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Risk factor control among Black and White adults with diabetes onset in older adulthood: The Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study

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Conflict of Interests

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Abstract

The objective of this study was to determine whether attainment of clinical and lifestyle targets varied by race and sex among adults with diabetes onset in older adulthood.

This study included 1,420 black and white adults from the REGARDS study without diabetes at baseline (2003-07) but with diabetes onset at the follow-up exam (2013-16). Attainment of clinical targets (A1c <8%; blood pressure <140/90 mm Hg; and statin use) and lifestyle targets (not smoking; physical activity>=4 times/week; and moderate/no alcohol use) was assessed at the follow-up exam. Modified Poisson regression was used to obtain prevalence ratios (PR) for meeting clinical and lifestyle targets stratified by race and sex, separately.

The mean age was 71.5 years, 53.6% were female, and 46.1% were black. The majority were aware of their diabetes status (85.7%) and used oral or injectable hypoglycemic medications (64.8%). Overall, 39.4% met all 3 clinical targets and 18.8% met all 3 lifestyle targets. Meeting A1c and blood pressure targets were similar by race and sex. Statin use was more prevalent for men than women among white adults (PR=1.13; 95% CI=0.99-1.29) and black adults (PR=1.23; 95% CI=1.06-1.43). For lifestyle factors, the non-smoking prevalence was similar by race and sex, while white men were more likely than white women to be physically active.

Although the attainment of each clinical and lifestyle target separately was generally high among adults with diabetes onset in older adulthood, race and sex differences were apparent. Comprehensive management of clinical and lifestyle factors in people with diabetes remains suboptimal.

Keywords

epidemiology; diabetes; race; sex; clinical factors; lifestyle factors

Introduction

In 2007-2012, 1 in 4 adults with prevalent diabetes in the US did not meet recommended targets for A1c, blood pressure, and cholesterol combined (Ali et al., 2014). Moreover, race and sex disparities in the control and treatment of cardiovascular risk factors among adults with prevalent diabetes have been reported. In a cross-sectional analysis of adults with prevalent diabetes in the Atherosclerosis Risk in Communities Study (2011-2013), meeting the A1c goal did not differ by race, while black adults were less likely than white adults to meet goals for blood pressure and LDL cholesterol (Parrinello et al., 2015). In the National Health and Nutrition Examination Survey (NHANES) 2001-2016, there were no sex differences in treatment for those with diabetes although among those treated, women were more likely to meet the A1c goal than men (Peters et al., 2019). Additionally, women with prevalent diabetes were less likely than men with prevalent diabetes to have controlled blood pressure and cholesterol or receive lipid-lowering medication (Ferrara et al., 2008; Gouni-Berthold et al., 2008; Nanna et al., 2019; Parrinello et al., 2015).

While the previous studies focused on clinical targets and sometimes included smoking status among individuals with prevalent diabetes, few studies have investigated race and sex differences in meeting recommended targets for both clinical (A1c, blood pressure, and cholesterol) and lifestyle (smoking status, physical activity, and alcohol consumption) factors among adults with diabetes onset in older adulthood. In a study of patients from a health maintenance organization identified at the time of their diabetes diagnosis, women were more likely than men to meet the A1c target among middle-aged adults but not older adults (Schroeder et al., 2014). Further, a recent systematic review and meta-analysis have shown that adherence to a healthy lifestyle among participants with diabetes reduces the risk of mortality and cardiovascular diseases (Zhang et al., 2020). Given that the incidence of diabetes more than doubled in the US from 1990 to 2008 (Centers for Disease Control and Prevention, 2017; Geiss et al., 2014) and recent data suggest diabetes incidence has stabilized and now maybe declining (Abraham et al., 2015; Selvin and Ali, 2017; Weng et al., 2016), the objective of this study was to examine whether meeting clinical and lifestyle targets varied by race and sex among adults with new diabetes onset in older adulthood.

