



Published in final edited form as:

*Med Care*. 2015 January ; 53(1): 25–31. doi:10.1097/MLR.0000000000000255.

## Revisiting Disparities in Quality of Care Among US Adults With Diabetes in the Era of Individualized Care, NHANES 2007–2010

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### Abstract

**Background**—Diabetes quality of care standards promote uniform goals and are used routinely for performance measurement and reimbursement. Diabetes health disparities have been characterized using these universal goals. However, guidelines emphasize individualized goals.

**Objectives**—To assess diabetes care disparities using individualized goals to (1) determine their racial/ethnic distribution and (2) compare disparities using individualized versus uniform goals.

**Research Design, Subjects, and Measures**—A nationally representative sample of non-Hispanic white, non-Hispanic black, and Hispanic adults with self-reported diabetes aged 20 years or more in the National Health and Nutrition Examination Survey, 2007–2010. Individualized glycemic goals (A1C < 6.5%, < 7.0%, or < 8.0%) assigned based on age, duration, complications, and comorbidity, and cholesterol goals [low-density lipoprotein cholesterol (LDL) < 70 or < 100 mg/dL] assigned based on cardiovascular history.

**Results**—More Hispanics were recommended an individualized A1C < 7.0% compared with whites (54% vs. 42%,  $P = 0.008$ ). Fewer blacks and Hispanics were recommended an individualized LDL < 70 mg/dL than whites (21% and 19% vs. 28%,  $P = 0.02$  and  $0.001$ ). Fewer Hispanics had adequate individualized A1C control (56% vs. 68%,  $P < 0.001$ ), and fewer blacks and Hispanics had adequate individualized LDL control (31% and 36% vs. 51%,  $P = 0.001$  and  $P = 0.004$ ). A uniform A1C < 7% goal did not reveal disparities in glycemic control; individualized A1C and LDL, blood pressure < 140/90 mm Hg, and nonsmoking was achieved by few adults (18%), and fewer blacks and Hispanics than whites (6% and 11% vs. 22%,  $P < 0.001$  and  $P = 0.005$ ).

**Conclusions**—Individualized goals for diabetes care may unearth greater racial/ethnic disparities in clinical performance compared with uniform goals. Diabetes performance measures should include individualized goals to prevent worsening disparities in diabetes outcomes.

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The authors declare no conflict of interest.

Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Website, [www.lww-medical-care.com](http://www.lww-medical-care.com).

## Keywords

organization of care; quality of care; disparities; diabetes

In 1999, standards for diabetes quality of care and performance measurement were established by the National Committee for Quality Assurance's (NCQA's) Health Plan Employer Data and Information Set (HEDIS).<sup>1</sup> The HEDIS measure for comprehensive diabetes care includes the intermediate outcome measures of hemoglobin A1c (A1C) and low-density lipoprotein cholesterol (LDL) control, for example, A1C < 8% and LDL < 100 mg/dL. These NCQA HEDIS diabetes quality measures have been influential tools for performance measurement, public reporting, and reimbursement as they are endorsed by the National Quality Forum and are used by the Centers for Medicare and Medicaid Services in a variety of programs, including the Physician Quality Reporting System.

Although the American Diabetes Association (ADA) has always endorsed a lower A1C < 7.0% goal for the majority of patients with diabetes, since 2002, they have also recommended an individualized approach to diabetes goal setting.<sup>2</sup> In 2012, the ADA and European Association for the Study of Diabetes (EASD) published a position statement strengthening their support for a patient-centered approach to managing hyperglycemia.<sup>3</sup> This position statement was in response to major diabetes trials which found little benefit, or even harm, from very intensive glycemic control (eg, A1C < 6.5%), especially for patients with cardiovascular disease.<sup>4-7</sup> Thus, in addition to uniform goals, diabetes guidelines strongly support personalized glycemic goals based on a combination of risks associated with hypoglycemia or other adverse events, disease duration, life expectancy, important comorbidities, established vascular complications, and social resources. For example, patients with cardiovascular disease are recommended an A1C < 8% goal, as opposed to <7%. The ADA also recommends individualizing cholesterol management based on cardiovascular disease history and the American College of Cardiology and American Heart Association (ACC/AHA) recommends individualizing statin medication dosages based on cardiovascular disease risk.<sup>8,9</sup>

