78 - 1.09)	0.335
Typical	50.4	1.14 (0.95 - 1.37)	0.157	16.5	0.85 (0.66 - 1.09)	0.193	49.4	0.88 (0.70 - 1.09)	0.237
Non-cardiac	46.5	--	--	18.0	--	--	45.7	--	--
Cardiac Specialist									
Cardiologist	48.7	1.00 (0.89 - 1.14)	0.951	17.7	1.03 (0.87 - 1.21)	0.746	47.6	1.07 (0.92 - 1.24)	0.407
Non-Cardiologist	49.2	--	--	17.9	--	--	48.7	--	--

[1] Obese defined as BMI ≥ 30.

[2] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[3] Reference group is patients without risk factor.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1 (Lines 1-3)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 (All Lines)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 (All Lines)
Objectives	3	State specific objectives, including any pre-specified hypotheses	4 (Lines 16 – 22)
Methods			
Study design	4	Present key elements of study design early in the paper	5 (Lines 3 – 11)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5 (Lines 3 – 11)
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5 (Lines 5 – 8)
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7 (All Lines)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5 (Lines 11 – 21) – 8 (All Lines)*
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	5 (lines 5-9)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	N/A
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7 (Lines 16 – 21) – 8 (Lines 1 – 12)
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed	N/A

		Case-control study—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8 (Lines 17)
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8 (Lines 17 – 23) -9 (All Lines)
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11 (All Lines)
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13 (Lines 13 – 20)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13 (All LInes)
Generalisability	21	Discuss the generalisability (external validity) of the study results	13 (Lines 23-25)
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15 (All Lines)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-016364.R2
Article Type:	Research
Date Submitted by the Author:	28-Jun-2017
Complete List of Authors:	Ladapo, Joseph; University of California Los Angeles David Geffen School of Medicine, Medicine Coles, Adrian; Duke Clinical Research Institute Dolor, Rowena; Duke Clinical Research Institute Mark, Daniel; Duke Clinical Research Institute Cooper, Lawton; National Heart Lung and Blood Institute Lee, Kerry; Duke Clinical Research Institute Goldberg, Jonathan; Louis Stokes VA Medical Center Shapiro, Michael; Oregon Health and Science University Hoffmann, Udo; Massachusetts General Hospital, Radiology Douglas, Pamela; Duke Clinical Research Institute
Primary Subject Heading:	Cardiovascular medicine
Secondary Subject Heading:	Epidemiology
Keywords:	coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Joseph A. Ladapo, MD, PhD,[1] Adrian Coles, PhD,[2] Rowena J. Dolor, MD, MHS,[2] Daniel B. Mark, MD, MPH,[2] Lawton Cooper, MD,[3] Kerry L. Lee, PhD,[2] Jonathan Goldberg, MD,[4] Michael D. Shapiro, DO,[5] Udo Hoffmann, MD, MPH,[6] Pamela S. Douglas, MD[2]

[1]Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California; [2]Duke Clinical Research Institute, Duke University School of Medicine, Durham, North Carolina; [3]National Heart, Lung, and Blood Institute, Bethesda, Maryland; [4]Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio; [5]Oregon Health and Science University, Portland, Oregon; [6]Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Address correspondence to: Joseph A. Ladapo, MD, PhD; David Geffen School of Medicine at UCLA; Department of Medicine; Division of General Internal Medicine and Health Services Research; 911 Broxton Ave.; Los Angeles, CA 90024; Phone: 310-794-2728 Fax: 310-794-0732; Email: jladapo@mednet.ucla.edu

Word count: 2593

Support: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235

Prior presentation: Presented at American College of Cardiology Scientific Sessions on April 2, 2016

Number of Tables, Figures, and Appendices: 2 Tables, 2 Figures, 1 Appendix

ABSTRACT

Objectives—To evaluate potential gaps in preventive medical therapy and healthy lifestyle practices among symptomatic patients with suspected coronary artery disease (CAD) seeing primary care physicians and cardiologists, and how gaps vary by sociodemographic characteristics and baseline cardiovascular risk.

Design—Cross sectional study assessing potential preventive gaps

Participants—10,003 symptomatic outpatients evaluated by primary care physicians, cardiologists, or other specialists for suspected CAD.

Setting—PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) from 2010-2014.

Measures—Primary measures were absence of an antihypertensive, statin, or angiotensin-converting enzyme inhibitor/angiotensin receptor blocker for renal protection in patients with hypertension, dyslipidemia, or diabetes, respectively, and being sedentary, smoking, or being obese.

Results—Preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. Overall, 49% of patients were sedentary, 18% currently smoked, and 48% were obese. Women were significantly more likely to not take a statin for dyslipidemia and to be sedentary. Patients with lower socioeconomic status were also significantly more likely to not take a statin. Compared to Whites, Blacks were significantly more likely to be obese, while Asians were less likely to smoke or be obese. High-risk patients sometimes experienced larger preventive care gaps than low-risk patients. For patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event (HR 1.35, 95% CI 1.02-1.82).

Conclusions—Among contemporary, symptomatic patients with suspected CAD, significant gaps exist in preventive care and lifestyle practices, and high-risk patients sometimes had larger gaps. Differences by sex, age, race/ethnicity, socioeconomic status, and geography are modest but contribute to disparities and have implications for improving population health. For patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event.

Clinical Trial Registration—clinicaltrials.gov Identifier NCT01174550

Keywords: coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Abbreviations: CAD - coronary artery disease; CTA - computed tomographic angiography; PROMISE - PROspective Multicenter Imaging Study for Evaluation of Chest Pain; ACEi/ARB - angiotensin-converting enzyme inhibitor or angiotensin receptor blocker use; BMI - body mass index

Strengths and limitations of this study

- Studied 10,003 patients without diagnosed CAD whose physicians believed that noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD.
- Focused on 6 potential gaps in preventive care demonstrated to increase the risk of cardiovascular disease.
- Focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography.
- Measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results.

Preventive medical care and lifestyle practices reduce the risk of adverse cardiovascular events[1,2] and may influence how likely a patient is to present to their primary care physician or cardiologist with symptoms suggestive of coronary artery disease (CAD). In the United States, approximately 4 million of these patients are referred for outpatient cardiac stress testing or coronary computed tomographic angiography (CTA) each year.[3] Although most have significant risk factors for adverse cardiovascular events, such as hypertension, dyslipidemia, and diabetes,[4,5] little is known about their preventive medical and lifestyle practices prior to presentation, the extent to which these preventive measures differ from national recommendations and guidelines,[6-9] or their relationship with sociodemographic and socioeconomic disparities. Understanding these patterns and characterizing the magnitude of medical or lifestyle gaps—that is, the difference between recommended preventive care and actual preventive care—is a critical step toward preventing disease and reducing adverse cardiovascular events in this population, independent of the outcome of diagnostic testing. Further, if preventive care varies by sociodemographic characteristics, this variation may contribute to important health disparities and identify populations in need of specific targeting. To identify opportunities for improving preventive care in this population, we used data from symptomatic patients in the PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) to (1) evaluate potential gaps in preventive medical therapy among patients with hypertension, dyslipidemia, or diabetes; (2) determine the extent to which these gaps differed by patients' baseline risk; (3) evaluate gaps in healthy lifestyle practices, as defined by being sedentary, smoking, or being obese; and (4) determine which gaps vary by sex, age, race/ethnicity, socioeconomic status, and geography.

Methods

Study Design

Methods used in PROMISE have been described previously.[4,10] The study protocol was approved by the local or central institutional review board at each coordinating center and at each enrolling site in North America. We enrolled symptomatic outpatients without diagnosed CAD whose physicians believed that non-urgent, noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD. After providing written informed consent, 10,003 eligible patients were randomly assigned to either anatomical testing with CTA or functional testing with exercise electrocardiography, nuclear stress, or stress echocardiography.[10] Enrollment began on July 27, 2010, and was completed on September 19, 2013. All the patients were followed until October 31, 2014. Analyses were performed in 2016.

Gaps in Preventive Medications and Lifestyle Practices

At the time of enrollment, information about preventive medication use and lifestyle practices was collected by the clinical sites through patient report, chart review, and other clinical sources. We focused on 6 potential gaps in preventive care that have been demonstrated to increase the risk of cardiovascular disease[1,11]: absence of an antihypertensive medication in patients with hypertension, absence of a statin in patients with dyslipidemia, absence of an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ACEi/ARB) for renal protection in patients with diabetes, being sedentary, smoking, and being obese, as determined by a body mass index (BMI) exceeding 30. Because patients had to be eligible for randomization to either CTA or functional testing, no patients known to have renal dysfunction were enrolled.

Hypertension, Dyslipidemia, and Diabetes

Because PROMISE was a pragmatic trial, diagnoses were identified and defined by physicians at the participating clinics rather than with study-specific criteria. Among our symptomatic patients, absence of antihypertensive medication in patients with hypertension was defined as a preventive care gap because of evidence that treating patients with this comorbidity reduces the risk of cardiovascular events[12] and because treatment is consistent with recommendations issued by the American Society of Hypertension, International Society of Hypertension,[13] and American Heart Association.[14] Absence of a statin in patients with dyslipidemia was considered a preventive care gap because statin use in primary and secondary prevention has been shown to reduce cardiovascular risk.[15,16] The median atherosclerotic cardiovascular disease (ASCVD) score in our population was 11.3% with an interquartile range (IQR) of 6.1% to 19.8%, well above the 10-year risk threshold of 7.5% for treatment in most participants.[17] Applying lower ASCVD thresholds for statin therapy has also been shown to be cost-effective.[18] Absence of an ACEi/ARB for renal protection in patients with diabetes was considered a preventive care gap because the vast majority of diabetics in our population were hypertensive (79.9%) and prophylactic use of ACEi/ARBs reduces the incidence of albuminuria,[19-21] which has been shown to be a risk factor for cardiovascular[22] and overall mortality in patients with diabetes.[23,24]

Physical Inactivity, Smoking, and Obesity

Being sedentary, smoking, and being obese have all been demonstrated to increase cardiovascular risk and therefore represent important gaps in preventive lifestyle practices.[1] We assessed the prevalence of these lifestyle practices across all patients in our cohort. To assess

activity level, we asked, "During the past month, did you participate in any physical activities or exercise regularly (1 or more times per week)? Examples include: running, aerobics, golf, gardening, walking, etc." (*yes* or *no*). To assess smoking, we asked, "Have you smoked in the past two weeks?" (*yes* or *no*).

Demographics and Socioeconomics

We focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography. Race/ethnicity was reported by the patient and categorized into the following mutually exclusive groups: White; Black; American Indian/Alaska Native, Native Hawaiian/Other Pacific Islanders; and Asian (not including any Hispanics) and Hispanics (from any racial/ethnic group).[25] Socioeconomic status was defined by the median household income of the patient's zip code based on data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates), similar to prior work.[26-29] Socioeconomic status was categorized into quartiles from lowest to highest median household income (low, medium-low, medium-high, and high). We used the following US Census categories for geographic regions: Northeast, Midwest, West, and South.

Statistical Analysis

Analyses were based on patient status at presentation for CAD evaluation. P values of less than 0.05 were considered significant. We estimated summary statistics for gaps in preventive care and lifestyle practices and constructed multivariable logistic regression models to assess the association of patients' sociodemographic characteristics (sex, age, race/ethnicity, socioeconomic status, and geography) at presentation with these gaps, while controlling for

baseline risk (for blood pressure: systolic <140 mmHg and diastolic <90 mmHg, systolic 140 to 159 mmHg or diastolic 90 to 99 mmHg, and systolic ≥160 mmHg or diastolic ≥100 mmHg; for ASCVD: <7.5%, 7.5% to <15%, and ≥15%), other clinical characteristics, and physician specialty (see Appendix Tables 1.1, 1.2, and 1.3 for detailed clinical characteristics and Appendix Tables 2.1 and 2.2 for fully reported regression results). In addition to estimating covariate-adjusted odds ratios and their corresponding 95% confidence intervals, the fitted models were used to compute covariate-adjusted probabilities[30] (also known as "predictive margins") of gaps in preventive medication use and healthy lifestyle practices, with stratification by sociodemographic characteristics. In these analyses, the regression models predict proportions for each sociodemographic characteristic, while holding the distribution of all other covariates constant. We excluded 4% of patients in PROMISE from our multivariable analyses because we were unable to match their reported zip codes to US Census Bureau data. Statistical analyses were performed using SAS software, version 9.2 or higher (SAS Institute, Cary, NC).

Results

Symptomatic Patients: Characteristics and Baseline Risk

Characteristics of the 10,003 symptomatic patients (88% with chest pain/dyspnea, 12% with other symptoms) presenting to their primary care physicians, cardiologists, or other specialists are summarized in Table 1. The median age of the cohort was 60.0 years (IQR, 54.4-66.0 years), and 52.7% were women. Whites composed 77.4% of the cohort, and Blacks and Hispanics composed 10.8% and 7.7%, respectively. Asians composed 2.5% of the cohort, and people of other/unknown race/ethnicity composed 1.6% of the cohort. Patients in the lowest socioeconomic quartile lived in zip codes with a median household income less than $42,610,

while patients in the highest socioeconomic quartile lived in zip codes with median household income of at least $71,059 annually.

Preventive Medical and Lifestyle Gaps

Overall, the prevalences of hypertension, dyslipidemia, and diabetes were 65.0% (N=6501), 67.7% (N=6767), and 21.4% (N=2144), respectively. Among these symptomatic patients, preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. In our examination of preventive lifestyle practices, 49% of all patients were sedentary, 18% were current smokers, and 48% were obese.

Association of Preventive Care Gaps with Sex, Age, and Race/Ethnicity

Adjusted odds ratios for the association between patient characteristics and preventive care gaps are presented in Table 2, and covariate-adjusted probabilities of preventive care gaps are presented in Figures 1 and 2. Women were significantly more likely than men to not take a statin for dyslipidemia (OR 1.33, 95% CI 1.18-1.50) and to be sedentary (OR 1.55, 95% CI 1.41-1.70). Older patients were significantly less likely than the youngest patients to not be taking a statin for dyslipidemia (65-79 years: OR 0.64, 95% CI 0.55-0.75; ≥80 years: OR 0.59, 95% CI 0.38-0.92) and to smoke (65-79 years: OR 0.23, 95% CI 0.19-0.27; ≥80 years: OR 0.04, 95% CI 0.01-0.13). There were no significant differences in preventive medications by patients' race/ethnicity, but differences existed in preventive lifestyle practices: compared to White patients, Blacks were significantly more likely to be obese (OR 1.55, 95% CI 1.31-1.84), while Asians were less likely to smoke (OR 0.49, 95% CI 0.30-0.80) or be obese (OR 0.16, 95% CI

0.11-0.24). There were no significant differences in preventive lifestyle practices of Hispanics compared to Whites.

Variation in Preventive Care Gaps Between Higher and Lower Risk Symptomatic Patients

The prevalence of preventive medical therapy gaps varied by patient risk. Among symptomatic patients with hypertension, those at the highest overall cardiovascular risk (ASCVD ≥15%) were less likely to not be on an antihypertensive than patients at the lowest overall cardiovascular risk (ASCVD <7.5%) (OR 0.45, 95% CI 0.34-0.58), but patients with the highest blood pressure (≥160/100) were more likely to not be on an antihypertensive than patients with the lowest blood pressure (<140/90) (OR 1.54, 95% CI 1.19-1.99). Among patients with dyslipidemia, those at the highest overall cardiovascular risk (OR 1.22, 95% CI 1.01-1.47) and with the highest blood pressure (OR 1.28, 95% CI 1.03-1.59) were more likely to not be on a statin, compared to patients with the lowest cardiovascular risk or lowest blood pressure. Among patients with diabetes, those at the highest overall cardiovascular risk were less likely to not be on an ACEi/ARB than patients at the lowest overall cardiovascular risk (OR 0.64, 95% CI 0.42-0.97) (Appendix Table 2.1).