Methods

Study Population

This study included participants from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study, a population-based prospective cohort designed to elucidate underlying mechanisms leading to racial and regional variations in stroke mortality. At baseline (2003-2007), 30,239 black and white adults aged 45 years or older from the continental US were enrolled. Details of the study design and procedures were published previously (Howard et al., 2005). Briefly, participants were randomly recruited using commercially available lists of mail and telephone contacts at baseline, with oversampling of black individuals and residents of the Southeastern US. A computer-assisted telephone interview (CATI) collected data on sociodemographic, medical history, lifestyle, and psychosocial characteristics. Then, an in-home exam was conducted approximately one month later by trained staff to assess anthropometry and blood pressure, perform electrocardiograms, and collect blood and urine specimens, which were shipped to a central laboratory at the University of Vermont. After baseline, participants were contacted via telephone every six months to obtain vital status and to detect potential study endpoints, which were later adjudicated based on medical record review. A second in-home exam was conducted during 2013-2016. Written informed consent was obtained from each study participant, and the study was approved by the institutional review boards at all participating sites.

The current analysis included 1,420 participants who did not have diabetes at baseline but met criteria for diabetes at the second in-home exam. Diabetes was defined as fasting glucose ≥126 mg/dL or random glucose ≥200 mg/dL or use of oral or injectable hypoglycemic medications.

Clinical Factors

The analysis included three clinical factors: A1c, blood pressure, and statin use. A1c was measured at a centralized laboratory using whole blood samples collected at the second in-home exam. Blood pressure was determined as the mean of two measurements (systolic blood pressure (SBP) and diastolic blood pressure (DBP)) taken 3-5 minutes apart following a standardized protocol concordant with the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Participant self-reported medication use during the CATI and the medication inventory conducted during the in-home examination were used to determine the use of antihypertensive medication, hypoglycemic medication, and statins. The primary clinical outcomes were defined as meeting targets for A1c (<8%), blood pressure (SBP<140 mm Hg and DBP<90 mm Hg), and cholesterol (statin use) (American Diabetes Association, 2016; Whelton et al., 2018), separately and overall, at the second in-home visit. Statin use intensity was categorized as high intensity (use of atorvastatin 40-80 mg/day or rosuvastatin 20-40 mg/day), low intensity (all other statin use), or no statin use. Because treatment recommendations suggest individualized targets for each of these clinical factors, alternative clinical definitions that were investigated included A1c<7%, SBP<130 and DBP<80 mm Hg, and low-density lipoprotein cholesterol (LDL)<100 mg/dL.

Lifestyle Factors

Lifestyle factors were self-reported at the second in-home visit. Cigarette smoking status was categorized as never smoker, former smoker, or current smoker. Alcohol consumption was categorized as none, moderate (≤7 drinks per week for women and ≤14 drinks per week for men), or heavy (>7 drinks per week for women and ≤14 drinks per week for men) (National Institute on Alcohol Abuse and Alcoholism, 2007). Physical activity was assessed using a validated question (‘How many times per week do you engage in intense physical activity, enough to work up a sweat?’) and responses were categorized as none, 1-3 times/week, or ≥4 times/week (Washburn et al., 1987; Washburn et al., 1990). The primary lifestyle outcomes were defined as meeting targets for non-smoking (never or former smoker), alcohol use (no or moderate alcohol consumption), and physical activity (≥4 times/week).

Covariates

All variables were ascertained at the REGARDS second in-home visit unless otherwise noted. Age, race (black or white), sex (men or women), education (< high school, high school graduate, some college, and college graduate and above), marital status (married or not married), and annual household income (<$20,000, $20,000–$34,999, $35,000–$74,999, >$75,000, or refused) were self-reported. Each participant’s residential address at baseline was geocoded and linked to US census data to determine community type at the census tract level. Community type was defined as rural (census tract that is <25% urban), mixed (census tract that is 25-75% urban), and urban (census tract that is >75% urban). Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters. Duration of diabetes was self-reported and oral or injectable hypoglycemic medication use was assessed using the medication inventory. History of coronary heart disease (CHD) was

measured using the self-reported history of myocardial infarction, coronary artery bypass grafting, coronary angioplasty or stenting at baseline or adjudicated myocardial infarction and revascularization procedures during follow-up.