Since the NCQA quality standards for diabetes care were established, several studies have found racial/ethnic disparities in diabetes quality of care.<sup>10-15</sup> However, the adoption of an individualized approach to goal setting in diabetes may alter our understanding of the degree to which disparities exist. Several variables upon which individualized goals are based differ significantly between non-Hispanic whites and minorities, including diabetic complications rates.<sup>16-19</sup> Previous work has found that individualized glycemic goals could lead to significantly fewer US adults having a recommended A1C < 7% goal, at only about 30%.<sup>20</sup> To date, the implications of individualized glycemic and cholesterol goals on the national assessment of racial/ethnic disparities in diabetes quality of care are unknown.

Using national data, we reassessed disparities in diabetes care using individualized goals to (1) determine their racial/ethnic distribution and (2) compare disparities using individualized versus uniform goals.

## METHODS

We used data collected from the National Health and Nutrition Examination Survey (NHANES) 2007–2010. The NHANES is a continuous, nationally representative survey of the US civilian, noninstitutionalized population. Participants are identified through a stratified, multistage probability sampling design. The survey oversamples Hispanics, non-Hispanic blacks, low-income persons identifying as non-Hispanic white or “other” race/ethnicity, and non-Hispanic whites age  $\geq 80$ . In NHANES 2007–2010, the overall Hispanic population was oversampled, which contrasted previous years when only Mexican Americans were oversampled. The NHANES methodology has been described in detail previously.<sup>21</sup>

We included adults aged 20 years and older who answered “yes” to the question: “[Other than during pregnancy,] have you ever been told by a doctor or other health professional that you have diabetes or sugar diabetes?” We stratified the population by race/ethnicity, characterized as non-Hispanic white (white), non-Hispanic black (black), and Mexican American or Hispanic (Hispanic). We do not report results for those reporting “other race” because of the heterogeneity of this subpopulation.

### Measures

**Descriptive Measures**—Descriptive variables included sex, age, diabetes duration, and self-reported medical conditions associated with diabetes (coronary heart disease, angina, heart failure, myocardial infarction, stroke, end-stage renal disease on dialysis, and retinopathy) and not associated with diabetes (lung disease, rheumatoid arthritis, liver disease, and non–skin-related cancer). Macroalbuminuria was included and defined by an albumin to creatinine ratio  $>300$  mg/g.

We calculated a weighted combined Charlson Comorbidity Index score based on comorbidities and age.<sup>22</sup> Comorbidities included myocardial infarction, heart failure, stroke, lung disease, rheumatoid arthritis, liver disease, diabetes, and cancer. A score of  $\geq 5$  was used to define high comorbidity, because this score is associated with a 79% 10-year mortality.<sup>22,23</sup> As diabetes trials have shown that intensive glycemic control (A1C  $< 7.0\%$ ) decreases complication rate after about 10 years of treatment, a high 10-year mortality risk would significantly decrease the potential benefits of intensive glycemic control.<sup>24</sup>

**Quality Measures**—Three mutually exclusive individualized glycemic goals were created based on age, duration, complications, and comorbidities. These criteria were based on recommendations from the ADA and EASD, as well as previously published work<sup>3,8,20,25</sup> (see Table 1 for details). For comparison, uniform glycemic goals were set at either A1C  $< 7\%$ , in accordance with ADA guidelines, or A1C  $< 8\%$ , in accordance with NCQA.