For the combined endpoint of death, myocardial infarction, or hospitalization for unstable angina, there was no association between having a treatment gap and the risk of an adverse event among patients with hypertension or diabetes. However, for patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event (HR 1.35, 95% CI 1.02-1.82).

Association of Preventive Care Gaps With Socioeconomic Status/Geography

Compared to symptomatic patients with the highest socioeconomic status, patients with a medium-high socioeconomic status were more likely to not receive an antihypertensive for hypertension (OR 1.25, 95% CI 1.01-1.55), while patients with the lowest socioeconomic status were more likely to not receive a statin for dyslipidemia (OR 1.20, 95% CI 1.02-1.41) (Table 2, Figure 2). Patients with lower socioeconomic status were also more likely to be sedentary (Low: OR 1.45, 95% CI 1.28-1.65; Medium-low: OR 1.20, 95% CI 1.07-1.36; Medium-high: OR 1.18, 95% CI 1.05-1.32) and smoke (Low: OR 2.00, 95% CI 1.68-2.38; Medium-low: OR 1.63, 95% CI 1.38-1.94; Medium-high: OR 1.52, 95% CI 1.28-1.80) than patients with the highest socioeconomic status (Table 2), and these differences were more pronounced as socioeconomic status fell. Regional differences were common: compared to patients in the South, patients living in the West were more likely to not receive antihypertensives for hypertension (OR 1.32, 95% CI 1.08-1.63) and not receive statins for dyslipidemia (OR 1.31, 95% CI 1.13-1.52). Compared to patients in the South, patients in all other US regions were less likely to be sedentary (Midwest: OR 0.58, 95% CI 0.52-0.65; Northeast: OR 0.63, 95% CI 0.55-0.72; West: OR 0.68, 95% CI 0.61-0.77), and patients in the West were less likely to smoke (OR 0.76, 95% CI 0.65-0.90), while patients in the Midwest were more likely to be obese (OR 1.23, 95% CI 1.08-1.41).

Discussion

In the PROMISE trial population, we found that symptomatic patients presenting to their primary care physicians, cardiologists, or other specialists with suspected CAD have a high prevalence of risk factors for adverse cardiovascular events, with many of these risk factors representing missed opportunities to improve preventive medical care and lifestyle practices. We identified populations that should be targeted for interventions based on their sex, age, race/ethnicity,

socioeconomic status, and geography. While some of the preventive care gaps were smaller in symptomatic patients at higher risk, others were larger or unassociated with baseline risk. Finally, our results support the notion that wider adherence to preventive medication and lifestyle practices may alter the epidemiology of chest pain presentations and reduce the incidence of evaluations for CAD.[31]

Our findings of gaps in preventive care and differences in these gaps across important sociodemographic characteristics complement the work of others. For example, in a study of patients with cardiovascular disease in the US Veterans Affairs health system, women were less likely to receive a statin than men.[32] In another study of patients with peripheral artery disease, patients living in low socioeconomic status areas, as defined by median household income, were less likely to receive statins than patients living in higher socioeconomic status areas.[28] Racial/ethnic differences in exercise participation, smoking, and obesity have also been reported.[25,33] However, our work extends and broadens the findings of these studies because (1) our study focused on actively symptomatic patients, whose presentation may be attributable to gaps in prevention; and (2) we simultaneously accounted for a wider range of sociodemographic characteristics.

By assessing the relationship between baseline risk and preventive gaps, we showed that there was a trend toward lower preventive care gaps among symptomatic patients with high ASCVD scores but higher preventive care gaps among symptomatic patients with elevated blood pressure. Our data also reflect more recent care preventive patterns across a broad geographic and socioeconomic sample. Our explicit inclusion of multiple racial/ethnic groups—particularly Asians—is also an advance for research in cardiovascular disease disparities, where previous

comparisons have often been limited to Whites and Blacks only.[29,33-35] Our findings of disparities in preventive care are therefore more comprehensive and robust.

Similar to other studies of gaps in preventive care, our results highlight the importance of public health and policy initiatives aimed at bolstering primary prevention. Policy initiatives, such as the Million Hearts campaign, now leverage public-private partnerships and large investments in state and community programs to improve aspirin use in patients with CAD, blood pressure control among patients with hypertension, cholesterol management, and smoking cessation.[36,37] In addition, our findings reinforce the potential benefits of public and private policies that eliminate marginal cost-sharing for cholesterol and hypertension screening, obesity screening and counseling, and smoking cessation services.[38] Gaps in preventive care also highlight opportunities for making diagnostic testing a "teachable moment" for symptomatic patients in this population—and for the primary care physicians and cardiologists caring for them. We did not examine the association of gaps in care with subsequent imaging, CAD diagnosis, or invasive coronary angiography. In prior work, we showed that new initiation of an aspirin, statin, beta-blocker, or ACEi/ARB was not associated with the rate of adverse cardiovascular events over a median follow-up period of 25 months in adjusted models.[39] We have also reported that absence of hypertension, dyslipidemia, and tobacco use are associated with a lower rate of adverse cardiovascular events.[40] We also found that treatment gaps among patients with hypertension or diabetes were not associated with an increased risk of adverse cardiovascular events. In contrast, treatment gaps among patients with dyslipidemia were associated with an increased risk of adverse cardiovascular events.

Our study has important limitations. There may have been patients whose hypertension or dyslipidemia were well-controlled with dietary changes and exercise alone. Among diabetics, we

did not have clinical information about albuminuria, so there may have been patients for whom the benefit of ACEi/ARB therapy was uncertain. In addition, our measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results. Our use of BMI as a surrogate for body fatness and obesity identification is also vulnerable to misclassification, since sex, age, race/ethnicity, and muscle mass influence the relationship between BMI and excess fat.

In conclusion, among contemporary, symptomatic patients presenting to primary care physicians, cardiologists, and other specialists with suspected CAD, opportunities exist to bridge significant gaps in preventive care and lifestyle practices and reduce the incidence of future CAD. Differences by sex, age, race/ethnicity, socioeconomic status, and geography tend to be modest but contribute to disparities and identify populations that should be targeted for interventions.

Acknowledgments

Author Contributions: AC had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Study concept and design: JL, PD

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: AC, KL

Source of Funding: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235. The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The views expressed in this article do not necessarily represent the official views of the National Heart, Lung, and Blood Institute.

Disclosures: Dr. Ladapo's work is supported by the National Heart, Lung, and Blood Institute (K23 HL116787) and he serves as a consultant to CardioDx, Inc. Dr. Douglas has received grant support from HeartFlow and serves on a data and safety monitoring board for General Electric Healthcare; Dr. Hoffmann has received grant support from Siemens Healthcare and HeartFlow; Dr. Mark has received personal fees from Medtronic, CardioDx, and St. Jude Medical and grant support from Eli Lilly, Bristol-Myers Squibb, Gilead Sciences, AGA Medical, Merck, Oxygen

Biotherapeutics, and AstraZeneca. No financial disclosures were reported by the other authors of this paper.

All data are the property of the PROMISE Trial of Duke University. Study data is availability is limited and available upon request.

We are grateful for the contributions of the study participants and study team.

References

1. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):937-952.
2. 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(1):16-22.
3. Ladapo JA, Blecker S, Douglas PS. Physician decision making and trends in the use of cardiac stress testing in the United States: an analysis of repeated cross-sectional data. *Ann Intern Med.* 2014;161(7):482-490.
4. Douglas PS, Hoffmann U, Patel MR, et al. Outcomes of anatomical versus functional testing for coronary artery disease. *N Engl J Med.* 2015;372(14):1291-1300.
5. Ladapo JA, Goldfeld KS, Douglas PS. Projected morbidity and mortality from missed diagnoses of coronary artery disease in the United States. *Int J Cardiol.* 2015;195:250-252.
6. Young LH, Wackers FJ, Chyun DA, et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. *JAMA.* 2009;301(15):1547-1555.
7. Hachamovitch R, Nutter B, Hlatky MA, et al. Patient management after noninvasive cardiac imaging: results from SPARC (Study of Myocardial Perfusion and Coronary Anatomy Imaging Roles in Coronary Artery Disease). *J Am Coll Cardiol.* 2012;59(5):462-474.
8. Cheezum MK, Hulten EA, Smith RM, et al. Changes in preventive medical therapies and CV risk factors after CT angiography. *JACC: Cardiovascular Imaging.* 2013;6(5):574-581.
9. Hulten E, Bittencourt MS, Singh A, et al. Coronary artery disease detected by coronary computed tomographic angiography is associated with intensifcation of preventive medical therapy and lower low-density lipoprotein cholesterol. *Circulation: Cardiovascular Imaging.* 2014;7(4):629-638.
10. Douglas PS, Hoffmann U, Lee KL, et al. PROspective Multicenter Imaging Study for Evaluation of chest pain: rationale and design of the PROMISE trial. *Am Heart J.* 2014;167(6):796-803 e791.
11. Jackson R, Lawes CM, Bennett DA, Milne RJ, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet.* 2005;365(9457):434-441.
12. Turnbull F, Neal B, Ninomiya T, et al. Effects of different regimens to lower blood pressure on major cardiovascular events in older and younger adults: meta-analysis of randomised trials. *BMJ.* 2008;336(7653):1121-1123.
13. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community a statement by the American Society of Hypertension and the International Society of Hypertension. *J. Hypertens.* 2014;32(1):3-15.
14. Rosendorff C, Black HR, Cannon CP, et al. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on

Clinical Cardiology and Epidemiology and Prevention. *Circulation.* 2007;115(21):2761-2788.
15. LaRosa JC, He J, Vupputuri S. Effect of statins on risk of coronary disease: a meta-analysis of randomized controlled trials. *JAMA.* 1999;282(24):2340-2346.
16. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation.* 2002;106(25):3143-3421.
17. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2014;129(25 Suppl 2):S49-73.
18. Pandya A, Sy S, Cho S, Weinstein MC, Gaziano TA. Cost-effectiveness of 10-year risk thresholds for initiation of statin therapy for primary prevention of cardiovascular disease. *JAMA.* 2015;314(2):142-150.
19. Patel A, MacMahon S, Chalmers J, et al. Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet.* 2007;370(9590):829-840.
20. Ruggenenti P, Fassi A, Ilieva AP, et al. Preventing microalbuminuria in type 2 diabetes. *N Engl J Med.* 2004;351(19):1941-1951.
21. Schrier RW, Estacio RO, Esler A, Mehler P. Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int.* 2002;61(3):1086-1097.
22. Newman DJ, Mattock MB, Dawnay AB, et al. Systematic review on urine albumin testing for early detection of diabetic complications. *Health Technol Assess.* 2005;9(30):iii-vi, xiii-163.
23. Adler AI, Stevens RJ, Manley SE, Bilous RW, Cull CA, Holman RR. Development and progression of nephropathy in type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS 64). *Kidney Int.* 2003;63(1):225-232.
24. American Diabetes Association. 8. Cardiovascular disease and risk management. *Diabetes Care.* 2015;38 Suppl:S49-57.
25. Barbeau EM, Krieger N, Soobader MJ. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health.* 2004;94(2):269-278.
26. Rathore SS, Berger AK, Weinfurt KP, et al. Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation.* 2000;102(6):642-648.
27. Rao SV, Schulman KA, Curtis LH, Gersh BJ, Jollis JG. Socioeconomic status and outcome following acute myocardial infarction in elderly patients. *Arch Intern Med.* 2004;164(10):1128-1133.
28. Subherwal S, Patel MR, Tang F, et al. Socioeconomic disparities in the use of cardioprotective medications among patients with peripheral artery disease: an analysis of the American College of Cardiology's NCDR PINNACLE Registry. *J Am Coll Cardiol.* 2013;62(1):51-57.

29. Bucholz EM, Ma S, Normand SL, Krumholz HM. Race, socioeconomic status, and life expectancy after acute myocardial infarction. *Circulation.* 2015;132(14):1338-1346.
30. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics.* 1999;55(2):652-659.
31. Zoghbi GJ, Dorfman TA, Iskandrian AE. The effects of medications on myocardial perfusion. *J Am Coll Cardiol.* 2008;52(6):401-416.
32. Virani SS, Woodard LD, Ramsey DJ, et al. Gender disparities in evidence-based statin therapy in patients with cardiovascular disease. *Am J Cardiol.* 2015;115(1):21-26.
33. Folsom AR, Yatsuya H, Nettleton JA, et al. Community prevalence of ideal cardiovascular health, by the American Heart Association definition, and relationship with cardiovascular disease incidence. *J Am Coll Cardiol.* 2011;57(16):1690-1696.
34. Hertz RP, Unger AN, Cornell JA, Saunders E. Racial disparities in hypertension prevalence, awareness, and management. *Arch Intern Med.* 2005;165(18):2098-2104.
35. Diez Roux AV, Merkin SS, Arnett D, et al. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med.* 2001;345(2):99-106.
36. Frieden TR, Berwick DM. The "Million Hearts" initiative--preventing heart attacks and strokes. *N Engl J Med.* 2011;365(13):e27.
37. Sanghavi DM, Conway PH. Paying for prevention: a novel test of medicare value-based payment for cardiovascular risk reduction. *JAMA.* 2015;314(2):123-124.
38. Koh HK, Sebelius KG. Promoting prevention through the Affordable Care Act. *N Engl J Med.* 2010;363(14):1296-1299.
39. Ladapo JA, Hoffmann U, Lee KL, Coles A, Huang M, Mark DB, Dolor RJ, Pelberg RA, Budoff M, Sigurdsson G, Severance HW, Douglas PS. Changes in Medical Therapy and Lifestyle After Anatomical or Functional Testing for Coronary Artery Disease. *Journal of the American Heart Association.* 2016;5(10).
40. Fordyce CB, Douglas PS, Roberts RS, Hoffmann U, Al-Khalidi HR, Patel MR, Granger CB, Kostis J, Mark DB, Lee KL, Udelson JE, Prospective Multicenter Imaging Study for Evaluation of Chest Pain I. Identification of Patients With Stable Chest Pain Deriving Minimal Value From Noninvasive Testing: The PROMISE Minimal-Risk Tool, A Secondary Analysis of a Randomized Clinical Trial. *JAMA Cardiol.* 2017;2(4):400-408.