Statistical Analyses

Descriptive statistics were used to compare participant characteristics across race-sex groups. Modified Poisson regression with robust standard errors was used to obtain prevalence ratios (PR) and 95% CI for meeting targets for each clinical and lifestyle factor (Zou, 2004). Model 1 was adjusted for age, education, annual household income, and community type. Model 2 included additional adjustment for BMI, diabetes duration, oral or injectable hypoglycemic medication use, and history of CHD. Models were stratified by race to compare the proportion of men versus women meeting clinical and lifestyle targets among black and white adults, separately. Models were also stratified by sex to compare the proportion of black versus white adults meeting clinical and lifestyle targets among women and men, separately. In all analyses, the listwise deletion approach was used to address missingness in the data. In sensitivity analyses, we investigated alternative recommendations for each clinical factor (A1c<7%, SBP<130 and DBP<80 mm Hg, and LDL<100 mg/dL). We also investigated whether meeting clinical and lifestyle targets varied by community type (urban, mixed, rural). We used SAS 9.4 (SAS Institute, Cary, NC) for all analyses.

Results

Participant characteristics by race-sex groups are presented in Table 1. The mean age was 71.5 years, 33.2% were college graduates, and 15.1% had an annual household income> $75,000. Most participants resided in urban areas (76.9%), with black adults more likely to reside in an urban area than white adults.

The majority of participants reported they were aware that they had diabetes (85.7%). Almost half (46.7%) reported they were diagnosed with diabetes within the last 5 years and 64.8% were using oral or injectable hypoglycemic medication. Mean BMI was lowest among white men (30.1 kg/m^2) and highest among black women (32.8 kg/m^2). Mean SBP was highest for black men (129 mm Hg) and lowest for white women (125 mm Hg), whereas antihypertensive medication use was highest for black women (84.3%) and lowest for white men (69.7%). Mean LDL cholesterol was highest among black women (98 mg/dL) and lowest for white men (84 mg/dL).

The majority of participants met the A1c and blood pressure recommendations, and the prevalence was similar by race and sex (Figure 1). In contrast, statin use was lower among black than white adults, with the highest use observed among white men (64.6%) and the lowest use observed among black women (48.0%). Less than half of participants met all three clinical targets for A1c, blood pressure, and statin use, and this was higher for white men (45.2%) than black men (41.0%) and for white women (40.5%) than black women (31.9%). The majority of participants were never or former smokers and reported no or moderate alcohol consumption (Figure 2). The prevalence of meeting all three lifestyle targets for smoking status, alcohol consumption, and physical activity was higher for white men (24.4%) and black men (22.7%) than white women (12.9%) and black women (15.6%).

In race-stratified models, meeting targets for A1c<8% and blood pressure <140/90 mm Hg was similar for men and women among both black and white adults, separately, after adjustment for age, education, income and community type (Table 2). However, black men were more likely than black women to use statins (PR=1.23, 95% CI: 1.06-1.43) and white men were more likely than white women to use statins (PR=1.17, 95% CI: 1.03-1.32). Findings were similar with additional adjustment for BMI, diabetes duration, oral or injectable hypoglycemic medication use, and history of CHD. For lifestyle factors, meeting targets for non-smoking and alcohol consumption was similar for men and women among black adults and white adults. In contrast, men were more likely than women to meet the physical activity target among black adults (PR=1.25, 95% CI: 0.89, 1.75) and among white adults (PR=1.50, 95% CI: 1.05-2.15) after multivariable adjustment. Additionally, men were more likely than women to meet all three lifestyle targets among black adults (PR=1.39, 95% CI: 0.97-2.00) and white adults (PR=1.63, 95% CI: 1.12-2.38).

In sex-stratified models, meeting targets for A1c<8% and blood pressure <140/90 mm Hg was similar for black and white adults among men and women separately (Table 3). Statin use was lower for black adults than white adults among men (PR=0.94, 95% CI: 0.82-1.07) and women (PR=0.86, 95% CI: 0.74-1.00) in minimally adjusted models. These associations were similar after additional adjustment. Black adults were less likely than white adults to meet targets for all three clinical factors among women (PR=0.80, 95% CI: 0.64-0.99) but not among men (PR=0.99, 95% CI: 0.80-1.22). For lifestyle factors, the non-smoking prevalence was similar for black and white adults, whereas black adults were more likely to report no or moderate alcohol consumption than white adults among women (PR=1.05, 95% CI: 1.02-1.09) but not among men (PR=1.01, 95% CI: 0.97-1.05).