Cholesterol goals were individualized based on cardiovascular history in accordance with ADA recommendations.<sup>8</sup> An LDL  $< 70$  mg/dL goal was assigned to individuals who reported a history of coronary heart disease, stroke, myocardial infarction, or angina; otherwise the cholesterol goal was an LDL  $< 100$  mg/dL. LDL measurements were available for a subsample of participants who fasted before their examination. We also defined

adequate cholesterol control by statin use per 2013 ACC/AHA guidelines.<sup>26</sup> Although these guidelines recommend prescribing statins at moderate or high dosages for patients with diabetes based on their arteriosclerotic cardiovascular disease risk, we were not able to determine adequacy of dosing, as medication dosages are not available in the NHANES public-use files. We identified participants who reported taking a statin medication in the month before their interview. For comparison, uniform LDL goals were set to an LDL < 100 mg/dL in accordance with NCQA.

We defined adequate blood pressure (BP) control as <140/90 mm Hg based on the Eighth Joint National Committee (JNC 8).<sup>9</sup> We used the average of the second and third BP measurements taken by certified examiners. Individuals were categorized as nonsmokers if they reported not smoking and had a serum cotinine level <10 ng/mL.

We defined comprehensive quality care based on meeting glycemic, cholesterol, and BP goals and non-smoking. For comparison, we created 3 measures of comprehensive quality: (1) individualized (individualized A1C and LDL, BP < 140/90 mm Hg, and nonsmoking); (2) uniform A1C < 7% (uniform A1C < 7%, LDL < 100 mg/dL, BP < 140/90 mm Hg, and nonsmoking); and (3) uniform A1C < 8% (uniform A1C < 8%, LDL < 100 mg/dL, BP < 140/90 mm Hg, and nonsmoking).

**Statistical Analysis**—We estimated the weighted means and percentages of selected descriptive covariates for the US adult diabetic population. Continuous variables were compared across racial/ethnic groups using regression models; categorical variables were compared across racial/ethnic groups with the Rao-Scott  $\chi^2$  test. Significance for all tests was set at  $P < 0.05$ . The complex survey design was accounted for in all analyses using sample weights which compensate for differential probability of selection among subgroups, minimize nonresponse bias, and match sample data totals to known target population totals, determined by the US Census Bureau.<sup>27</sup> The NHANES examination weight was used for all analyses to obtain population estimates, except when analyses included LDL cholesterol, for which the fasting subsample weight was used.

We applied our definition of individualization to the US diabetic population to determine the proportion of individuals that should have an individualized A1C goal of <6.5%, <7%, or <8% and an individualized LDL goal of <70 or <100 mg/dL by race/ethnicity. To assess to what degree individualized goals change the landscape of disparities, we determined the proportion in each race/ethnicity category that met their individualized glycemic, uniform A1C < 7% (endorsed by the ADA), uniform A1C < 8% (endorsed by NCQA), individualized LDL, uniform LDL < 100 mg/dL, statin therapy, BP < 140/90 mm Hg, and nonsmoking goals. We also determined the proportion in each race/ethnicity category that achieved each of the 3 comprehensive quality measures.

## RESULTS

Whites were older (61 vs. 59 and 57 y,  $P < 0.001$ ) and were less likely to be female than blacks and Hispanics (48% vs. 60% and 51%,  $P = 0.03$ ) (Table 2). The distribution of complications differed by race/ethnicity. Specifically, fewer blacks and Hispanics had

coronary heart disease (5% and 9% vs. 15%,  $P < 0.001$ ) and a history of myocardial infarction (9% and 9% vs. 13%,  $P = 0.002$ ) than whites; however, blacks and Hispanics had higher rates of end-stage renal disease than whites (3% and 2% vs. 0.4%,  $P = 0.04$ ). Hispanics had less comorbidity than whites and blacks (Charlson score, 3.8 vs. 4.7 and 4.3,  $P < 0.001$ ).

### Distribution of Individualized Goals

The distribution of individualized glycemic goals differed significantly between Hispanics and whites ( $P = 0.008$ ) but not between blacks and whites (Table 3). Overall, Hispanics had lower individualized A1C goals than whites and blacks. Nearly 10% of whites and blacks (9% each) were recommended an A1C  $< 6.5\%$  goal, compared with 12% of Hispanics. An A1C  $< 7\%$  goal was recommended for 42% of Hispanics, compared with only 33% of whites and 36% of blacks.