FIGURE LEGENDS

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

Table 1. Demographics and Presenting Characteristics for All Patients

Characteristic	All Patients (N=10003)
Female (%)	5270/10003 (52.7%)
Median age (IQR), years	60.0 (54.4-66.0)
Age (%), years	
45-64	7111/10003 (71.1%)
65-79	2711/10003 (27.1%)
80+	181/10003 (1.8%)
Race/ethnicity (%)	
Hispanic or Latino	767/9945 (7.7%)
Not Hispanic or Latino-White	7693/9945 (77.4%)
Not Hispanic or Latino-Black	1071/9945 (10.8%)
Not Hispanic or Latino-Asian	250/9945 (2.5%)
Not Hispanic or Latino-Other	164/9945 (1.6%)
Socioeconomic status (minimum, maximum income), $[a]	
Low	11118, 42610
Medium-low	42613, 54149
Medium-high	54167, 71034
High	71059, 184338
US region[b]	
Midwest	2208/9690 (22.8%)
Northeast	1439/9690 (14.9%)
South	3999/9690 (41.3%)
West	2044/9690 (21.1%)
Cardiac risk factors	
BMI ≥ 30 (%) (median 29.7, IQR 26.3-33.9)	4724/9907 (47.7%)
Hypertension (%)	6501/10002 (65.0%)
Diabetes (%)	2144/10002 (21.4%)
Dyslipidemia (%)	6767/10002 (67.7%)
Family history of premature CAD (%)	3202/9970 (32.1%)
Peripheral arterial disease or cerebrovascular disease (%)	552/10003 (5.5%)
CAD risk equivalent (%)	2531/10003 (25.3%)

Characteristic	All Patients (N=10003)
Metabolic syndrome (%)	3772/10003 (37.7%)
Current tobacco use (%)	1773/10000 (17.7%)
Regular exercise (%)	5116/9982 (51.3%)
History of depression (%)	2058/10000 (20.6%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.14) [10003]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (11.75) [9901]
Medication use (%)	
Aspirin	4280/9569 (44.7%)
Statin	4389/9569 (45.9%)
Beta-blocker	2399/9569 (25.1%)
ACE inhibitor or ARB	4194/9569 (43.8%)
Primary presenting symptoms (%)	
Chest pain	7272/9996 (72.7%)
Dyspnea	1490/9996 (14.9%)
Other	1234/9996 (12.3%)
Type of angina (%)	
Typical	1166/10003 (11.7%)
Atypical	7773/10003 (77.7%)
Non-cardiac	1064/10003 (10.6%)
Physician specialty (%)	
Cardiology	8662/10003 (86.6%)
Internal medicine	565/10003 (5.6%)
Other	776/10003 (7.8%)

[a]Median household income (in US $) is used as a surrogate for socioeconomic status.

[b]143 patients had missing zip code data, and 170 patients had zip codes that were not reported in 2010 Census ACS data.

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; CAD, coronary artery disease; IQR, interquartile range.

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline

	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.37	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.42
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age, years									
45-64	14.7	--	--	39.1	--	--	33.3	--	--
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
Race/ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43	1.32 (0.88 - 1.98)	0.18	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic status[e]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37	1.20 (1.02 - 1.41)	0.027	30	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.79
High	13.9	--	--	35.5	--	--	34.3	--	--

Patient Characteristic	No antihypertensive use among patients with hypertension[a,b] Prevalence, %	Adjusted OR (95% CI)	P-value	No statin use among patients with dyslipidemia[c] Prevalence, %	Adjusted OR (95% CI)	P-value	No ACEi or ARB use in patients with diabetes[d] Prevalence, %	Adjusted OR (95% CI)	P-value
US region[e]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.85
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--

[a]Commonly used antihypertensives include angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[b]Only patients with hypertension included in the analysis (N=6501).

[c]Only patients with dyslipidemia included in the analysis (N=6767).

[d]Only patients with diabetes included in the analysis (N=2144).

[e]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline Cont.

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
45-64	48.7	--	--	21.7	--	--	51.0	--	--
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
Race/ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.93 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic status[b]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
High	41.4	--	--	11.5	--	--	42.3	--	--
US region[b]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.97 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--

[a]Obese defined as BMI ≥ 30.

[b]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

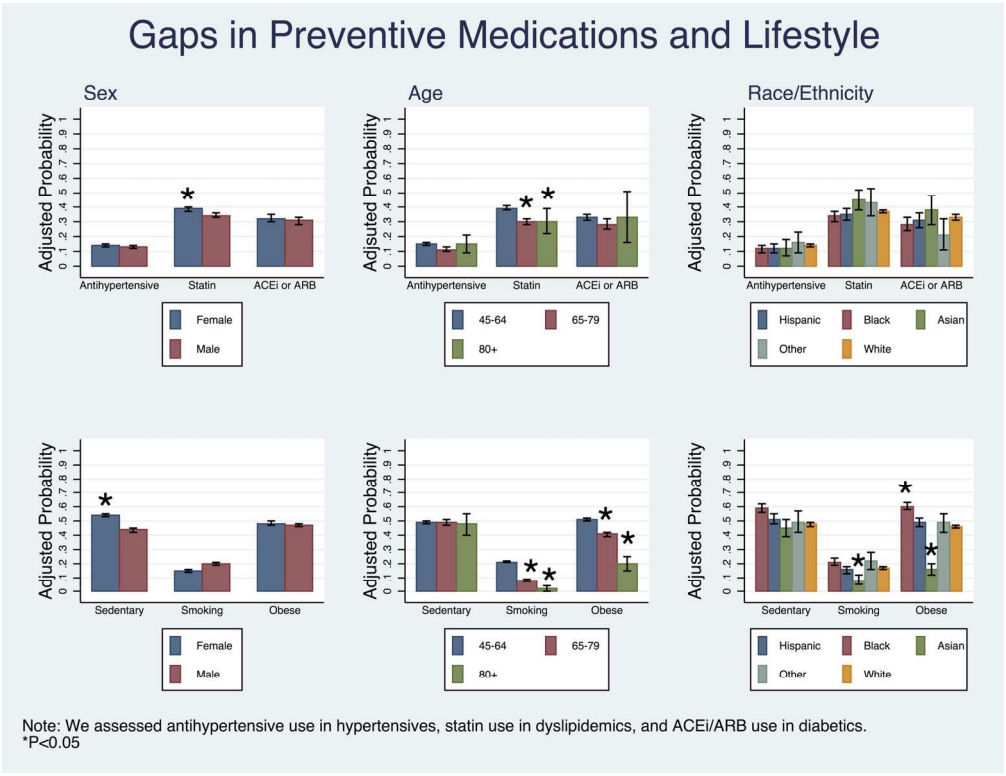

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

158x121mm (300 x 300 DPI)

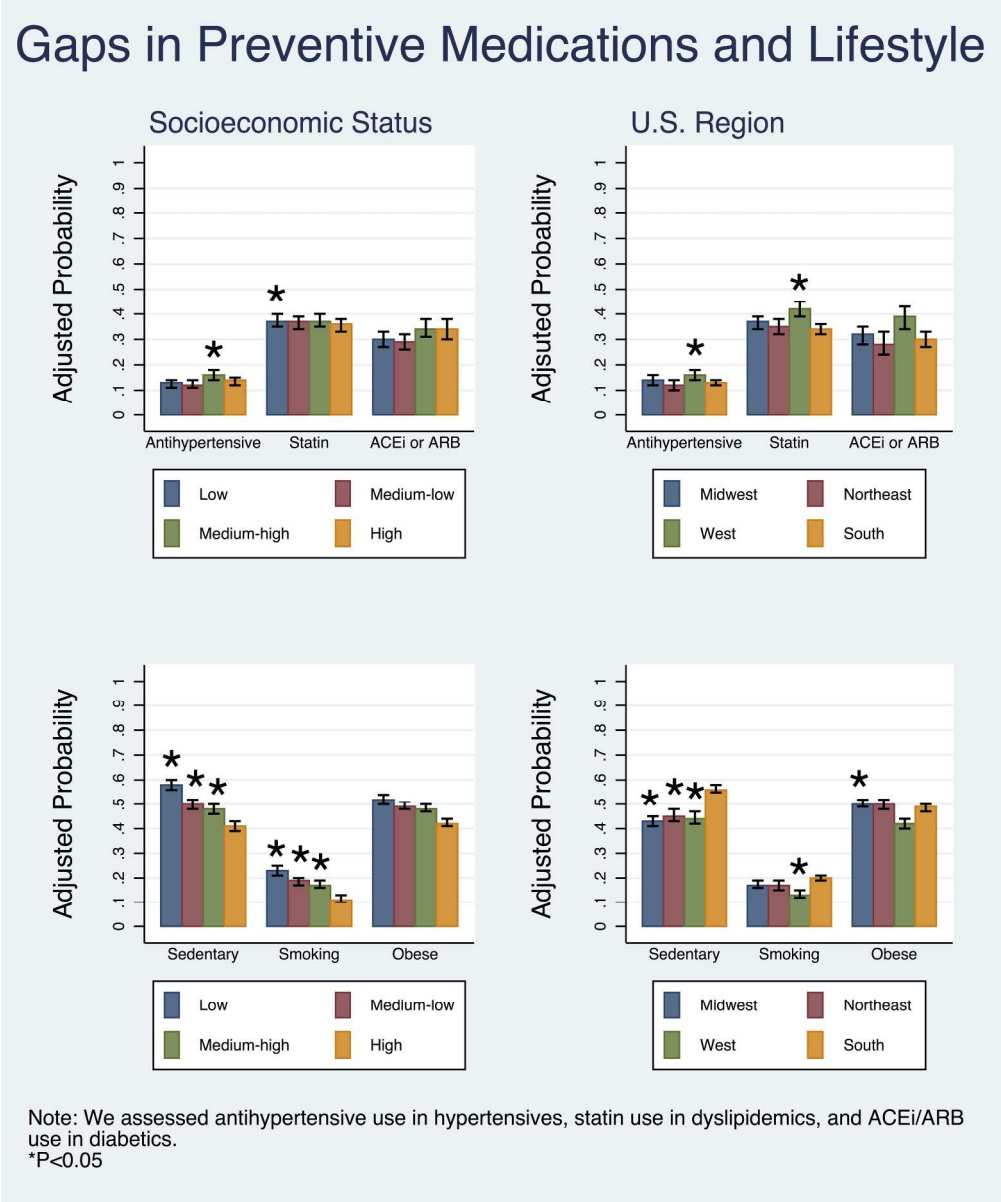

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

248x298mm (300 x 300 DPI)

Supplementary Appendix

Table 1.1. Demographics and Baseline Characteristics for Patients With Hypertension

Characteristic	Patients With Hypertension (N=6501)
Female (%)	3509/6501 (54.0%)
Age (%), y	
45-64	4522/6501 (69.6%)
65-79	1849/6501 (28.4%)
80+	130/6501 (2.0%)
Race/ethnicity (%)	
Hispanic or Latino	531/6471 (8.2%)
Not Hispanic or Latino-White	4813/6471 (74.4%)
Not Hispanic or Latino-Black	885/6471 (13.7%)
Not Hispanic or Latino-Asian	142/6471 (2.2%)
Not Hispanic or Latino-Other	100/6471 (1.5%)
Socioeconomic status (minimum, maximum income), $*	
Low	(11792,42610)
Medium-low	(42613,54149)
Medium-high	(54167,71034)
High	(71059,180815)
US region	
Midwest	1395/6316 (22.1%)
Northeast	965/6316 (15.3%)
South	2736/6316 (43.3%)
West	1220/6316 (19.3%)
Cardiac risk factors	
BMI ≥ 30 (%)	3538/6439 (54.9%)
Diabetes (%)	1712/6501 (26.3%)
Dyslipidemia (%)	4408/6501 (67.8%)
Family history of premature CAD (%)	2050/6481 (31.6%)
Peripheral arterial disease or cerebrovascular disease (%)	424/6501 (6.5%)
CAD risk equivalent (%)	1992/6501 (30.6%)
Metabolic syndrome (%)	3080/6501 (47.4%)
Current tobacco use (%)	1025/6499 (15.8%)
Regular exercise (%)	3060/6487 (47.2%)
History of depression (%)	1381/6499 (21.2%)

Characteristic	Patients With Hypertension (N=6501)
Risk Scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.21) [6501]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	17 (12.72) [6434]
Medication use (%)	
Aspirin	2956/6363 (46.5%)
Statin	3057/6363 (48.0%)
Beta-blocker	2126/6363 (33.4%)
ACE inhibitor or ARB	4041/6363 (63.5%)
Primary presenting symptoms (%)	
Chest pain	4653/6498 (71.6%)
Dyspnea	1027/6498 (15.8%)
Other	818/6498 (12.6%)
Type of angina (%)	
Typical	802/6501 (12.3%)
Atypical	5044/6501 (77.6%)
Non-cardiac	655/6501 (10.1%)
Physician specialty (%)	
Cardiology	5592/6501 (86.0%)
Internal Medicine	380/6501 (5.8%)
Other	529/6501 (8.1%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.2. Demographics and Baseline Characteristics for Patients With Dyslipidemia

Characteristic	Patients with Dyslipidemia (N=6767)
Female (%)	3632/6767 (53.7%)
Age (%), y	
45-64	4824/6767 (71.3%)
65-79	1827/6767 (27.0%)
80+	116/6767 (1.7%)
Race/ethnicity (%)	
Hispanic or Latino	516/6728 (7.7%)
Not Hispanic or Latino-White	5270/6728 (78.3%)
Not Hispanic or Latino-Black	618/6728 (9.2%)
Not Hispanic or Latino-Asian	207/6728 (3.1%)
Not Hispanic or Latino-Other	117/6728 (1.7%)
Socioeconomic status (minimum, maximum income)*	
Low	(11118,42610)
Medium-low	(42613,54149)
Medium-high	(54175,71034)
High	(71059,184338)
US region	
Midwest	1543/6572 (23.5%)
Northeast	1004/6572 (15.3%)
South	2569/6572 (39.1%)
West	1456/6572 (22.2%)
Cardiac risk factors	
BMI ≥ 30 (%)	3257/6701 (48.6%)
Hypertension (%)	4408/6767 (65.1%)
Diabetes (%)	1656/6767 (24.5%)
Family history of premature CAD (%)	2310/6746 (34.2%)
Peripheral arterial disease or cerebrovascular disease (%)	420/6767 (6.2%)
CAD risk equivalent (%)	1940/6767 (28.7%)
Metabolic syndrome (%)	3181/6767 (47.0%)
Current tobacco use (%)	1016/6765 (15.0%)
Regular exercise (%)	3520/6749 (52.2%)
History of depression (%)	1498/6765 (22.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.11) [6767]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (12.26) [6698]

Characteristic	Patients with Dyslipidemia (N=6767)
Medication use (%)	
Aspirin	3161/6570 (48.1%)
Statin	4178/6570 (63.6%)
Beta-blocker	1655/6570 (25.2%)
ACE inhibitor or ARB	2943/6570 (44.8%)
Primary presenting symptoms (%)	
Chest pain	4851/6761 (71.7%)
Dyspnea	1033/6761 (15.3%)
Other	877/6761 (13.0%)
Type of angina (%)	
Typical	801/6767 (11.8%)
Atypical	5268/6767 (77.8%)
Non-cardiac	698/6767 (10.3%)
Physician specialty (%)	
Cardiology	5858/6767 (86.6%)
Internal Medicine	371/6767 (5.5%)
Other	538/6767 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.3. Demographics and Baseline Characteristics for Patients With Diabetes

Characteristic	Patients with Diabetes (N=2144)
Female (%)	1151/2144 (53.7%)
Age (%), y	
45-64	1488/2144 (69.4%)
65-79	630/2144 (29.4%)
80+	26/2144 (1.2%)
Race/ethnicity (%)	
Hispanic or Latino	256/2132 (12.0%)
Not Hispanic or Latino-White	1414/2132 (66.3%)
Not Hispanic or Latino-Black	345/2132 (16.2%)
Not Hispanic or Latino-Asian	75/2132 (3.5%)
Not Hispanic or Latino-Other	42/2132 (2.0%)
Socioeconomic status (minimum, maximum income)*	
Low	(14586,42610)
Medium-low	(42641,54149)
Medium-high	(54260,71034)
High	(71059,139779)
US region	
Midwest	414/2074 (20.0%)
Northeast	348/2074 (16.8%)
South	916/2074 (44.2%)
West	396/2074 (19.1%)
Cardiac risk factors	
BMI ≥ 30 (%)	1463/2117 (69.1%)
Hypertension (%)	1712/2144 (79.9%)
Dyslipidemia (%)	1656/2144 (77.2%)
Family history of premature CAD (%)	655/2140 (30.6%)
Peripheral arterial disease or cerebrovascular disease (%)	165/2144 (7.7%)
CAD risk equivalent (%)	2144/2144 (100.0%)
Metabolic syndrome (%)	1822/2144 (85.0%)
Current tobacco use (%)	318/2144 (14.8%)
Regular exercise (%)	926/2142 (43.2%)
History of depression (%)	516/2142 (24.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	54 (20.26) [2144]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	24 (15.25) [2111]
Medication use (%)	