Findings from both the race-stratified and sex-stratified models were generally similar after additional adjustment for depressive symptoms and medication adherence that was available on a subset of participants (data not shown). In sensitivity analyses evaluating alternative definitions for each clinical target, 73% of the participants had A1c<7%, 55% had blood pressure < 130/80, and 64% had LDL <100mg/dl. For meeting A1c<7%, black men were less likely to meet this target than white men while prevalence was similar among women (Supplemental Table S1). There were sex differences in meeting the blood pressure target with black men being less likely than black women to meet the blood pressure <130/80 mm Hg target (PR=0.81, 95% CI: 0.66-0.99). Additionally, men were more likely than women to meet the LDL<100 mg/dL target among white adults (PR=1.17, 95% CI: 1.03-1.34) and black adults (PR=1.12, 95% CI: 0.93-1.31).

In sensitivity analyses investigating community type, meeting recommended clinical and lifestyle targets was similar for urban, mixed, and rural communities. For clinical targets, the percentage of adults with diabetes meeting all three clinical targets was 39.9%, 33.1%, and 44.9% in urban, mixed, and rural communities, respectively (p=0.1134). For lifestyle targets, the percentage of adults with diabetes meeting all three lifestyle targets was 17.4%, 21.6%, and 21.7% in urban, mixed, and rural communities, respectively (p=0.2511).

Discussion

In this study of black and white adults with diabetes onset in older adulthood, the percentage of those meeting individual clinical and lifestyle targets was relatively high. However, collectively meeting these targets was suboptimal, with 39.4% of participants meeting all targets for A1c, blood pressure, and statin use, and 18.8% meeting all targets for non-smoking, alcohol consumption, and physical activity. Meeting A1c and blood pressure targets were similar by race and sex, whereas women were less likely to use statins than men, and black adults were less likely to use statins than white adults. Non-smoking was similar across race and sex groups, while men were more likely than women to meet physical activity goals in both race groups.

Prior studies of adults with prevalent diabetes have reported similar findings for meeting all clinical targets combined. In the ARIC Study, 33.5% of adults with prevalent diabetes met all targets for A1c, blood pressure, and LDL cholesterol (Parrinello et al., 2015), and older black adults were less likely to meet all three targets compared with older white adults. In NHANES 2005-2016, 23% of adults with prevalent diabetes met all targets for A1c, blood pressure, LDL cholesterol and non-smoking, with black adults being 43% less likely than white adults to meet this composite target (Kazemian et al., 2019). In contrast, in our study, the percentage of adults meeting all three clinical targets (A1c, blood pressure, and statin use) was higher overall, likely due to the new diabetes onset in older adulthood and similar by race.

Our finding that women in general and black women, in particular, were less likely to use statins is consistent with findings from previous studies. In the Medical Expenditure Panel Survey, statin use increased in the overall population from 17.9% in 2002-2003 to 27.8% in 2012-2013, with racial/ethnic and sex differences evident (Salami et al., 2017). In a prior analysis of REGARDS participants with prevalent diabetes at baseline, women were less likely than men to use statins and less likely to attain LDL <100 mg/dL while on treatment (Gamboa et al., 2017). Another study using data from a national outpatient registry reported that in the subgroup of patients with diabetes, women were also less likely than men to use statins (Nanna et al., 2019). Provider-level and patient-level factors may contribute to these sex differences in statin use as women were more likely than men to report never being offered statin therapy by their provider, and when offered, women were more likely than men to report declining or discontinuing statin therapy and concerns about potential adverse effects of statin therapy, including new diabetes onset (Nanna et al., 2019). Reporting health care quality metrics by race and sex may help mitigate these disparities in treatment and disease management (Khazanie and Ho, 2019). Further, the use of clinical decision support systems and online patient portals have been shown to improve prescribing of guideline-based treatments and patient adherence to medications (Lyles et al., 2016; Njie et al., 2015; Sarkar et al., 2014).