For individuals who met criteria for the A1C  $< 7\%$  goal, significantly more whites than blacks were of age 65–75 years with no complications, low comorbidity, and diabetes duration  $< 10$  years (18% vs. 8%,  $P = 0.01$ ) (Appendix A, Supplemental Digital Content, <http://links.lww.com/MLR/A820>). Among individuals who met criteria for the A1C  $< 8\%$  goal, more Hispanics than whites were of age 45–64 years with complications and low comorbidity (12% vs. 6%,  $P = 0.03$ ), fewer Hispanics were over age 75 years (18% vs. 30%,  $P = 0.01$ ), and more blacks than whites were of age 45–64 years with high comorbidity (32% vs. 23%,  $P = 0.03$ ).

The population-level distribution of individualized LDL goals differed between blacks and Hispanics compared to whites. Fewer blacks (21%) and Hispanics (19%) than whites (28%) were recommended an LDL  $< 70$  mg/dL goal (21% and 19% vs. 28%,  $P = 0.02$  and 0.001, respectively).

### Glycemic and LDL Control

Fewer Hispanics than whites met individualized A1C goals (56% vs. 68%;  $P < 0.001$ ) (Table 4). This difference was most notable for the individualized A1C  $< 8\%$  goal, achieved by only 69% of Hispanics, compared with 81% of whites. Fewer blacks and Hispanics than whites met the uniform A1C  $< 8\%$  goal (74% and 69% vs. 80%,  $P = 0.02$  and  $P < 0.001$ , respectively).

Fewer blacks and Hispanics met their individualized LDL goal than whites (31% and 36% vs. 51%,  $P < 0.001$  and  $P = 0.004$ , respectively). Fewer blacks and Hispanics than whites met their individualized LDL  $< 70$  mg/dL goal (10% and 19% vs. 33%,  $P = 0.003$  and 0.006, respectively). Defining adequate cholesterol management by statin use decreased apparent racial differences. Fewer blacks and Hispanics than whites met the uniform LDL  $< 100$  mg/dL goal (39% and 43% vs. 62%;  $P < 0.001$  for both). About 10% fewer blacks and Hispanics had adequate cholesterol management when defined by statin use instead of LDL levels (45% and 44% vs. 56%,  $P = 0.01$  and  $P < 0.001$ , respectively).

### BP Control and Nonsmoking

Fewer blacks achieved adequate BP control ( $< 140/90$  mm Hg, 53% vs. 69%,  $P < 0.001$ ) and were nonsmokers (64% vs. 73%,  $P < 0.001$ ) than whites. More Hispanics than whites were nonsmokers (81% vs. 73%,  $P = 0.004$ ). No differences were detected between Hispanics and whites in BP control.

### Comprehensive Diabetes Quality of Care

We evaluated comprehensive diabetes quality of care using individualized versus uniform standards. Irrespective of the standards used, fewer blacks compared with whites had adequate comprehensive care (individualized: 6% vs. 22%,  $P < 0.001$ ; uniform A1C  $< 7\%$ : 7% vs. 19%,  $P = 0.006$ ; uniform A1C  $< 8\%$ : 11% vs. 31%,  $P < 0.001$ ). In addition, fewer Hispanics compared with whites had adequate comprehensive care with the individualized goals (11% vs. 22%,  $P = 0.005$ ) and the uniform A1C  $< 8\%$  goal (17% vs. 31%,  $P = 0.007$ ).