Characteristic	Patients with Diabetes (N=2144)
Aspirin	1098/2118 (51.8%)
Statin	1291/2118 (61.0%)
Beta-blocker	619/2118 (29.2%)
ACE inhibitor or ARB	1444/2118 (68.2%)
Primary presenting symptoms (%)	
Chest pain	1518/2144 (70.8%)
Dyspnea	375/2144 (17.5%)
Other	251/2144 (11.7%)
Type of angina (%)	
Typical	296/2144 (13.8%)
Atypical	1653/2144 (77.1%)
Non-cardiac	195/2144 (9.1%)
Physician specialty (%)	
Cardiology	1830/2144 (85.4%)
Internal Medicine	142/2144 (6.6%)
Other	172/2144 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 2.1. Prevalence and Adjusted Odds of No Medication Use at Baseline

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Key Risk Factors									
Hypertension	13.8	--	--	33.3	1.08 (0.92 - 1.28)	0.334	20.2	0.07 (0.05 - 0.09)	< 0.001
Dyslipidemia	13.1	1.31 (1.08 - 1.59)	0.007	36.4	--	--	29.8	1.27 (0.92 - 1.74)	0.148
Diabetes	8.07	0.67 (0.52 - 0.85)	< 0.001	25.5	0.51 (0.43 - 0.60)	< 0.001	31.8	--	--
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.370	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.420
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age									
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30.0	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
45-64	14.7	--	--	39.1	--	--	33.3	--	--
Race/Ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43.0	1.32 (0.88 - 1.98)	0.180	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic Status[5]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37.0	1.20 (1.02 - 1.41)	0.027	30.0	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.790
High	13.9	--	--	35.5	--	--	34.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
US Region[5]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35.0	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.850
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--
Cardiac Risk Factors at Baseline[6]									
BMI ≥ 30	12.1	0.71 (0.58 - 0.85)	< 0.001	34.9	0.93 (0.80 - 1.07)	0.285	27.7	0.58 (0.43 - 0.78)	< 0.001
Regular exercise	13.7	0.89 (0.76 - 1.04)	0.151	37.2	1.04 (0.94 - 1.17)	0.444	31.8	0.78 (0.62 - 0.99)	0.041
Current tobacco use	14.2	1.11 (0.89 - 1.37)	0.356	39.5	1.09 (0.93 - 1.27)	0.287	35.4	1.24 (0.89 - 1.71)	0.204
Family History of Premature CAD	13.0	0.90 (0.77 - 1.07)	0.226	36.3	0.98 (0.87 - 1.09)	0.672	31.2	0.91 (0.71 - 1.16)	0.433
Peripheral arterial disease or cerebrovascular disease	12.2	0.99 (0.72 - 1.37)	0.948	25.3	0.66 (0.52 - 0.84)	< 0.001	28.8	1.08 (0.71 - 1.64)	0.720
Metabolic syndrome	11.4	1.09 (0.87 - 1.35)	0.463	33.8	1.22 (1.04 - 1.43)	0.015	27.6	0.94 (0.64 - 1.40)	0.774
History of depression	13.6	0.98 (0.81 - 1.18)	0.794	37.0	1.00 (0.87 - 1.13)	0.955	34.6	1.12 (0.86 - 1.47)	0.389
ASCVD pooled cohort risk prediction categories									
High (>=15)	10.5	0.45 (0.34 - 0.58)	< 0.001	31.6	1.22 (1.01 - 1.47)	0.036	27.1	0.64 (0.42 - 0.97)	0.034
Intermediate (7.5 - 14.99)	13.2	0.63 (0.51 - 0.77)	< 0.001	37.4	1.07 (0.93 - 1.24)	0.330	39.3	0.90 (0.60 - 1.34)	0.588
Low (< 7.5)	19.7	--	--	41.3	--	--	41.3	--	--
Blood Pressure categories									
High (≥160/100)	15.3	1.54 (1.19 - 1.99)	0.001	39.6	1.28 (1.03 - 1.59)	0.023	25.2	1.14 (0.74 - 1.77)	0.556
Intermediate (≥140-159/90-99)	16.3	1.58 (1.34 - 1.86)	< 0.001	36.3	1.08 (0.95 - 1.22)	0.241	27.5	1.02 (0.79 - 1.32)	0.884
Low (<140/90)	12.1	--	--	36.1	--	--	34.9	--	--
Medication Use at Baseline									
Antihypertensive				31.0	0.64 (0.53 - 0.77)	< 0.001	14.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Statin	10.0	0.53 (0.45 - 0.64)	< 0.001				27.0	0.51 (0.39 - 0.67)	< 0.001
ACEi or ARB	0.00	--	--	29.0	0.82 (0.70 - 0.96)	0.011			
Primary Presenting Symptom									
Chest pain	14.2	0.90 (0.72 - 1.12)	0.340	37.2	1.08 (0.92 - 1.27)	0.356	32.6	0.95 (0.66 - 1.35)	0.754
Dyspnea	11.1	0.79 (0.59 - 1.06)	0.118	34.9	1.09 (0.89 - 1.33)	0.419	28.7	0.90 (0.59 - 1.37)	0.617
Other	14.7	--	--	34.3	--	--	32.1	--	--
Type of Angina									
Atypical	13.9	0.92 (0.72 - 1.18)	0.515	36.7	1.03 (0.87 - 1.24)	0.712	32.1	0.95 (0.64 - 1.40)	0.788
Typical	11.1	0.76 (0.55 - 1.06)	0.107	35.4	1.04 (0.83 - 1.31)	0.720	30.4	0.94 (0.58 - 1.52)	0.802
Non-cardiac	15.8	--	--	35.6	--	--	31.4	--	--
Cardiac Specialist									
Cardiologist	13.5	0.83 (0.67 - 1.03)	0.099	36.3	0.94 (0.80 - 1.10)	0.406	31.6	0.94 (0.68 - 1.30)	0.723
Non-Cardiologist	15.2	--	--	37.4	--	--	32.8	--	--

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

[1] Commonly used antihypertensives include ACE inhibitors, ARBs, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[2] Only patients with hypertension included in the analysis (N=6501).

[3] Only patients with dyslipidemia included in the analysis (N=6767).

[4] Only patients with diabetes included in the analysis (N=2144).

[5] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[6] Reference group is patients without risk factor.

Table 2.2. Prevalence and Adjusted Odds of Lifestyle Choices at Baseline

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
45-64	48.7	--	--	21.7	--	--	51.0	--	--
Race/Ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.96 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic Status[5]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.98 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454
High	41.4	--	--	11.5	--	--	42.3	--	--
US Region[2]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.96 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--
Cardiac Risk Factors at Baseline[3]									
Current tobacco use	58.3	1.73 (1.54 - 1.94)	< 0.001	--	--	--	40.2	0.46 (0.41 - 0.54)	< 0.001
BMI ≥ 30	56.2	1.64 (1.47 - 1.82)	< 0.001	14.9	0.48 (0.41 - 0.55)	< 0.001	--	--	--

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Hypertension	52.8	1.32 (1.20 - 1.45)	< 0.001	15.8	0.62 (0.55 - 0.70)	< 0.001	54.9	1.19 (1.06 - 1.33)	0.003
Diabetes	56.8	1.12 (0.99 - 1.26)	0.078	14.8	0.61 (0.51 - 0.72)	< 0.001	69.1	0.48 (0.40 - 0.56)	< 0.001
Dyslipidemia	47.8	0.91 (0.83 - 1.01)	0.068	15.0	0.53 (0.47 - 0.60)	< 0.001	48.6	0.41 (0.37 - 0.46)	< 0.001
Family History of Premature CAD	45.2	0.78 (0.71 - 0.85)	< 0.001	18.3	1.07 (0.95 - 1.21)	0.248	48.3	1.05 (0.94 - 1.17)	0.400
Peripheral arterial disease or cerebrovascular disease	57.8	1.33 (1.11 - 1.60)	0.003	21.9	1.61 (1.28 - 2.03)	< 0.001	45.6	0.78 (0.62 - 0.97)	0.028
Metabolic syndrome	56.0	1.10 (0.97 - 1.24)	0.157	16.3	1.43 (1.20 - 1.69)	< 0.001	83.3	27.77 (23.74 - 32.48)	< 0.001
History of depression	53.3	1.09 (0.98 - 1.21)	0.119	23.0	1.52 (1.33 - 1.74)	< 0.001	53.2	1.25 (1.10 - 1.42)	< 0.001
ASCVD pooled cohort risk prediction ≥ 7.5%	49.7	1.08 (0.97 - 1.20)	0.170	19.2	2.45 (2.12 - 2.83)	< 0.001	49.4	0.89 (0.78 - 1.02)	0.094
Primary Presenting Symptom									
Chest pain	48.5	1.09 (0.95 - 1.24)	0.209	18.5	0.92 (0.77 - 1.09)	0.315	46.9	0.96 (0.82 - 1.13)	0.626
Dyspnea	52.2	1.27 (1.08 - 1.49)	0.004	13.8	0.73 (0.58 - 0.92)	0.007	53.0	1.23 (1.01 - 1.50)	0.036
Other	46.0	--	--	17.8	--	--	45.5	--	--
Type of Angina									
Atypical	48.8	1.08 (0.94 - 1.25)	0.256	17.9	0.96 (0.80 - 1.16)	0.682	47.7	0.92 (0.78 - 1.09)	0.335
Typical	50.4	1.14 (0.95 - 1.37)	0.157	16.5	0.85 (0.66 - 1.09)	0.193	49.4	0.88 (0.70 - 1.09)	0.237
Non-cardiac	46.5	--	--	18.0	--	--	45.7	--	--
Cardiac Specialist									
Cardiologist	48.7	1.00 (0.89 - 1.14)	0.951	17.7	1.03 (0.87 - 1.21)	0.746	47.6	1.07 (0.92 - 1.24)	0.407
Non-Cardiologist	49.2	--	--	17.9	--	--	48.7	--	--

[1] Obese defined as BMI ≥ 30.

[2] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[3] Reference group is patients without risk factor.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1 (Lines 1-3)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 (All Lines)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 (All Lines)
Objectives	3	State specific objectives, including any pre-specified hypotheses	4 (Lines 16 – 22)
Methods			
Study design	4	Present key elements of study design early in the paper	5 (Lines 3 – 11)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5 (Lines 3 – 11)
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5 (Lines 5 – 8)
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7 (All Lines)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5 (Lines 11 – 21) – 8 (All Lines)*
Bias	9	Describe any efforts to address potential sources of bias	N/A
Study size	10	Explain how the study size was arrived at	5 (lines 5-9)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	N/A
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7 (Lines 16 – 21) – 8 (Lines 1 – 12)
		(*b*) Describe any methods used to examine subgroups and interactions	N/A
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed	N/A

		Case-control study—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8 (Lines 17)
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8 (Lines 17 – 23) -9 (All Lines)
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	N/A
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11 (All Lines)
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13 (Lines 13 – 20)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13 (All LInes)
Generalisability	21	Discuss the generalisability (external validity) of the study results	13 (Lines 23-25)
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15 (All Lines)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-016364.R3
Article Type:	Research
Date Submitted by the Author:	19-Jul-2017
Complete List of Authors:	Ladapo, Joseph; University of California Los Angeles David Geffen School of Medicine, Medicine Coles, Adrian; Duke Clinical Research Institute Dolor, Rowena; Duke Clinical Research Institute Mark, Daniel; Duke Clinical Research Institute Cooper, Lawton; National Heart Lung and Blood Institute Lee, Kerry; Duke Clinical Research Institute Goldberg, Jonathan; Louis Stokes VA Medical Center Shapiro, Michael; Oregon Health and Science University Hoffmann, Udo; Massachusetts General Hospital, Radiology Douglas, Pamela; Duke Clinical Research Institute
Primary Subject Heading:	Cardiovascular medicine
Secondary Subject Heading:	Epidemiology
Keywords:	coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Quantifying Sociodemographic and Income Disparities in Medical Therapy and Lifestyle Among Symptomatic Patients with Suspected Coronary Artery Disease: A Cross-Sectional Study in North America

Joseph A. Ladapo, MD, PhD,[1] Adrian Coles, PhD,[2] Rowena J. Dolor, MD, MHS,[2] Daniel B. Mark, MD, MPH,[2] Lawton Cooper, MD,[3] Kerry L. Lee, PhD,[2] Jonathan Goldberg, MD,[4] Michael D. Shapiro, DO,[5] Udo Hoffmann, MD, MPH,[6] Pamela S. Douglas, MD[2]

[1]Division of General Internal Medicine and Health Services Research, David Geffen School of Medicine at UCLA, Los Angeles, California; [2]Duke Clinical Research Institute, Duke University School of Medicine, Durham, North Carolina; [3]National Heart, Lung, and Blood Institute, Bethesda, Maryland; [4]Louis Stokes Cleveland VA Medical Center, Cleveland, Ohio; [5]Oregon Health and Science University, Portland, Oregon; [6]Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts

Address correspondence to: Joseph A. Ladapo, MD, PhD; David Geffen School of Medicine at UCLA; Department of Medicine; Division of General Internal Medicine and Health Services Research; 911 Broxton Ave.; Los Angeles, CA 90024; Phone: 310-794-2728 Fax: 310-794-0732; Email: jladapo@mednet.ucla.edu

Word count: 2593

Support: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235

Prior presentation: Presented at American College of Cardiology Scientific Sessions on April 2, 2016

Number of Tables, Figures, and Appendices: 2 Tables, 2 Figures, 1 Appendix

ABSTRACT

Objectives—To evaluate potential gaps in preventive medical therapy and healthy lifestyle practices among symptomatic patients with suspected coronary artery disease (CAD) seeing primary care physicians and cardiologists, and how gaps vary by sociodemographic characteristics and baseline cardiovascular risk.

Design—Cross sectional study assessing potential preventive gaps

Participants—10,003 symptomatic outpatients evaluated by primary care physicians, cardiologists, or other specialists for suspected CAD.

Setting—PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) from 2010-2014.

Measures—Primary measures were absence of an antihypertensive, statin, or angiotensin-converting enzyme inhibitor/angiotensin receptor blocker for renal protection in patients with hypertension, dyslipidemia, or diabetes, respectively, and being sedentary, smoking, or being obese.

Results—Preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. Overall, 49% of patients were sedentary, 18% currently smoked, and 48% were obese. Women were significantly more likely to not take a statin for dyslipidemia and to be sedentary. Patients with lower socioeconomic status were also significantly more likely to not take a statin. Compared to Whites, Blacks were significantly more likely to be obese, while Asians were less likely to smoke or be obese. High-risk patients sometimes experienced larger preventive care gaps than low-risk patients. For patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event (HR 1.35, 95% CI 1.02-1.82).

Conclusions—Among contemporary, symptomatic patients with suspected CAD, significant gaps exist in preventive care and lifestyle practices, and high-risk patients sometimes had larger gaps. Differences by sex, age, race/ethnicity, socioeconomic status, and geography are modest but contribute to disparities and have implications for improving population health. For patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event.