For lifestyle targets, 91% of participants with diabetes in our study met the non-smoking recommendation, and this was similar across race and sex groups. The percentage of REGARDS participants meeting non-smoking goals is slightly higher than findings from NHANES 2007-2012 that reported about 81% of adults with diabetes were non-smokers

(Ali et al., 2014). The American Diabetes Association's lifestyle management recommendations suggest low to moderate alcohol use for adults with diabetes as heavy or excessive alcohol consumption may contribute to weight gain and hyperglycemia (American Diabetes Association, 2018; Mozaffarian, 2016). In general, alcohol consumption is more common among white adults than black adults (Dawson et al., 1995) and men than women (Erol and Karpyak, 2015). Our study found that black women with diabetes were more likely to report no or moderate alcohol consumption than white women with diabetes, whereas no sex differences were observed. For physical activity, there has been limited research on sex differences in physical activity among older adults with diabetes. In our study, we found that men with diabetes were more likely than women with diabetes to engage in physical activity ≥4 times/week. Additionally, we found that black women with diabetes were more likely than white women with diabetes to meet the physical activity target. These findings may relate to the cumulative advantage in health hypothesis which posits that socially advantaged individuals, such as those with higher education, white adults, and men, may be more likely to engage in regular physical activity and leisure-time sports (Ross and Wu, 1996; Willson et al., 2007).

Our study did not identify differences in meeting recommended clinical and lifestyle targets by community type. In the Veteran's Health Administration, meeting the recommended A1c target was also similar in urban and rural communities (Egede et al., 2011). In contrast, meeting the recommended A1c target differed by race and community type in NHANES III such that compared with black adults in rural areas, the prevalence of meeting the A1c target was higher for black adults in urban areas, white adults in rural areas and white adults in urban areas (Mainous et al., 2004). Because the majority of our participants resided in urban areas, we were unable to further investigate potential differences in meeting recommended targets by race, sex and community type jointly.

This study has several strengths. REGARDS is a national prospective study that collected objective and self-reported data at baseline and follow-up using standardized protocols. Using these resources, we were able to investigate clinical as well as lifestyle targets among adults who had new diabetes onset in older adulthood and did not have a long duration of diabetes (<10 years from baseline to follow-up). The study also has several limitations. First, REGARDS participants had to attend the second visit to assess diabetes onset, so those who died before the second exam, withdrew from the follow-up, or declined to participate were not included in this analysis. In a prior analysis investigating how this potential selection bias affected racial differences in incident hypertension, results were similar after accounting for racial differences in attrition and survival (Long et al., 2019). Second, clinical practice standards recommend individualized A1c and blood pressure targets that consider life expectancy and other comorbidities as well as physician-patient shared decision making. While we investigated relatively less stringent targets for A1c, blood pressure, and cholesterol in our sensitivity analyses, it is possible that the patient-physician shared goals accounted for deviations from these alternative targets. Third, lifestyle factors were self-reported. We assessed the frequency of physical activity using a single validated question that is predictive of health outcomes (McDonnell et al., 2013; Washburn et al., 1990) but did not have data available on physical activity intensity or duration. Additionally, dietary targets as a lifestyle factor were not studied as these data were not yet available for investigation.

In conclusion, the majority of black and white adults with diabetes onset in older adulthood met targets for each clinical and lifestyle factor, except for statin use and physical activity. Race and sex differences were noted for statin use and physical activity and meeting combined clinical and lifestyle targets, demonstrating that gaps remain in comprehensive cardiovascular risk factor management among middle-aged and older adults with diabetes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Overall, 39.4% of participants with diabetes met all three clinical targets (A1c, blood pressure, statin use).
- For lifestyle factors, 18.8% met all three targets (non-smoking, physically active, no or moderate alcohol consumption).
- Meeting each clinical and lifestyle target was similar for urban, rural and mixed community types.
- Meeting A1c, blood pressure, and non-smoking targets were similar by race and sex.
- Women were less likely to use statins and be physically active than men.