## CONCLUSIONS

We found that uniform goals for glycemic and cholesterol control inadequately describe US racial/ethnic disparities in diabetes care. The different distribution of individualized A1C and LDL goals by racial/ethnic groups reflects the different sociodemographics and medical histories of US diabetes patients. Because the US Hispanic population is younger and has less comorbidity, more Hispanics may benefit from lower individualized glycemic goals than whites and blacks. The uniform A1C  $< 7\%$  goal was unable to detect national disparities in the level of glycemic control. In contrast, there was a significant Hispanic-white disparity in achieving individualized glycemic goals. In addition, as more whites report having cardiovascular disease than blacks and Hispanics, significantly more whites should have a LDL  $< 70$  mg/dL goal. Overall, comprehensive diabetes care was achieved by only a small segment of the diabetes population, regardless of racial/ethnic group, and fewer blacks and Hispanics than whites achieved adequate comprehensive diabetes care using both individualized and uniform goals.

In contrast to prior work, we found no black-white or Hispanic-white disparity in glycemic control when adequate glycemic control was defined by the A1C  $< 7\%$  goal. Previous research has suggested that the black-white disparity in glycemic control is closing in both Medicare and Veterans Affairs data.<sup>28,29</sup> Our concern is that policymakers will see this closing disparity as a nearing victory, when actually the A1C  $< 7\%$  goal may be a blunt instrument for judging glycemic quality of care. By individualizing glycemic goals based on age, duration of diabetes, diabetic complication history, and comorbidity, we were able to identify a 10% difference in adequate glycemic control among Hispanics and whites. The current strategy for measuring adequate glycemic control, the uniform A1C  $< 8\%$  goal endorsed by the NCQA does identify disparities; however, this higher goal is also crude because it considers many healthy patients with diabetes as being adequately treated when they are likely actually undertreated.

The implications of a population-level lower glycemic target for Hispanics are significant for long-term population health outcomes. Pursuing the same glycemic goal across all racial



groups could actually lead to persistent undertreatment of hyperglycemia among many healthy Hispanics with diabetes. The rationale for recommending lower A1C targets is based on observations from UKPDS that found that intensive glucose control, applied during the early phases of disease, leads to microvascular, cardiovascular, and mortality benefits decades later, but can take up to 10 years to show benefits.<sup>30</sup> Thus young and healthy adults with diabetes are more likely to survive long enough to benefit from intensive glycemic control. Because of the potential harms of intensive glycemic control, namely hypoglycemia, polypharmacy, and self-management burden, individualizing glycemic targets is an important issue for all patients, and clinicians should be especially wary of using universal glycemic targets among Hispanic patients. The application of individualized glycemic goals reveals an untapped opportunity to improve the health of all patients, and especially the Hispanic population in the United States.

Interestingly, we found that fewer Hispanics with the individualized A1C < 8% goal achieved this goal compared with whites. The individualized A1C < 8% goal is suggested for the least healthy patients with diabetes, because they have the highest risk for side effects and least certainty of benefit from intensive glycemic control. The lower rate of achieving glycemic control among the least healthy diabetic subpopulation portends worse outcomes for minorities in the near future.

Fewer racial/ethnic minorities with diabetes had adequate cholesterol management based on individualized LDL goals and statin usage, even though more whites actually should have the more aggressive LDL < 70 mg/dL goal. Importantly, systematic underreporting of cardiovascular disease among racial/ethnic minorities may affect our findings of significant differences in the distribution of individualized LDL goals.<sup>31</sup> In contrast to our study, several national studies of quality of care in the diabetes population have found little, if any, disparity in cholesterol control, when using uniform goals, that is, LDL < 100 mg/dL.<sup>10,12,13,28,32</sup> This difference suggests that using the uniform LDL < 100 mg/dL goal hides a serious deficit in cholesterol management among racial/ethnic minorities with diabetes and cardiovascular disease. Thus, additional attention is needed to improving adequate cholesterol management in blacks and Hispanics with diabetes, especially those with cardiovascular disease.

In agreement with previous studies,<sup>12,13,32</sup> we found that blacks were less likely to have adequate BP control and more likely to smoke compared with whites. Previous studies have found that blacks have greater awareness and treatment than whites among those with uncontrolled hypertension,<sup>33,34</sup> suggesting that more effective treatment modalities among blacks are needed. Previous studies have found no black-white difference in smoking,<sup>32</sup> which may differ from our results because we included cotinine levels in defining smokers. Further work is needed to address the higher rates of smoking among blacks.