Clinical Trial Registration—clinicaltrials.gov Identifier NCT01174550

Keywords: coronary artery disease, cardiac stress testing, coronary computed tomography angiography, health disparities, socioeconomics

Abbreviations: CAD - coronary artery disease; CTA - computed tomographic angiography; PROMISE - PROspective Multicenter Imaging Study for Evaluation of Chest Pain; ACEi/ARB - angiotensin-converting enzyme inhibitor or angiotensin receptor blocker use; BMI - body mass index

Strengths and limitations of this study

- The study had a large sample size with an N of 10,003 patients.
- Measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results.
- There may have been patients whose hypertension or dyslipidemia were well-controlled with dietary changes and exercise alone.
- Among diabetics, we did not have clinical information about albuminuria, so there may have been patients for whom the benefit of ACEi/ARB therapy was uncertain.
- Use of BMI as a surrogate for body fatness and obesity identification is also vulnerable to misclassification, since sex, age, race/ethnicity, and muscle mass influence the relationship between BMI and excess fat.

Preventive medical care and lifestyle practices reduce the risk of adverse cardiovascular events[1,2] and may influence how likely a patient is to present to their primary care physician or cardiologist with symptoms suggestive of coronary artery disease (CAD). In the United States, approximately 4 million of these patients are referred for outpatient cardiac stress testing or coronary computed tomographic angiography (CTA) each year.[3] Although most have significant risk factors for adverse cardiovascular events, such as hypertension, dyslipidemia, and diabetes,[4,5] little is known about their preventive medical and lifestyle practices prior to presentation, the extent to which these preventive measures differ from national recommendations and guidelines,[6-9] or their relationship with sociodemographic and socioeconomic disparities. Understanding these patterns and characterizing the magnitude of medical or lifestyle gaps—that is, the difference between recommended preventive care and actual preventive care—is a critical step toward preventing disease and reducing adverse cardiovascular events in this population, independent of the outcome of diagnostic testing. Further, if preventive care varies by sociodemographic characteristics, this variation may contribute to important health disparities and identify populations in need of specific targeting. To identify opportunities for improving preventive care in this population, we used data from symptomatic patients in the PROspective Multicenter Imaging Study for Evaluation of Chest Pain (PROMISE) to (1) evaluate potential gaps in preventive medical therapy among patients with hypertension, dyslipidemia, or diabetes; (2) determine the extent to which these gaps differed by patients' baseline risk; (3) evaluate gaps in healthy lifestyle practices, as defined by being sedentary, smoking, or being obese; and (4) determine which gaps vary by sex, age, race/ethnicity, socioeconomic status, and geography.

Methods

Study Design

Methods used in PROMISE have been described previously.[4,10] The study protocol was approved by the local or central institutional review board at each coordinating center and at each enrolling site in North America. We enrolled symptomatic outpatients without diagnosed CAD whose physicians believed that non-urgent, noninvasive cardiovascular testing was necessary for the evaluation of suspected CAD. After providing written informed consent, 10,003 eligible patients were randomly assigned to either anatomical testing with CTA or functional testing with exercise electrocardiography, nuclear stress, or stress echocardiography.[10] Enrollment began on July 27, 2010, and was completed on September 19, 2013. All the patients were followed until October 31, 2014. Analyses were performed in 2016.

Gaps in Preventive Medications and Lifestyle Practices

At the time of enrollment, information about preventive medication use and lifestyle practices was collected by the clinical sites through patient report, chart review, and other clinical sources. We focused on 6 potential gaps in preventive care that have been demonstrated to increase the risk of cardiovascular disease[1,11]: absence of an antihypertensive medication in patients with hypertension, absence of a statin in patients with dyslipidemia, absence of an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ACEi/ARB) for renal protection in patients with diabetes, being sedentary, smoking, and being obese, as determined by a body mass index (BMI) exceeding 30. Because patients had to be eligible for randomization to either CTA or functional testing, no patients known to have renal dysfunction were enrolled.

Hypertension, Dyslipidemia, and Diabetes

Because PROMISE was a pragmatic trial, diagnoses were identified and defined by physicians at the participating clinics rather than with study-specific criteria. Among our symptomatic patients, absence of antihypertensive medication in patients with hypertension was defined as a preventive care gap because of evidence that treating patients with this comorbidity reduces the risk of cardiovascular events[12] and because treatment is consistent with recommendations issued by the American Society of Hypertension, International Society of Hypertension,[13] and American Heart Association.[14] Absence of a statin in patients with dyslipidemia was considered a preventive care gap because statin use in primary and secondary prevention has been shown to reduce cardiovascular risk.[15,16] The median atherosclerotic cardiovascular disease (ASCVD) score in our population was 11.3% with an interquartile range (IQR) of 6.1% to 19.8%, well above the 10-year risk threshold of 7.5% for treatment in most participants.[17] Applying lower ASCVD thresholds for statin therapy has also been shown to be cost-effective.[18] Absence of an ACEi/ARB for renal protection in patients with diabetes was considered a preventive care gap because the vast majority of diabetics in our population were hypertensive (79.9%) and prophylactic use of ACEi/ARBs reduces the incidence of albuminuria,[19-21] which has been shown to be a risk factor for cardiovascular[22] and overall mortality in patients with diabetes.[23,24]

Physical Inactivity, Smoking, and Obesity

Being sedentary, smoking, and being obese have all been demonstrated to increase cardiovascular risk and therefore represent important gaps in preventive lifestyle practices.[1] We assessed the prevalence of these lifestyle practices across all patients in our cohort. To assess

activity level, we asked, "During the past month, did you participate in any physical activities or exercise regularly (1 or more times per week)? Examples include: running, aerobics, golf, gardening, walking, etc." (*yes* or *no*). To assess smoking, we asked, "Have you smoked in the past two weeks?" (*yes* or *no*).

Demographics and Socioeconomics

We focused on disparities in prevention by sex, age, race/ethnicity, socioeconomic status, and geography. Race/ethnicity was reported by the patient and categorized into the following mutually exclusive groups: White; Black; American Indian/Alaska Native, Native Hawaiian/Other Pacific Islanders; and Asian (not including any Hispanics) and Hispanics (from any racial/ethnic group).[25] Socioeconomic status was defined by the median household income of the patient's zip code based on data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates), similar to prior work.[26-29] Socioeconomic status was categorized into quartiles from lowest to highest median household income (low, medium-low, medium-high, and high). We used the following US Census categories for geographic regions: Northeast, Midwest, West, and South.

Statistical Analysis

Analyses were based on patient status at presentation for CAD evaluation. P values of less than 0.05 were considered significant. We estimated summary statistics for gaps in preventive care and lifestyle practices and constructed multivariable logistic regression models to assess the association of patients' sociodemographic characteristics (sex, age, race/ethnicity, socioeconomic status, and geography) at presentation with these gaps, while controlling for

baseline risk (for blood pressure: systolic <140 mmHg and diastolic <90 mmHg, systolic 140 to 159 mmHg or diastolic 90 to 99 mmHg, and systolic ≥160 mmHg or diastolic ≥100 mmHg; for ASCVD: <7.5%, 7.5% to <15%, and ≥15%), other clinical characteristics, and physician specialty (see Appendix Tables 1.1, 1.2, and 1.3 for detailed clinical characteristics and Appendix Tables 2.1 and 2.2 for fully reported regression results). In addition to estimating covariate-adjusted odds ratios and their corresponding 95% confidence intervals, the fitted models were used to compute covariate-adjusted probabilities[30] (also known as "predictive margins") of gaps in preventive medication use and healthy lifestyle practices, with stratification by sociodemographic characteristics. In these analyses, the regression models predict proportions for each sociodemographic characteristic, while holding the distribution of all other covariates constant. We excluded 4% of patients in PROMISE from our multivariable analyses because we were unable to match their reported zip codes to US Census Bureau data. Statistical analyses were performed using SAS software, version 9.2 or higher (SAS Institute, Cary, NC).

Results

Symptomatic Patients: Characteristics and Baseline Risk

Characteristics of the 10,003 symptomatic patients (88% with chest pain/dyspnea, 12% with other symptoms) presenting to their primary care physicians, cardiologists, or other specialists are summarized in Table 1. The median age of the cohort was 60.0 years (IQR, 54.4-66.0 years), and 52.7% were women. Whites composed 77.4% of the cohort, and Blacks and Hispanics composed 10.8% and 7.7%, respectively. Asians composed 2.5% of the cohort, and people of other/unknown race/ethnicity composed 1.6% of the cohort. Patients in the lowest socioeconomic quartile lived in zip codes with a median household income less than $42,610,

while patients in the highest socioeconomic quartile lived in zip codes with median household income of at least $71,059 annually.

Preventive Medical and Lifestyle Gaps

Overall, the prevalences of hypertension, dyslipidemia, and diabetes were 65.0% (N=6501), 67.7% (N=6767), and 21.4% (N=2144), respectively. Among these symptomatic patients, preventive treatment gaps affected 14% of patients with hypertension, 36% of patients with dyslipidemia, and 32% of patients with diabetes. In our examination of preventive lifestyle practices, 49% of all patients were sedentary, 18% were current smokers, and 48% were obese.

Association of Preventive Care Gaps with Sex, Age, and Race/Ethnicity

Adjusted odds ratios for the association between patient characteristics and preventive care gaps are presented in Table 2, and covariate-adjusted probabilities of preventive care gaps are presented in Figures 1 and 2. Women were significantly more likely than men to not take a statin for dyslipidemia (OR 1.33, 95% CI 1.18-1.50) and to be sedentary (OR 1.55, 95% CI 1.41-1.70). Older patients were significantly less likely than the youngest patients to not be taking a statin for dyslipidemia (65-79 years: OR 0.64, 95% CI 0.55-0.75; ≥80 years: OR 0.59, 95% CI 0.38-0.92) and to smoke (65-79 years: OR 0.23, 95% CI 0.19-0.27; ≥80 years: OR 0.04, 95% CI 0.01-0.13). There were no significant differences in preventive medications by patients' race/ethnicity, but differences existed in preventive lifestyle practices: compared to White patients, Blacks were significantly more likely to be obese (OR 1.55, 95% CI 1.31-1.84), while Asians were less likely to smoke (OR 0.49, 95% CI 0.30-0.80) or be obese (OR 0.16, 95% CI

0.11-0.24). There were no significant differences in preventive lifestyle practices of Hispanics compared to Whites.

Variation in Preventive Care Gaps Between Higher and Lower Risk Symptomatic Patients

The prevalence of preventive medical therapy gaps varied by patient risk. Among symptomatic patients with hypertension, those at the highest overall cardiovascular risk (ASCVD ≥15%) were less likely to not be on an antihypertensive than patients at the lowest overall cardiovascular risk (ASCVD <7.5%) (OR 0.45, 95% CI 0.34-0.58), but patients with the highest blood pressure (≥160/100) were more likely to not be on an antihypertensive than patients with the lowest blood pressure (<140/90) (OR 1.54, 95% CI 1.19-1.99). Among patients with dyslipidemia, those at the highest overall cardiovascular risk (OR 1.22, 95% CI 1.01-1.47) and with the highest blood pressure (OR 1.28, 95% CI 1.03-1.59) were more likely to not be on a statin, compared to patients with the lowest cardiovascular risk or lowest blood pressure. Among patients with diabetes, those at the highest overall cardiovascular risk were less likely to not be on an ACEi/ARB than patients at the lowest overall cardiovascular risk (OR 0.64, 95% CI 0.42-0.97) (Appendix Table 2.1).

For the combined endpoint of death, myocardial infarction, or hospitalization for unstable angina, there was no association between having a treatment gap and the risk of an adverse event among patients with hypertension or diabetes. However, for patients with dyslipidemia, the presence of a treatment gap was associated with a higher risk of an adverse event (HR 1.35, 95% CI 1.02-1.82).

Association of Preventive Care Gaps With Socioeconomic Status/Geography

Compared to symptomatic patients with the highest socioeconomic status, patients with a medium-high socioeconomic status were more likely to not receive an antihypertensive for hypertension (OR 1.25, 95% CI 1.01-1.55), while patients with the lowest socioeconomic status were more likely to not receive a statin for dyslipidemia (OR 1.20, 95% CI 1.02-1.41) (Table 2, Figure 2). Patients with lower socioeconomic status were also more likely to be sedentary (Low: OR 1.45, 95% CI 1.28-1.65; Medium-low: OR 1.20, 95% CI 1.07-1.36; Medium-high: OR 1.18, 95% CI 1.05-1.32) and smoke (Low: OR 2.00, 95% CI 1.68-2.38; Medium-low: OR 1.63, 95% CI 1.38-1.94; Medium-high: OR 1.52, 95% CI 1.28-1.80) than patients with the highest socioeconomic status (Table 2), and these differences were more pronounced as socioeconomic status fell. Regional differences were common: compared to patients in the South, patients living in the West were more likely to not receive antihypertensives for hypertension (OR 1.32, 95% CI 1.08-1.63) and not receive statins for dyslipidemia (OR 1.31, 95% CI 1.13-1.52). Compared to patients in the South, patients in all other US regions were less likely to be sedentary (Midwest: OR 0.58, 95% CI 0.52-0.65; Northeast: OR 0.63, 95% CI 0.55-0.72; West: OR 0.68, 95% CI 0.61-0.77), and patients in the West were less likely to smoke (OR 0.76, 95% CI 0.65-0.90), while patients in the Midwest were more likely to be obese (OR 1.23, 95% CI 1.08-1.41).

Discussion

In the PROMISE trial population, we found that symptomatic patients presenting to their primary care physicians, cardiologists, or other specialists with suspected CAD have a high prevalence of risk factors for adverse cardiovascular events, with many of these risk factors representing missed opportunities to improve preventive medical care and lifestyle practices. We identified populations that should be targeted for interventions based on their sex, age, race/ethnicity,

socioeconomic status, and geography. While some of the preventive care gaps were smaller in symptomatic patients at higher risk, others were larger or unassociated with baseline risk. Finally, our results support the notion that wider adherence to preventive medication and lifestyle practices may alter the epidemiology of chest pain presentations and reduce the incidence of evaluations for CAD.[31]

Our findings of gaps in preventive care and differences in these gaps across important sociodemographic characteristics complement the work of others. For example, in a study of patients with cardiovascular disease in the US Veterans Affairs health system, women were less likely to receive a statin than men.[32] In another study of patients with peripheral artery disease, patients living in low socioeconomic status areas, as defined by median household income, were less likely to receive statins than patients living in higher socioeconomic status areas.[28] Racial/ethnic differences in exercise participation, smoking, and obesity have also been reported.[25,33] However, our work extends and broadens the findings of these studies because (1) our study focused on actively symptomatic patients, whose presentation may be attributable to gaps in prevention; and (2) we simultaneously accounted for a wider range of sociodemographic characteristics.

By assessing the relationship between baseline risk and preventive gaps, we showed that there was a trend toward lower preventive care gaps among symptomatic patients with high ASCVD scores but higher preventive care gaps among symptomatic patients with elevated blood pressure. Our data also reflect more recent care preventive patterns across a broad geographic and socioeconomic sample. Our explicit inclusion of multiple racial/ethnic groups—particularly Asians—is also an advance for research in cardiovascular disease disparities, where previous

comparisons have often been limited to Whites and Blacks only.[29,33-35] Our findings of disparities in preventive care are therefore more comprehensive and robust.