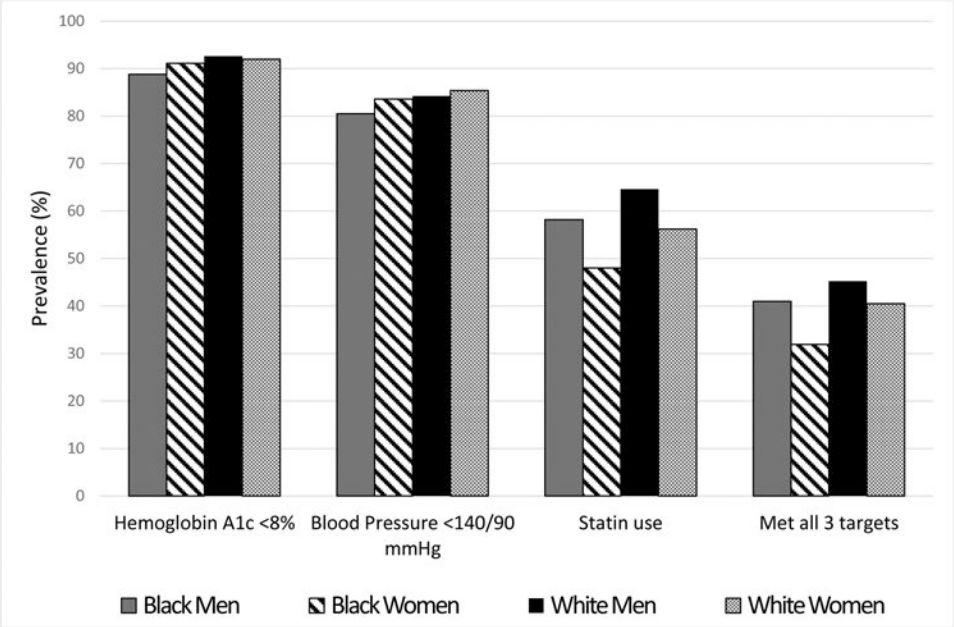

Figure 1.

Percentage of adults with new onset diabetes meeting clinical targets, the REGARDS Study (2013-2016) (n=1,420)