We also found that fewer US minorities than whites achieved standards for comprehensive diabetes care. Only about 1 in 6 patients with diabetes are achieving appropriate individualized comprehensive diabetes care in the United States. For comparison, among whites, 1 in 5 patients achieve individualized comprehensive diabetes care; whereas among blacks and Hispanics, only 1 in 20 and 1 in 10 patients achieve individualized

comprehensive diabetes care. Our results agreed with a prior study of US Veterans which found a significant disparity in glycemic, BP, and LDL cholesterol control over a 5-year period.<sup>35</sup> This disparity in comprehensive diabetes care may translate into an ongoing disparity in diabetes outcomes unless addressed. Although diabetes trials often focus on improvements in glycemic control, strong evidence exists for using a multipronged approach to improve diabetes outcomes.<sup>36</sup> Thus, studies aimed at reducing health disparities in diabetes outcomes should include several markers of quality of care, including BP, cholesterol, and smoking, as outcomes.

Our findings of significant differences in meeting standards of individualized diabetes care by race/ethnicity emphasize how the implementation of evidence-based strategies is needed for reducing disparities for patients with diabetes. Expanding routine measurement in clinical practice of quality of care by racial/ethnic groups is essential to recognizing the magnitude of disparities, especially as racial differences in diabetes outcomes have been found within physicians and not just between physicians.<sup>37</sup> After existing disparities are recognized, then evidence-based strategies, such as culturally tailored programs,<sup>38</sup> multidisciplinary health care teams, multilevel interventions,<sup>39</sup> peer support, in-person provider feedback, and nurse case management,<sup>40</sup> are needed to reduce disparities.

There are several limitations to this study. This paper described the national implications of individualization for different racial and ethnic subgroups; however, truly patient-centered diabetes care requires personalized tailoring of goals and, on the individual patient level should include several important clinical variables not available in a national survey. Thus it is possible that including individual patient preferences, social support, and future hypoglycemia risk may increase the proportion of patients for whom higher glycemic goals are recommended; however, it is unclear whether the proportions would change differentially by race/ethnicity. Second, we relied on self-reported complications, which may be underestimates due to recall bias, and self-reported duration of diabetes, which may be inaccurate. Third, it is important to acknowledge that some studies have suggested that A1C levels may differ by race and ethnicity,<sup>41</sup> a factor which is not accounted for in current recommendations for individualized glycemic goals. Fourth, this work assumed that particular A1C or LDL levels carry the same risk for complications across racial/ethnic groups. Fifth, although the newest cholesterol guidelines call for moderate-intensity or high-intensity statin dosing based on clinical history, NHANES did not include collection of drug dosage information, thus limiting our ability to assess appropriateness of drug dosage. Sixth, although NHANES data are nationally representative, we cannot be certain that it is representative of the US population with diabetes. Finally, we defined comorbidity using the weighted combined Charlson Comorbidity Index and several other comorbidity indices exist, which could change the severity of comorbidity attributed to individuals.

In conclusion, individualized glycemic and cholesterol goals are necessary for evaluating national disparities in diabetes, otherwise disparities in diabetes care will seemingly close, but worse outcomes will persist for blacks and Hispanics. The quality of diabetes care defined by individualized goals reveals greater disparities in diabetes care compared with uniform goals. Substantial room exists for improving the achievement of adequate comprehensive individualized diabetes care. To prevent worsening racial/ethnic disparities



in diabetes outcomes, future performance measures used for public reporting and reimbursement should include individualized glycemic and cholesterol goals in their assessments of diabetes quality of care.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

N.L.: supported by NIDDK K23 DK097283. M.H.C.: supported by NIDDK K24 DK071933. N.L., P.C.F., C.-H.C., M.H.C., and E.S.H.: members of the NIDDK Chicago Center for Diabetes Translation Research at the University of Chicago (P30 DK092949).