Similar to other studies of gaps in preventive care, our results highlight the importance of public health and policy initiatives aimed at bolstering primary prevention. Policy initiatives, such as the Million Hearts campaign, now leverage public-private partnerships and large investments in state and community programs to improve aspirin use in patients with CAD, blood pressure control among patients with hypertension, cholesterol management, and smoking cessation.[36,37] In addition, our findings reinforce the potential benefits of public and private policies that eliminate marginal cost-sharing for cholesterol and hypertension screening, obesity screening and counseling, and smoking cessation services.[38] Gaps in preventive care also highlight opportunities for making diagnostic testing a "teachable moment" for symptomatic patients in this population—and for the primary care physicians and cardiologists caring for them. We did not examine the association of gaps in care with subsequent imaging, CAD diagnosis, or invasive coronary angiography. In prior work, we showed that new initiation of an aspirin, statin, beta-blocker, or ACEi/ARB was not associated with the rate of adverse cardiovascular events over a median follow-up period of 25 months in adjusted models.[39] We have also reported that absence of hypertension, dyslipidemia, and tobacco use are associated with a lower rate of adverse cardiovascular events.[40] We also found that treatment gaps among patients with hypertension or diabetes were not associated with an increased risk of adverse cardiovascular events. In contrast, treatment gaps among patients with dyslipidemia were associated with an increased risk of adverse cardiovascular events.

Our study has important limitations. There may have been patients whose hypertension or dyslipidemia were well-controlled with dietary changes and exercise alone. Among diabetics, we

did not have clinical information about albuminuria, so there may have been patients for whom the benefit of ACEi/ARB therapy was uncertain. In addition, our measures of preventive lifestyle practices were gathered through self-report; errors or inaccuracies in self-report could therefore affect our results. Our use of BMI as a surrogate for body fatness and obesity identification is also vulnerable to misclassification, since sex, age, race/ethnicity, and muscle mass influence the relationship between BMI and excess fat. In terms of methodological strengths, our analyses included adjustments for multiple clinical characteristics and collected detailed race/ethnicity information. In addition, our study population was diverse in age, sex, income, and geography. In terms of methodological weaknesses, because the study population was primarily composed of white patients, the study results may not be generalizable to all populations.

In conclusion, among contemporary, symptomatic patients presenting to primary care physicians, cardiologists, and other specialists with suspected CAD, opportunities exist to bridge significant gaps in preventive care and lifestyle practices and reduce the incidence of future CAD. Differences by sex, age, race/ethnicity, socioeconomic status, and geography tend to be modest but contribute to disparities and identify populations that should be targeted for interventions.

Acknowledgments

Author Contributions: AC had full access to all the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

Study concept and design: JL, PD

Acquisition, analysis, or interpretation of data: All authors

Drafting of the manuscript: All authors

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: AC, KL

Source of Funding: The PROMISE trial was funded by National Heart, Lung, and Blood Institute grants R01 HL098237, R01 HL098236, R01 HL098305, and R01 HL098235. The funding source had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The views expressed in this article do not necessarily represent the official views of the National Heart, Lung, and Blood Institute.

Disclosures: Dr. Ladapo's work is supported by the National Heart, Lung, and Blood Institute (K23 HL116787) and he serves as a consultant to CardioDx, Inc. Dr. Douglas has received grant support from HeartFlow and serves on a data and safety monitoring board for General Electric Healthcare; Dr. Hoffmann has received grant support from Siemens Healthcare and HeartFlow; Dr. Mark has received personal fees from Medtronic, CardioDx, and St. Jude Medical and grant support from Eli Lilly, Bristol-Myers Squibb, Gilead Sciences, AGA Medical, Merck, Oxygen

Biotherapeutics, and AstraZeneca. No financial disclosures were reported by the other authors of this paper.

All data are the property of the PROMISE Trial of Duke University. Study data is availability is limited and available upon request.

We are grateful for the contributions of the study participants and study team.

References

1. Yusuf S, Hawken S, Ounpuu S, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet.* 2004;364(9438):937-952.
2. 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(1):16-22.
3. Ladapo JA, Blecker S, Douglas PS. Physician decision making and trends in the use of cardiac stress testing in the United States: an analysis of repeated cross-sectional data. *Ann Intern Med.* 2014;161(7):482-490.
4. Douglas PS, Hoffmann U, Patel MR, et al. Outcomes of anatomical versus functional testing for coronary artery disease. *N Engl J Med.* 2015;372(14):1291-1300.
5. Ladapo JA, Goldfeld KS, Douglas PS. Projected morbidity and mortality from missed diagnoses of coronary artery disease in the United States. *Int J Cardiol.* 2015;195:250-252.
6. Young LH, Wackers FJ, Chyun DA, et al. Cardiac outcomes after screening for asymptomatic coronary artery disease in patients with type 2 diabetes: the DIAD study: a randomized controlled trial. *JAMA.* 2009;301(15):1547-1555.
7. Hachamovitch R, Nutter B, Hlatky MA, et al. Patient management after noninvasive cardiac imaging: results from SPARC (Study of Myocardial Perfusion and Coronary Anatomy Imaging Roles in Coronary Artery Disease). *J Am Coll Cardiol.* 2012;59(5):462-474.
8. Cheezum MK, Hulten EA, Smith RM, et al. Changes in preventive medical therapies and CV risk factors after CT angiography. *JACC: Cardiovascular Imaging.* 2013;6(5):574-581.
9. Hulten E, Bittencourt MS, Singh A, et al. Coronary artery disease detected by coronary computed tomographic angiography is associated with intensifcation of preventive medical therapy and lower low-density lipoprotein cholesterol. *Circulation: Cardiovascular Imaging.* 2014;7(4):629-638.
10. Douglas PS, Hoffmann U, Lee KL, et al. PROspective Multicenter Imaging Study for Evaluation of chest pain: rationale and design of the PROMISE trial. *Am Heart J.* 2014;167(6):796-803 e791.
11. Jackson R, Lawes CM, Bennett DA, Milne RJ, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet.* 2005;365(9457):434-441.
12. Turnbull F, Neal B, Ninomiya T, et al. Effects of different regimens to lower blood pressure on major cardiovascular events in older and younger adults: meta-analysis of randomised trials. *BMJ.* 2008;336(7653):1121-1123.
13. Weber MA, Schiffrin EL, White WB, et al. Clinical practice guidelines for the management of hypertension in the community a statement by the American Society of Hypertension and the International Society of Hypertension. *J. Hypertens.* 2014;32(1):3-15.
14. Rosendorff C, Black HR, Cannon CP, et al. Treatment of hypertension in the prevention and management of ischemic heart disease: a scientific statement from the American Heart Association Council for High Blood Pressure Research and the Councils on

Clinical Cardiology and Epidemiology and Prevention. *Circulation.* 2007;115(21):2761-2788.
15. LaRosa JC, He J, Vupputuri S. Effect of statins on risk of coronary disease: a meta-analysis of randomized controlled trials. *JAMA.* 1999;282(24):2340-2346.
16. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Third Report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation.* 2002;106(25):3143-3421.
17. Goff DC, Jr., Lloyd-Jones DM, Bennett G, et al. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation.* 2014;129(25 Suppl 2):S49-73.
18. Pandya A, Sy S, Cho S, Weinstein MC, Gaziano TA. Cost-effectiveness of 10-year risk thresholds for initiation of statin therapy for primary prevention of cardiovascular disease. *JAMA.* 2015;314(2):142-150.
19. Patel A, MacMahon S, Chalmers J, et al. Effects of a fixed combination of perindopril and indapamide on macrovascular and microvascular outcomes in patients with type 2 diabetes mellitus (the ADVANCE trial): a randomised controlled trial. *Lancet.* 2007;370(9590):829-840.
20. Ruggenenti P, Fassi A, Ilieva AP, et al. Preventing microalbuminuria in type 2 diabetes. *N Engl J Med.* 2004;351(19):1941-1951.
21. Schrier RW, Estacio RO, Esler A, Mehler P. Effects of aggressive blood pressure control in normotensive type 2 diabetic patients on albuminuria, retinopathy and strokes. *Kidney Int.* 2002;61(3):1086-1097.
22. Newman DJ, Mattock MB, Dawnay AB, et al. Systematic review on urine albumin testing for early detection of diabetic complications. *Health Technol Assess.* 2005;9(30):iii-vi, xiii-163.
23. Adler AI, Stevens RJ, Manley SE, Bilous RW, Cull CA, Holman RR. Development and progression of nephropathy in type 2 diabetes: the United Kingdom Prospective Diabetes Study (UKPDS 64). *Kidney Int.* 2003;63(1):225-232.
24. American Diabetes Association. 8. Cardiovascular disease and risk management. *Diabetes Care.* 2015;38 Suppl:S49-57.
25. Barbeau EM, Krieger N, Soobader MJ. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *Am J Public Health.* 2004;94(2):269-278.
26. Rathore SS, Berger AK, Weinfurt KP, et al. Race, sex, poverty, and the medical treatment of acute myocardial infarction in the elderly. *Circulation.* 2000;102(6):642-648.
27. Rao SV, Schulman KA, Curtis LH, Gersh BJ, Jollis JG. Socioeconomic status and outcome following acute myocardial infarction in elderly patients. *Arch Intern Med.* 2004;164(10):1128-1133.
28. Subherwal S, Patel MR, Tang F, et al. Socioeconomic disparities in the use of cardioprotective medications among patients with peripheral artery disease: an analysis of the American College of Cardiology's NCDR PINNACLE Registry. *J Am Coll Cardiol.* 2013;62(1):51-57.

29. Bucholz EM, Ma S, Normand SL, Krumholz HM. Race, socioeconomic status, and life expectancy after acute myocardial infarction. *Circulation.* 2015;132(14):1338-1346.
30. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics.* 1999;55(2):652-659.
31. Zoghbi GJ, Dorfman TA, Iskandrian AE. The effects of medications on myocardial perfusion. *J Am Coll Cardiol.* 2008;52(6):401-416.
32. Virani SS, Woodard LD, Ramsey DJ, et al. Gender disparities in evidence-based statin therapy in patients with cardiovascular disease. *Am J Cardiol.* 2015;115(1):21-26.
33. Folsom AR, Yatsuya H, Nettleton JA, et al. Community prevalence of ideal cardiovascular health, by the American Heart Association definition, and relationship with cardiovascular disease incidence. *J Am Coll Cardiol.* 2011;57(16):1690-1696.
34. Hertz RP, Unger AN, Cornell JA, Saunders E. Racial disparities in hypertension prevalence, awareness, and management. *Arch Intern Med.* 2005;165(18):2098-2104.
35. Diez Roux AV, Merkin SS, Arnett D, et al. Neighborhood of residence and incidence of coronary heart disease. *N Engl J Med.* 2001;345(2):99-106.
36. Frieden TR, Berwick DM. The "Million Hearts" initiative--preventing heart attacks and strokes. *N Engl J Med.* 2011;365(13):e27.
37. Sanghavi DM, Conway PH. Paying for prevention: a novel test of medicare value-based payment for cardiovascular risk reduction. *JAMA.* 2015;314(2):123-124.
38. Koh HK, Sebelius KG. Promoting prevention through the Affordable Care Act. *N Engl J Med.* 2010;363(14):1296-1299.
39. Ladapo JA, Hoffmann U, Lee KL, Coles A, Huang M, Mark DB, Dolor RJ, Pelberg RA, Budoff M, Sigurdsson G, Severance HW, Douglas PS. Changes in Medical Therapy and Lifestyle After Anatomical or Functional Testing for Coronary Artery Disease. *Journal of the American Heart Association.* 2016;5(10).
40. Fordyce CB, Douglas PS, Roberts RS, Hoffmann U, Al-Khalidi HR, Patel MR, Granger CB, Kostis J, Mark DB, Lee KL, Udelson JE, Prospective Multicenter Imaging Study for Evaluation of Chest Pain I. Identification of Patients With Stable Chest Pain Deriving Minimal Value From Noninvasive Testing: The PROMISE Minimal-Risk Tool, A Secondary Analysis of a Randomized Clinical Trial. *JAMA Cardiol.* 2017;2(4):400-408.

FIGURE LEGENDS

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

Table 1. Demographics and Presenting Characteristics for All Patients

Characteristic	All Patients (N=10003)
Female (%)	5270/10003 (52.7%)
Median age (IQR), years	60.0 (54.4-66.0)
Age (%), years	
45-64	7111/10003 (71.1%)
65-79	2711/10003 (27.1%)
80+	181/10003 (1.8%)
Race/ethnicity (%)	
Hispanic or Latino	767/9945 (7.7%)
Not Hispanic or Latino-White	7693/9945 (77.4%)
Not Hispanic or Latino-Black	1071/9945 (10.8%)
Not Hispanic or Latino-Asian	250/9945 (2.5%)
Not Hispanic or Latino-Other	164/9945 (1.6%)
Socioeconomic status (minimum, maximum income), $[a]	
Low	11118, 42610
Medium-low	42613, 54149
Medium-high	54167, 71034
High	71059, 184338
US region[b]	
Midwest	2208/9690 (22.8%)
Northeast	1439/9690 (14.9%)
South	3999/9690 (41.3%)
West	2044/9690 (21.1%)
Cardiac risk factors	
BMI ≥ 30 (%) (median 29.7, IQR 26.3-33.9)	4724/9907 (47.7%)
Hypertension (%)	6501/10002 (65.0%)
Diabetes (%)	2144/10002 (21.4%)
Dyslipidemia (%)	6767/10002 (67.7%)
Family history of premature CAD (%)	3202/9970 (32.1%)
Peripheral arterial disease or cerebrovascular disease (%)	552/10003 (5.5%)
CAD risk equivalent (%)	2531/10003 (25.3%)

Characteristic	All Patients (N=10003)
Metabolic syndrome (%)	3772/10003 (37.7%)
Current tobacco use (%)	1773/10000 (17.7%)
Regular exercise (%)	5116/9982 (51.3%)
History of depression (%)	2058/10000 (20.6%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.14) [10003]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (11.75) [9901]
Medication use (%)	
Aspirin	4280/9569 (44.7%)
Statin	4389/9569 (45.9%)
Beta-blocker	2399/9569 (25.1%)
ACE inhibitor or ARB	4194/9569 (43.8%)
Primary presenting symptoms (%)	
Chest pain	7272/9996 (72.7%)
Dyspnea	1490/9996 (14.9%)
Other	1234/9996 (12.3%)
Type of angina (%)	
Typical	1166/10003 (11.7%)
Atypical	7773/10003 (77.7%)
Non-cardiac	1064/10003 (10.6%)
Physician specialty (%)	
Cardiology	8662/10003 (86.6%)
Internal medicine	565/10003 (5.6%)
Other	776/10003 (7.8%)

[a]Median household income (in US $) is used as a surrogate for socioeconomic status.

[b]143 patients had missing zip code data, and 170 patients had zip codes that were not reported in 2010 Census ACS data.

ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; CAD, coronary artery disease; IQR, interquartile range.

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline

	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.37	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.42
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age, years									
45-64	14.7	--	--	39.1	--	--	33.3	--	--
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
Race/ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43	1.32 (0.88 - 1.98)	0.18	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic status[e]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37	1.20 (1.02 - 1.41)	0.027	30	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.79
High	13.9	--	--	35.5	--	--	34.3	--	--

Patient Characteristic	No antihypertensive use among patients with hypertension[a,b]			No statin use among patients with dyslipidemia[c]			No ACEi or ARB use in patients with diabetes[d]		
	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value	Prevalence, %	Adjusted OR (95% CI)	P-value
US region[e]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.85
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--

[a]Commonly used antihypertensives include angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[b]Only patients with hypertension included in the analysis (N=6501).

[c]Only patients with dyslipidemia included in the analysis (N=6767).

[d]Only patients with diabetes included in the analysis (N=2144).

[e]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

Table 2. Prevalence and Adjusted Odds of No Medication Use and Lifestyle Choices at Baseline Cont.

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
45-64	48.7	--	--	21.7	--	--	51.0	--	--
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
Race/ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.93 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic status[b]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454

	Sedentary			Current Smoking			Obese[a]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
High	41.4	--	--	11.5	--	--	42.3	--	--
US region[b]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.97 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--

[a]Obese defined as BMI ≥ 30.