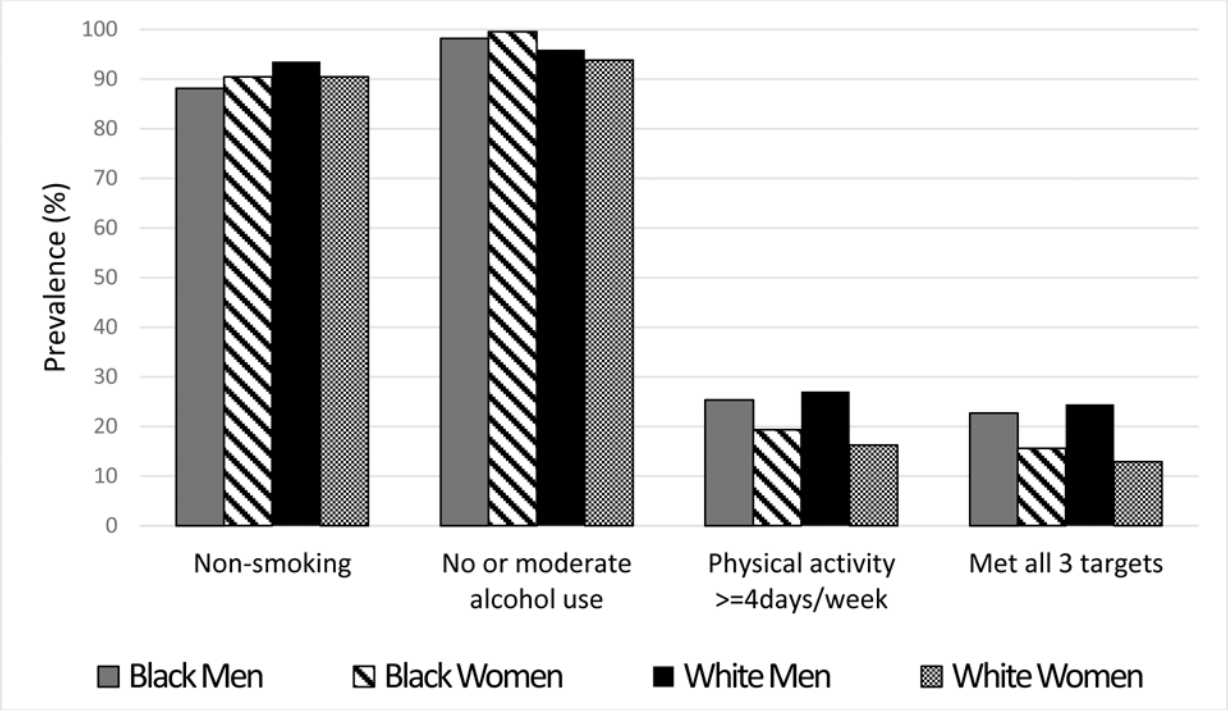

Figure 2.
Percentage of adults with new onset diabetes meeting lifestyle targets, the REGARDS Study (2013-2016) (n=1,420)

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Table 1.

Characteristics of participants with new diabetes onset in the REGARDS Study (2013-2016)

Characteristic	Black Men N=232 Mean (SD) or %	Black Women N=423	White Men N=427	White Women N=338	Overall N=1420	P-value
Age (years)	70.6 (8.4)	70.8 (7.9)	72.9 (7.6)	71.2 (7.9)	71.5 (7.9)	0.01
Education						0.01
Less than high school	11.2	18.2	7.7	8.0	11.5	
High school graduate	35.3	29.6	19.0	27.5	26.8	
Some college	27.2	28.8	26.9	31.1	28.5	
College graduate and above	26.3	23.4	46.4	33.4	33.2	
Annual household income						0.01
< $20,000	15.2	26.3	5.7	15.9	24.2	
$20,000–$34,999	26.5	27.7	17.3	26.7	30.5	
$35,000–$74,999	31.3	19.9	40.8	30.5	14.4	
> $75,000	13.0	5.9	25.8	11.4	15.1	
Declined to disclose	13.9	20.1	10.4	15.6	15.8	
Currently married	71.1	28.9	80.8	47.3	55.7	0.01
Community type						0.01
Rural	3.4	5.6	19.9	17.5	12.3	
Mixed	4.8	6.4	14.7	15.8	10.8	
Urban	91.9	88.0	65.5	66.7	76.9	
Aware of diabetes	84.5	89.8	84.3	83.1	85.7	0.05
Duration of diabetes < 5 years	43.7	49.0	46.7	45.9	46.7	0.68
Insulin use	5.6	5.9	4.2	5.0	5.1	0.72
Any diabetes medication use	61.2	66.0	67.4	62.7	64.8	0.33
Body mass index (kg/m^2)	30.6 (5.7)	32.8 (7.1)	30.1 (5.7)	31.4 (6.2)	31.3 (6.2)	0.01
Hemoglobin A1c (%)	6.8 (1.1)	6.7 (1.2)	6.6 (0.9)	6.7 (1.0)	6.7 (1.1)	0.07
Systolic blood pressure (mm Hg)	129 (15)	126 (15)	126 (14)	125 (14)	126 (14)	0.06
Diastolic blood pressure (mm Hg)	76 (9)	74 (10)	73 (9)	73 (9)	74 (9)	0.01
Antihypertensive medication use	79.0	84.3	69.7	72.4	76.3	0.01

Characteristic	Black Men N=232	Black Women N=423	White Men N=427	White Women N=338	Overall N=1420	P-value
	Mean (SD) or %					
LDL cholesterol (mg/dL)	95 (39)	98 (34)	84 (29)	96 (33)	93 (34)	0.01
Statin use						0.01
No statin	41.8	52.0	35.5	43.8	43.4	
Low-intensity statin	42.7	37.8	51.6	44.7	44.4	
High-intensity statin	15.5	10.2	12.9	11.5	12.2	
History of coronary heart disease	22.4	18.7	37.2	16.3	24.3	0.01

Table 2.