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**TABLE 1**

Criteria for Determining Individualized A1C Goals

	Age (y)	Complications	Comorbidity	Duration (y)
Individualized A1C				
< 6.5%	20-44	Without	Low	Any
	< 7.0%			
< 8.0%	20-44	With	Low	Any
	45-64	Without	Low	Any
	65-75	Without	Low	<10
	20-44	With/without	High	Any
	45-64	With	Low	Any
> 75	45-64	With/without	High	Any
	65-75	With	Low/high	<10
	65-75	With/without	High	<10
	65-75	With/without	Low/high	10
	>75	With/without	Low/high	Any

TABLE 2

Characteristics of US Adults With Self-reported Diabetes by Race/Ethnicity, 2007-2010\*

	Overall (N = 1373)	White (N = 551)	Black (N = 392)	Hispanic (N = 430)	P
Age [mean (SE)] (y)	59.8 (0.5)	61.2 (0.6)	59.0 (0.7)	56.6 (0.9)	<0.001
Female (%)	50 (46-55)	48 (41-54)	60 (54-66)	51 (47-55)	0.03
Diabetes duration [mean (SE)] (y)	11.4 (0.4)	11.5 (0.5)	11.2 (0.4)	10.9 (0.5)	0.67
Diabetic complications (%)	42 (38-45)	42 (37-48)	43 (39-48)	37 (32-42)	0.68
Coronary heart disease (%)	12 (10-14)	15 (12-17)	5 (3-8)	9 (6-11)	<0.001
Angina (%)	8 (6-10)	9 (6-12)	6 (4-9)	6 (3-8)	0.39
Heart failure (%)	10 (8-13)	11(7-14)	12 (9-15)	6 (4-8)	0.051
Myocardial infarction (%)	12 (10-14)	13 (10-16)	9 (7-11)	9 (6-12)	0.002
Stroke (%)	10 (8-12)	11 (8-13)	11 (8-14)	6 (4-8)	0.09
End-stage renal disease on dialysis (%)	1 (0.4-2)	0.4 (0-1)	3 (0.7-4)	2 (0.3-3)	0.04
Macroalbuminuria (%)	5 (4-7)	4 (1-7)	8 (5-11)	7 (5-10)	0.19
Retinopathy (%)	19 (17-21)	18 (15-21)	22 (18-26)	20 (16-24)	0.17
Weighted combined Charlson Comorbidity Index [mean (SE)] <sup>†</sup>	4.5 (0.1)	4.7 (0.1)	4.3 (0.1)	3.8 (0.1)	<0.001
A1C [mean (SE)] <sup>‡</sup>	7.3 (0.6)	7.1 (0.1)	7.5 (0.1)	7.6 (0.1)	0.002
LDL cholesterol [mean (SE)] <sup>§</sup>	99.7 (1.4)	95.3 (1.9)	109.8 (2.5)	107.6 (2.2)	<0.001
Systolic blood pressure [mean (SE)] (mm Hg) <sup>//</sup>	128.6 (0.7)	127.9 (1.0)	131.1 (1.1)	129.1 (1.5)	0.18
Diastolic blood pressure [mean (SE)] (mm Hg) <sup>//</sup>	67.1 (0.7)	66.1 (0.9)	69.6 (1.3)	68.2 (0.7)	0.06

\* Data are expressed as % (95% CI), unless otherwise stated. Results are weighted to represent the US population.

<sup>†</sup> Comorbidities included myocardial infarction, heart failure, stroke, lung disease, rheumatoid arthritis, liver disease, diabetes, and cancer.

<sup>‡</sup> Based on 1238 people who were tested.

<sup>§</sup> Based on 551 people who were tested.

<sup>//</sup> Based on 1223 people who were examined.