[b]Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

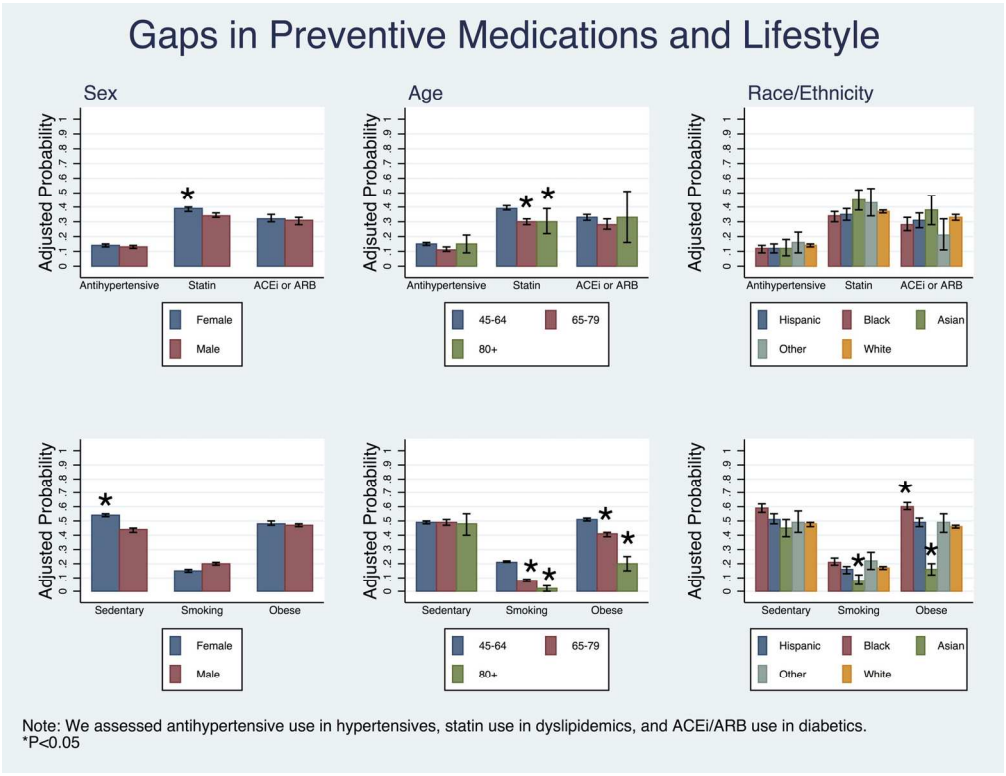

Figure 1. Preventive medical therapy and lifestyle practices at presentation, by sex, age, and race/ethnicity. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are male sex, 45-64 years old, and White race/ethnicity.

158x121mm (300 x 300 DPI)

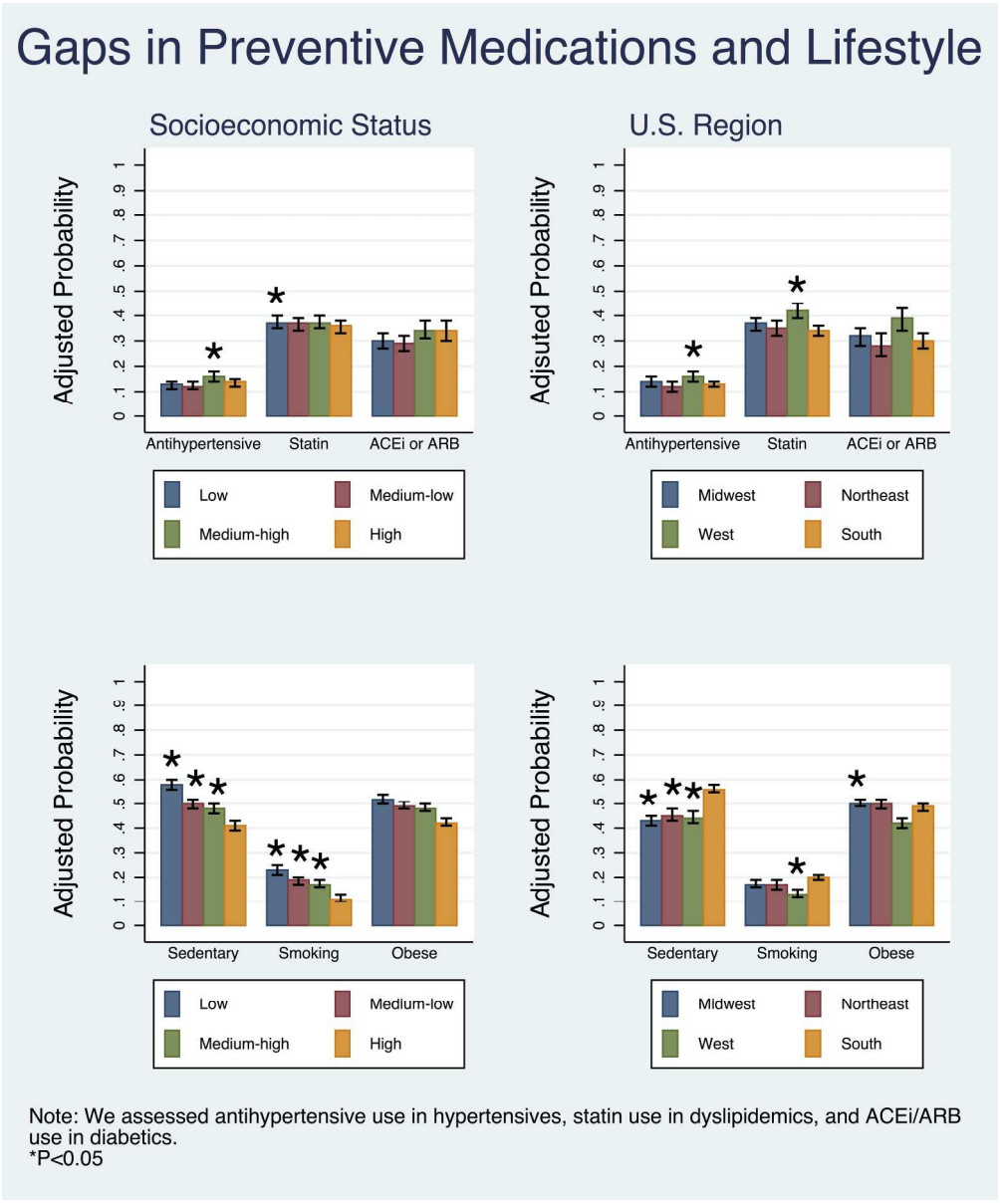

Figure 2. Preventive medical therapy and lifestyle practices at presentation. The bars represent covariate-adjusted probabilities of a preventive care gap, based on the multivariate models reported in Table 2. The reference groups for tests of statistical significance are high socioeconomic status and South region.

248x298mm (300 x 300 DPI)

Supplementary Appendix

Table 1.1. Demographics and Baseline Characteristics for Patients With Hypertension

Characteristic	Patients With Hypertension (N=6501)
Female (%)	3509/6501 (54.0%)
Age (%), y	
45-64	4522/6501 (69.6%)
65-79	1849/6501 (28.4%)
80+	130/6501 (2.0%)
Race/ethnicity (%)	
Hispanic or Latino	531/6471 (8.2%)
Not Hispanic or Latino-White	4813/6471 (74.4%)
Not Hispanic or Latino-Black	885/6471 (13.7%)
Not Hispanic or Latino-Asian	142/6471 (2.2%)
Not Hispanic or Latino-Other	100/6471 (1.5%)
Socioeconomic status (minimum, maximum income), $*	
Low	(11792,42610)
Medium-low	(42613,54149)
Medium-high	(54167,71034)
High	(71059,180815)
US region	
Midwest	1395/6316 (22.1%)
Northeast	965/6316 (15.3%)
South	2736/6316 (43.3%)
West	1220/6316 (19.3%)
Cardiac risk factors	
BMI ≥ 30 (%)	3538/6439 (54.9%)
Diabetes (%)	1712/6501 (26.3%)
Dyslipidemia (%)	4408/6501 (67.8%)
Family history of premature CAD (%)	2050/6481 (31.6%)
Peripheral arterial disease or cerebrovascular disease (%)	424/6501 (6.5%)
CAD risk equivalent (%)	1992/6501 (30.6%)
Metabolic syndrome (%)	3080/6501 (47.4%)
Current tobacco use (%)	1025/6499 (15.8%)
Regular exercise (%)	3060/6487 (47.2%)
History of depression (%)	1381/6499 (21.2%)

Characteristic	Patients With Hypertension (N=6501)
Risk Scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.21) [6501]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	17 (12.72) [6434]
Medication use (%)	
Aspirin	2956/6363 (46.5%)
Statin	3057/6363 (48.0%)
Beta-blocker	2126/6363 (33.4%)
ACE inhibitor or ARB	4041/6363 (63.5%)
Primary presenting symptoms (%)	
Chest pain	4653/6498 (71.6%)
Dyspnea	1027/6498 (15.8%)
Other	818/6498 (12.6%)
Type of angina (%)	
Typical	802/6501 (12.3%)
Atypical	5044/6501 (77.6%)
Non-cardiac	655/6501 (10.1%)
Physician specialty (%)	
Cardiology	5592/6501 (86.0%)
Internal Medicine	380/6501 (5.8%)
Other	529/6501 (8.1%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.2. Demographics and Baseline Characteristics for Patients With Dyslipidemia

Characteristic	Patients with Dyslipidemia (N=6767)
Female (%)	3632/6767 (53.7%)
Age (%), y	
45-64	4824/6767 (71.3%)
65-79	1827/6767 (27.0%)
80+	116/6767 (1.7%)
Race/ethnicity (%)	
Hispanic or Latino	516/6728 (7.7%)
Not Hispanic or Latino-White	5270/6728 (78.3%)
Not Hispanic or Latino-Black	618/6728 (9.2%)
Not Hispanic or Latino-Asian	207/6728 (3.1%)
Not Hispanic or Latino-Other	117/6728 (1.7%)
Socioeconomic status (minimum, maximum income)*	
Low	(11118,42610)
Medium-low	(42613,54149)
Medium-high	(54175,71034)
High	(71059,184338)
US region	
Midwest	1543/6572 (23.5%)
Northeast	1004/6572 (15.3%)
South	2569/6572 (39.1%)
West	1456/6572 (22.2%)
Cardiac risk factors	
BMI ≥ 30 (%)	3257/6701 (48.6%)
Hypertension (%)	4408/6767 (65.1%)
Diabetes (%)	1656/6767 (24.5%)
Family history of premature CAD (%)	2310/6746 (34.2%)
Peripheral arterial disease or cerebrovascular disease (%)	420/6767 (6.2%)
CAD risk equivalent (%)	1940/6767 (28.7%)
Metabolic syndrome (%)	3181/6767 (47.0%)
Current tobacco use (%)	1016/6765 (15.0%)
Regular exercise (%)	3520/6749 (52.2%)
History of depression (%)	1498/6765 (22.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	53 (20.11) [6767]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	15 (12.26) [6698]

Characteristic	Patients with Dyslipidemia (N=6767)
Medication use (%)	
Aspirin	3161/6570 (48.1%)
Statin	4178/6570 (63.6%)
Beta-blocker	1655/6570 (25.2%)
ACE inhibitor or ARB	2943/6570 (44.8%)
Primary presenting symptoms (%)	
Chest pain	4851/6761 (71.7%)
Dyspnea	1033/6761 (15.3%)
Other	877/6761 (13.0%)
Type of angina (%)	
Typical	801/6767 (11.8%)
Atypical	5268/6767 (77.8%)
Non-cardiac	698/6767 (10.3%)
Physician specialty (%)	
Cardiology	5858/6767 (86.6%)
Internal Medicine	371/6767 (5.5%)
Other	538/6767 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 1.3. Demographics and Baseline Characteristics for Patients With Diabetes

Characteristic	Patients with Diabetes (N=2144)
Female (%)	1151/2144 (53.7%)
Age (%), y	
45-64	1488/2144 (69.4%)
65-79	630/2144 (29.4%)
80+	26/2144 (1.2%)
Race/ethnicity (%)	
Hispanic or Latino	256/2132 (12.0%)
Not Hispanic or Latino-White	1414/2132 (66.3%)
Not Hispanic or Latino-Black	345/2132 (16.2%)
Not Hispanic or Latino-Asian	75/2132 (3.5%)
Not Hispanic or Latino-Other	42/2132 (2.0%)
Socioeconomic status (minimum, maximum income)*	
Low	(14586,42610)
Medium-low	(42641,54149)
Medium-high	(54260,71034)
High	(71059,139779)
US region	
Midwest	414/2074 (20.0%)
Northeast	348/2074 (16.8%)
South	916/2074 (44.2%)
West	396/2074 (19.1%)
Cardiac risk factors	
BMI ≥ 30 (%)	1463/2117 (69.1%)
Hypertension (%)	1712/2144 (79.9%)
Dyslipidemia (%)	1656/2144 (77.2%)
Family history of premature CAD (%)	655/2140 (30.6%)
Peripheral arterial disease or cerebrovascular disease (%)	165/2144 (7.7%)
CAD risk equivalent (%)	2144/2144 (100.0%)
Metabolic syndrome (%)	1822/2144 (85.0%)
Current tobacco use (%)	318/2144 (14.8%)
Regular exercise (%)	926/2142 (43.2%)
History of depression (%)	516/2142 (24.1%)
Risk scores	
Mean Diamond and Forrester score (SD) [n]	54 (20.26) [2144]
Mean ASCVD Pooled Cohort Risk Prediction (2013) (SD) [n]	24 (15.25) [2111]
Medication use (%)	

Characteristic	Patients with Diabetes (N=2144)
Aspirin	1098/2118 (51.8%)
Statin	1291/2118 (61.0%)
Beta-blocker	619/2118 (29.2%)
ACE inhibitor or ARB	1444/2118 (68.2%)
Primary presenting symptoms (%)	
Chest pain	1518/2144 (70.8%)
Dyspnea	375/2144 (17.5%)
Other	251/2144 (11.7%)
Type of angina (%)	
Typical	296/2144 (13.8%)
Atypical	1653/2144 (77.1%)
Non-cardiac	195/2144 (9.1%)
Physician specialty (%)	
Cardiology	1830/2144 (85.4%)
Internal Medicine	142/2144 (6.6%)
Other	172/2144 (8.0%)

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

*Median household income (in US $) is used as a surrogate for socioeconomic status.