Prevalence ratios (PR) for men with diabetes versus women with diabetes for meeting clinical and lifestyle targets, stratified by race, the REGARDS Study (2013-2016)

	Black Men vs. Women PR (95% CI)	**White Men vs. Women PR (95% CI)**	**Black Men vs. Women PR (95% CI)**	**White Men vs. Women PR (95% CI)**
Clinical factors	Model 1		Model 2	
Hemoglobin A1c <8%	0.98 (0.92-1.05)	0.97 (0.92-1.02)	0.99 (0.92-1.06)	0.96 (0.91-1.02)
Blood pressure <140/90 mm Hg	0.99 (0.91-1.08)	0.99 (0.92-1.07)	0.98 (0.89-1.07)	0.98 (0.90-1.06)
Statin use	1.23 (1.06-1.43)	1.17 (1.03-1.32)	1.23 (1.06-1.43)	1.13 (0.99-1.29)
Combined A1c, blood pressure and statin use	1.29 (1.04-1.61)	1.12 (0.94-1.35)	1.25 (0.99-1.57)	1.06 (0.87-1.28)
Lifestyle factors				
Non-smoking	0.98 (0.95-1.01)	1.03 (0.96-1.07)	1.00 (0.93-1.07)	1.03 (0.97-1.08)
No or moderate alcohol use	0.98 (0.95-1.01)	1.03 (0.99-1.07)	0.98 (0.95-1.01)	1.04 (0.99-1.08)
Physical activity ≥4 days/week	1.33 (0.95-1.87)	1.48 (1.03-2.12)	1.25 (0.89-1.75)	1.50 (1.05-2.15)
Combined non-smoking, alcohol use, and physical activity	1.50 (1.04-2.18)	1.56 (1.06-2.28)	1.39 (0.97-2.00)	1.63 (1.12-2.38)

Model 1 adjusted for age, education, annual household income, and community type.

Model 2 adjusted for age, education, annual household income, community type, body mass index, diabetes duration, diabetes medication use, and history of coronary heart disease

Table 3.

Prevalence ratios (PR) for Black adults with diabetes versus White adults with diabetes for meeting clinical and lifestyle targets, stratified by sex, the REGARDS Study (2013-2016)

	Men Black vs. White PR (95% CI)	**Women Black vs. White PR (95% CI)**	**Men Black vs. White PR (95% CI)**	**Women Black vs. White PR (95% CI)**
Clinical factors	Model 1		Model 2	
Hemoglobin A1c <8%	0.97 (0.90-1.05)	0.98 (0.93-1.04)	0.97 (0.90-1.06)	0.98 (0.93-1.03)
Blood pressure <140/90 mm Hg	0.97 (0.88-1.07)	1.00 (0.92-1.09)	0.99 (0.90-1.09)	1.02 (0.94-1.10)
Statin use	0.94 (0.82-1.07)	0.86 (0.74-1.00)	0.97 (0.85-1.10)	0.85 (0.73-0.99)
Combined A1c, blood pressure and statin use	0.94 (0.76-1.15)	0.80 (0.64-0.99)	0.99 (0.80-1.22)	0.80 (0.64-0.99)
Lifestyle factors				
Non-smoking	0.99 (0.93-1.06)	1.01 (0.95-1.07)	0.98 (0.92-1.05)	1.01 (0.95-1.07)
No or moderate alcohol use	1.00 (0.96-1.04)	1.06 (1.02-1.10)	1.01 (0.97-1.05)	1.05 (1.02-1.09)
Physical activity ≥4 days/week	1.13 (0.79-1.62)	1.23 (0.84-1.80)	1.12 (0.77-1.60)	1.26 (0.86-1.85)
Combined non-smoking, alcohol use, and physical activity	1.14 (0.79-1.66)	1.18 (0.78-1.80)	1.14 (0.78-1.66)	1.21 (0.79-1.85)

Model 1 adjusted for age, education, annual household income, and community type.

Model 2 adjusted for age, education, annual household income, community type, body mass index, diabetes duration, diabetes medication use, and history of coronary heart disease