**TABLE 3**

US Distribution of Individualized Glycemic and Cholesterol Goals by Race/Ethnicity, 2007-2010\*

	White (Reference)	Black	<i>P</i>	Hispanic	<i>P</i>
Individualized A1C <sup>†</sup>			0.63		0.008
<6.5%	9 (6-12)	9 (6-11)		12 (6-18)	
<7.0%	33 (27-38)	36 (31-41)		42 (37-48)	
<8.0%	58 (52-64)	55 (51-60)		45 (40-51)	
Individualized LDL <sup>‡</sup>			0.02		0.001
<70 mg/dL	28 (23-32)	21 (17-25)		19 (15-22)	
<100 mg/dL	72 (68-77)	79 (75-83)		81 (78-85)	

\* Results are weighted to represent the US population. Data are expressed as % (95% CI).

<sup>†</sup> Individualized A1C assigned to patients based on age, duration of diabetes, diabetic complication history, and comorbidity. See Table 1 for details.

<sup>‡</sup> Individualized LDL <70 mg/dL goal assigned to patients with a history of cardiovascular disease. Other patients were assigned the <100 mg/dL goal.

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TABLE 4

US Adults With Diabetes Meeting Goals for Diabetes Quality of Care, 2007-2010<sup>\*</sup>

	Overall	White	Black	<i>P</i> (vs. White)	Hispanic	
	% (95% CI)	% (95% CI)	% (95% CI)		% (95% CI)	<i>P</i> (vs. White)
A1C						
Individualized <sup>†</sup>	65 (61-69)	68 (63-73)	64 (59-69)	0.30	56 (50-62)	<0.001
< 6.5%	45 (32-59)	49 (32-72)	38 (15-61)	0.51	40 (17-63)	0.57
< 7.0%	50 (42-58)	51 (39-62)	63 (42-63)	0.78	47 (39-54)	0.56
< 8.0%	79 (76-82)	81 (77-85)	76 (71-81)	0.08	69 (62-76)	0.003
Uniform A1C < 7.0%	52 (47-57)	53 (47-60)	52 (46-57)	0.08	46 (39-52)	0.07
Uniform A1C < 8.0%	77 (74-80)	80 (76-84)	74 (70-78)	0.02	69 (63-75)	<0.001
LDL						
Individualized <sup>‡</sup>	46 (41-51)	51 (45-59)	31 (23-38)	<0.001	36 (28-44)	0.004
< 70 mg/dL	28 (18-38)	33 (21-45)	10 (1-19)	0.003	19 (11-27)	0.006
< 100 mg/dL	52 (46-58)	58 (49-68)	37 (28-45)	0.001	41 (31-50)	0.01
Uniform LDL < 100 mg/dL	55 (51-60)	62 (55-69)	39 (30-48)	<0.001	43 (35-50)	<0.001
Any statin use	52 (49-56)	56 (51-62)	45 (39-51)	0.01	44 (41-48)	<0.001
Blood pressure <140/90	65 (61-69)	69 (63-74)	53 (48-59)	<0.001	66 (61-71)	0.45
Nonsmoking <sup>§</sup>	72 (69-75)	73 (69-77)	64 (59-68)	<0.001	81 (78-84)	0.004
Comprehensive						
Individualized A1C, individualized LDL, BP < 140/90, nonsmoking	18 (15-21)	22 (17-27)	6 (2-11)	<0.001	11 (6-15)	0.005
Uniform A1C < 7%, uniform LDL < 100 mg/dL, BP < 140/90, nonsmoking	16 (12-20)	19 (13-26)	7 (3-11)	0.006	13 (9-17)	0.09
Uniform A1C < 8%, uniform LDL < 100 mg/dL, BP < 140/90, nonsmoking	25 (21-30)	31 (24-39)	11 (6-15)	<0.001	17 (11-23)	0.007

\* Results are weighted to represent the US population. Data are expressed as % (95% CI).

<sup>†</sup> Individualized A1C assigned to patients based on age, duration of diabetes, diabetic complication history, and comorbidity. See Table 1 for details.

<sup>‡</sup> Individualized LDL < 70 mg/dL goal assigned to patients with a history of cardiovascular disease. Other patients were assigned the <100 mg/dL goal.

<sup>§</sup> Nonsmoking defined by self-report and a serum cotinine < 10 ng/mL.