Table 2.1. Prevalence and Adjusted Odds of No Medication Use at Baseline

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.									
	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Key Risk Factors									
Hypertension	13.8	--	--	33.3	1.08 (0.92 - 1.28)	0.334	20.2	0.07 (0.05 - 0.09)	< 0.001
Dyslipidemia	13.1	1.31 (1.08 - 1.59)	0.007	36.4	--	--	29.8	1.27 (0.92 - 1.74)	0.148
Diabetes	8.07	0.67 (0.52 - 0.85)	< 0.001	25.5	0.51 (0.43 - 0.60)	< 0.001	31.8	--	--
Sex									
Female	14.3	0.92 (0.78 - 1.10)	0.370	38.5	1.33 (1.18 - 1.50)	< 0.001	32.9	1.11 (0.86 - 1.42)	0.420
Male	13.2	--	--	34.0	--	--	30.5	--	--
Age									
65-79	11.5	1.12 (0.90 - 1.41)	0.308	30.0	0.64 (0.55 - 0.75)	< 0.001	28.4	1.10 (0.82 - 1.47)	0.541
80+	14.1	1.47 (0.84 - 2.57)	0.176	28.7	0.59 (0.38 - 0.92)	0.021	30.8	1.48 (0.57 - 3.87)	0.422
45-64	14.7	--	--	39.1	--	--	33.3	--	--
Race/Ethnicity									
Hispanic or Latino	11.9	0.86 (0.64 - 1.16)	0.333	34.3	0.95 (0.77 - 1.17)	0.624	30.6	0.87 (0.60 - 1.27)	0.481
Not Hispanic or Latino-Asian	12.5	0.68 (0.39 - 1.18)	0.171	45.8	1.37 (1.00 - 1.87)	0.051	38.6	0.91 (0.48 - 1.74)	0.773
Not Hispanic or Latino-Black	11.6	0.95 (0.74 - 1.22)	0.715	33.6	0.94 (0.77 - 1.14)	0.522	27.7	1.28 (0.92 - 1.78)	0.146
Not Hispanic or Latino-Other	17.2	1.08 (0.61 - 1.92)	0.796	43.0	1.32 (0.88 - 1.98)	0.180	21.4	0.45 (0.18 - 1.14)	0.092
Not Hispanic or Latino-White	14.3	--	--	36.4	--	--	32.9	--	--
Socioeconomic Status[5]									
Low	12.6	1.02 (0.81 - 1.28)	0.891	37.0	1.20 (1.02 - 1.41)	0.027	30.0	0.90 (0.64 - 1.25)	0.518
Medium-low	12.4	0.96 (0.76 - 1.19)	0.687	36.4	1.12 (0.96 - 1.30)	0.149	28.7	0.80 (0.57 - 1.13)	0.203
Medium-high	16.1	1.25 (1.01 - 1.55)	0.037	37.3	1.08 (0.93 - 1.25)	0.326	34.5	0.96 (0.68 - 1.34)	0.790
High	13.9	--	--	35.5	--	--	34.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
US Region[5]									
Midwest	14.1	1.13 (0.92 - 1.37)	0.242	36.6	1.07 (0.93 - 1.23)	0.347	31.7	1.07 (0.79 - 1.44)	0.677
Northeast	12.2	1.01 (0.79 - 1.28)	0.939	35.0	1.10 (0.93 - 1.30)	0.258	28.4	0.97 (0.69 - 1.35)	0.850
West	16.5	1.32 (1.08 - 1.63)	0.008	41.6	1.31 (1.13 - 1.52)	< 0.001	38.4	1.22 (0.88 - 1.68)	0.239
South	12.8	--	--	34.2	--	--	29.9	--	--
Cardiac Risk Factors at Baseline[6]									
BMI ≥ 30	12.1	0.71 (0.58 - 0.85)	< 0.001	34.9	0.93 (0.80 - 1.07)	0.285	27.7	0.58 (0.43 - 0.78)	< 0.001
Regular exercise	13.7	0.89 (0.76 - 1.04)	0.151	37.2	1.04 (0.94 - 1.17)	0.444	31.8	0.78 (0.62 - 0.99)	0.041
Current tobacco use	14.2	1.11 (0.89 - 1.37)	0.356	39.5	1.09 (0.93 - 1.27)	0.287	35.4	1.24 (0.89 - 1.71)	0.204
Family History of Premature CAD	13.0	0.90 (0.77 - 1.07)	0.226	36.3	0.98 (0.87 - 1.09)	0.672	31.2	0.91 (0.71 - 1.16)	0.433
Peripheral arterial disease or cerebrovascular disease	12.2	0.99 (0.72 - 1.37)	0.948	25.3	0.66 (0.52 - 0.84)	< 0.001	28.8	1.08 (0.71 - 1.64)	0.720
Metabolic syndrome	11.4	1.09 (0.87 - 1.35)	0.463	33.8	1.22 (1.04 - 1.43)	0.015	27.6	0.94 (0.64 - 1.40)	0.774
History of depression	13.6	0.98 (0.81 - 1.18)	0.794	37.0	1.00 (0.87 - 1.13)	0.955	34.6	1.12 (0.86 - 1.47)	0.389
ASCVD pooled cohort risk prediction categories									
High (>=15)	10.5	0.45 (0.34 - 0.58)	< 0.001	31.6	1.22 (1.01 - 1.47)	0.036	27.1	0.64 (0.42 - 0.97)	0.034
Intermediate (7.5 - 14.99)	13.2	0.63 (0.51 - 0.77)	< 0.001	37.4	1.07 (0.93 - 1.24)	0.330	39.3	0.90 (0.60 - 1.34)	0.588
Low (< 7.5)	19.7	--	--	41.3	--	--	41.3	--	--
Blood Pressure categories									
High (≥160/100)	15.3	1.54 (1.19 - 1.99)	0.001	39.6	1.28 (1.03 - 1.59)	0.023	25.2	1.14 (0.74 - 1.77)	0.556
Intermediate (≥140-159/90-99)	16.3	1.58 (1.34 - 1.86)	< 0.001	36.3	1.08 (0.95 - 1.22)	0.241	27.5	1.02 (0.79 - 1.32)	0.884
Low (<140/90)	12.1	--	--	36.1	--	--	34.9	--	--
Medication Use at Baseline									
Antihypertensive				31.0	0.64 (0.53 - 0.77)	< 0.001	14.3	--	--

Table 2.1 Prevalence and adjusted odds of no medication use at baseline.

	No antihypertensive use among patients with hypertension[1,2]			No statin use among patients with dyslipidemia[3]			No ACEi or ARB use in patients with diabetes[4]		
Patient Characteristic	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Statin	10.0	0.53 (0.45 - 0.64)	< 0.001				27.0	0.51 (0.39 - 0.67)	< 0.001
ACEi or ARB	0.00	--	--	29.0	0.82 (0.70 - 0.96)	0.011			
Primary Presenting Symptom									
Chest pain	14.2	0.90 (0.72 - 1.12)	0.340	37.2	1.08 (0.92 - 1.27)	0.356	32.6	0.95 (0.66 - 1.35)	0.754
Dyspnea	11.1	0.79 (0.59 - 1.06)	0.118	34.9	1.09 (0.89 - 1.33)	0.419	28.7	0.90 (0.59 - 1.37)	0.617
Other	14.7	--	--	34.3	--	--	32.1	--	--
Type of Angina									
Atypical	13.9	0.92 (0.72 - 1.18)	0.515	36.7	1.03 (0.87 - 1.24)	0.712	32.1	0.95 (0.64 - 1.40)	0.788
Typical	11.1	0.76 (0.55 - 1.06)	0.107	35.4	1.04 (0.83 - 1.31)	0.720	30.4	0.94 (0.58 - 1.52)	0.802
Non-cardiac	15.8	--	--	35.6	--	--	31.4	--	--
Cardiac Specialist									
Cardiologist	13.5	0.83 (0.67 - 1.03)	0.099	36.3	0.94 (0.80 - 1.10)	0.406	31.6	0.94 (0.68 - 1.30)	0.723
Non-Cardiologist	15.2	--	--	37.4	--	--	32.8	--	--

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; ASCVD = atherosclerotic cardiovascular disease; BMI = body mass index; CAD = coronary artery disease.

[1] Commonly used antihypertensives include ACE inhibitors, ARBs, beta-blockers, thiazide-type diuretics, and calcium-channel blockers.

[2] Only patients with hypertension included in the analysis (N=6501).

[3] Only patients with dyslipidemia included in the analysis (N=6767).

[4] Only patients with diabetes included in the analysis (N=2144).

[5] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[6] Reference group is patients without risk factor.

36/bmjopen-2017-016360 on 29 September 2017. Downloaded from

Table 2.2. Prevalence and Adjusted Odds of Lifestyle Choices at Baseline

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Sex									
Female	53.5	1.55 (1.41 - 1.70)	< 0.001	15.5	0.95 (0.84 - 1.08)	0.434	48.1	1.04 (0.93 - 1.16)	0.535
Male	43.4	--	--	20.2	--	--	47.2	--	--
Age, y									
65-79	48.9	1.02 (0.91 - 1.14)	0.723	8.30	0.23 (0.19 - 0.27)	< 0.001	40.8	0.59 (0.52 - 0.68)	< 0.001
80+	47.5	1.05 (0.76 - 1.45)	0.771	2.21	0.04 (0.01 - 0.13)	< 0.001	20.2	0.23 (0.15 - 0.37)	< 0.001
45-64	48.7	--	--	21.7	--	--	51.0	--	--
Race/Ethnicity									
Hispanic or Latino	50.7	1.06 (0.90 - 1.25)	0.493	16.6	0.89 (0.71 - 1.12)	0.328	48.8	0.96 (0.76 - 1.13)	0.447
Not Hispanic or Latino-Asian	44.8	1.30 (0.99 - 1.71)	0.058	8.00	0.49 (0.30 - 0.80)	0.005	16.7	0.16 (0.11 - 0.24)	< 0.001
Not Hispanic or Latino-Black	58.4	1.13 (0.97 - 1.31)	0.105	20.7	0.96 (0.80 - 1.16)	0.683	59.8	1.55 (1.31 - 1.84)	< 0.001
Not Hispanic or Latino-Other	48.1	1.02 (0.73 - 1.42)	0.895	22.6	1.36 (0.90 - 2.06)	0.147	48.2	0.94 (0.63 - 1.41)	0.781
Not Hispanic or Latino-White	47.4	--	--	17.6	--	--	46.9	--	--
Socioeconomic Status[5]									
Low	57.7	1.45 (1.28 - 1.65)	< 0.001	23.1	2.00 (1.68 - 2.38)	< 0.001	52.1	0.99 (0.85 - 1.16)	0.918
Medium-low	50.2	1.20 (1.07 - 1.36)	0.003	18.9	1.63 (1.38 - 1.94)	< 0.001	49.1	1.04 (0.90 - 1.21)	0.559
Medium-high	47.7	1.18 (1.05 - 1.32)	0.007	17.4	1.52 (1.28 - 1.80)	< 0.001	48.4	1.06 (0.92 - 1.22)	0.454
High	41.4	--	--	11.5	--	--	42.3	--	--
US Region[2]									
Midwest	42.5	0.58 (0.52 - 0.65)	< 0.001	17.4	0.99 (0.85 - 1.14)	0.848	50.3	1.23 (1.08 - 1.41)	0.002
Northeast	45.5	0.63 (0.55 - 0.72)	< 0.001	17.1	1.02 (0.85 - 1.21)	0.854	49.9	1.04 (0.89 - 1.22)	0.617
West	44.3	0.68 (0.61 - 0.77)	< 0.001	13.7	0.76 (0.65 - 0.90)	0.001	42.5	0.96 (0.84 - 1.12)	0.648
South	56.3	--	--	19.9	--	--	48.5	--	--
Cardiac Risk Factors at Baseline[3]									
Current tobacco use	58.3	1.73 (1.54 - 1.94)	< 0.001	--	--	--	40.2	0.46 (0.41 - 0.54)	< 0.001
BMI ≥ 30	56.2	1.64 (1.47 - 1.82)	< 0.001	14.9	0.48 (0.41 - 0.55)	< 0.001	--	--	--

	Sedentary			Current Smoking			Obese[1]		
Outcome	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**	**Prevalence, %**	**Adjusted OR (95% CI)**	**P-value**
Hypertension	52.8	1.32 (1.20 - 1.45)	< 0.001	15.8	0.62 (0.55 - 0.70)	< 0.001	54.9	1.19 (1.06 - 1.33)	0.003
Diabetes	56.8	1.12 (0.99 - 1.26)	0.078	14.8	0.61 (0.51 - 0.72)	< 0.001	69.1	0.48 (0.40 - 0.56)	< 0.001
Dyslipidemia	47.8	0.91 (0.83 - 1.01)	0.068	15.0	0.53 (0.47 - 0.60)	< 0.001	48.6	0.41 (0.37 - 0.46)	< 0.001
Family History of Premature CAD	45.2	0.78 (0.71 - 0.85)	< 0.001	18.3	1.07 (0.95 - 1.21)	0.248	48.3	1.05 (0.94 - 1.17)	0.400
Peripheral arterial disease or cerebrovascular disease	57.8	1.33 (1.11 - 1.60)	0.003	21.9	1.61 (1.28 - 2.03)	< 0.001	45.6	0.78 (0.62 - 0.97)	0.028
Metabolic syndrome	56.0	1.10 (0.97 - 1.24)	0.157	16.3	1.43 (1.20 - 1.69)	< 0.001	83.3	27.77 (23.74 - 32.48)	< 0.001
History of depression	53.3	1.09 (0.98 - 1.21)	0.119	23.0	1.52 (1.33 - 1.74)	< 0.001	53.2	1.25 (1.10 - 1.42)	< 0.001
ASCVD pooled cohort risk prediction ≥ 7.5%	49.7	1.08 (0.97 - 1.20)	0.170	19.2	2.45 (2.12 - 2.83)	< 0.001	49.4	0.89 (0.78 - 1.02)	0.094
Primary Presenting Symptom									
Chest pain	48.5	1.09 (0.95 - 1.24)	0.209	18.5	0.92 (0.77 - 1.09)	0.315	46.9	0.96 (0.82 - 1.13)	0.626
Dyspnea	52.2	1.27 (1.08 - 1.49)	0.004	13.8	0.73 (0.58 - 0.92)	0.007	53.0	1.23 (1.01 - 1.50)	0.036
Other	46.0	--	--	17.8	--	--	45.5	--	--
Type of Angina									
Atypical	48.8	1.08 (0.94 - 1.25)	0.256	17.9	0.96 (0.80 - 1.16)	0.682	47.7	0.92 (0.78 - 1.09)	0.335
Typical	50.4	1.14 (0.95 - 1.37)	0.157	16.5	0.85 (0.66 - 1.09)	0.193	49.4	0.88 (0.70 - 1.09)	0.237
Non-cardiac	46.5	--	--	18.0	--	--	45.7	--	--
Cardiac Specialist									
Cardiologist	48.7	1.00 (0.89 - 1.14)	0.951	17.7	1.03 (0.87 - 1.21)	0.746	47.6	1.07 (0.92 - 1.24)	0.407
Non-Cardiologist	49.2	--	--	17.9	--	--	48.7	--	--

[1] Obese defined as BMI ≥ 30.

[2] Zip code level data extracted from 2010 US Census Bureau American Community Survey Data (5-year estimates).

[3] Reference group is patients without risk factor.

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*

Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1 (Lines 1-3)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 (All Lines)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 (All Lines)
Objectives	3	State specific objectives, including any pre-specified hypotheses	4 (Lines 16 – 22)
Methods			
Study design	4	Present key elements of study design early in the paper	5 (Lines 3 – 11)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5 (Lines 3 – 11)
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5 (Lines 5 – 8)
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7 (All Lines)
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*5 (Lines 11 – 21) – 8 (All Lines)*
Bias	9	Describe any efforts to address potential sources of bias	7-8
Study size	10	Explain how the study size was arrived at	5 (lines 5-9)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7-8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7 (Lines 16 – 21) – 8 (Lines 1 – 12)
		(*b*) Describe any methods used to examine subgroups and interactions	7-8
		(*c*) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed	N/A

		Case-control study—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8 (Lines 17)
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8 (Lines 17 – 23) -9 (All Lines)
		(b) Indicate number of participants with missing data for each variable of interest	21-22
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	21-23
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-11 (All Lines)
		(*b*) Report category boundaries when continuous variables were categorized	N/A
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	11-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13 (Lines 13 – 20)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13 (All LInes)
Generalisability	21	Discuss the generalisability (external validity) of the study results	14 (lines 6-10)
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	15 (All Lines)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.