A Closer Look at Racial Differences in Diabetes Outcomes Among a Community Sample: Diabetes Distress, Self-care, and HbA_{1c}

Vicki S. Helgeson, Jeanean B. Naqvi, Mary T. Korytkowski, and Tiffany L. Gary-Webb

Diabetes Care 2021;44:2487–2492 | https://doi.org/10.2337/dc21-0734

OBJECTIVE

Approximately 34 million people in the U.S. have diabetes. With this illness come substantial changes to psychological and physical health. However, type 2 diabetes disproportionately affects non-Hispanic Black compared with non-Hispanic White populations. The purpose of this study was to examine racial differences in psychological, behavioral, and physical health over time among individuals recently diagnosed with type 2 diabetes.

RESEARCH DESIGN AND METHODS

Data were collected from a community sample of 193 adults recently diagnosed with type 2 diabetes (44% female; 45% Black). Measures of distress, self-care behaviors, and HbA_{1c} were taken at an initial interview (time 1) and 6 months later (time 2). Individuals wore an Actical accelerometer to assess physical activity and participated in three 24-h dietary recall interviews to assess dietary intake within 2 weeks of the initial interview.

RESULTS

From time 1 to time 2, Black women showed the highest increase in depressive symptoms. There was a greater increase in regimen and physician distress among White compared with Black participants. White men and Black women reported a decline in medication adherence over time. There were no racial differences in changes in physical activity across 6 months. However, Black individuals had higher overall calorie consumption with greater protein, saturated fat, and cholesterol intake than White individuals. There were no race or sex differences in changes in glycemic stability.

CONCLUSIONS

Initial adjustment to a diagnosis of type 2 diabetes differentially influences Black and White men and women in terms of depressive symptoms, diabetes distress, and self-care.

More than 34 million people in the U.S. have diabetes, and a majority of those cases are type 2 diabetes (1). Diabetes is the seventh leading cause of death in the U.S. and is associated with myriad health complications, including heart disease, stroke,

---

Carnegie Mellon University, Pittsburgh, PA

Corresponding author: Vicki S. Helgeson, vh2e@andrew.cmu.edu

Received 3 April 2021 and accepted 16 August 2021

kidney disease, blindness, and neuropathy. Unfortunately, diabetes disproportionately affects certain racial/ethnic groups. Non-Hispanic Black populations are not only more likely to have diabetes compared with non-Hispanic White populations (1) but also more likely to experience diabetes-related complications, including cardiovascular disease and chronic kidney disease (2). These racial inequities are rooted in social determinants of health, such as socioeconomic status, health care, neighborhood, food environment, and discrimination, all of which are shaped by the distribution of power, money, and resources (3,4). It may be useful to understand how these racial inequities come to light when individuals are in their initial stages of diabetes adjustment. Therefore, the goal of the current study was to examine how Black and White individuals who have recently been diagnosed with type 2 diabetes adjust to their disease in terms of psychological, behavioral, and physical health over a 6-month period.

First, diabetes imposes a psychological burden on individuals, with links to higher levels of depression and psychological distress. Studies are unclear as to whether Black individuals with diabetes are more depressed than White individuals (5,6), but research suggests that Black individuals report higher levels of diabetes distress than White individuals. This is likely due to social and structural factors connected to racism/discrimination, socioeconomic status, and health care access (3,4). Two studies showed that non-Hispanic Black adults had higher levels of diabetes-related distress than non-Hispanic White adults (7,8). A study in the Netherlands compared White and minority groups and found higher rates of diabetes distress among minority groups after controlling for demographic and disease variables (9). However, these studies examined global measures of diabetes distress, without differentiating between distinct domains of interpersonal distress, emotional distress, regimen distress, and physician distress.

Second, diabetes management involves a wide variety of self-care behaviors. A systematic review revealed that racial differences in diabetes self-care were not consistent across domains (10). Non-Hispanic Black adults monitor blood glucose and perform foot examinations more frequently than non-Hispanic White adults, but non-Hispanic Black adults are less adherent to medication than non-Hispanic White adults. No racial differences were observed in diet or exercise adherence.

Third, glycemic stability is a primary predictor of diabetes-related complications, and prior research has demonstrated racial/ethnic inequalities in this domain. A previous meta-analysis found that glycemic stability is lower in Black compared with White individuals (11). However, a recent study of middle-aged men and women showed no racial differences in HbA_{1c} or other markers of glycemia among those with diabetes, adjusting for demographics (12). Other studies have shown that Black individuals have higher levels of HbA_{1c} than White individuals, given the same level of glucose concentration (13,14).

The primary study goal was to examine racial differences in psychological, behavioral, and physical health measures over time among a community sample of individuals recently diagnosed with type 2 diabetes. The vast majority of research in the area of type 2 diabetes involves individuals who have had the disease for years, if not decades. We aimed to identify individuals who had been diagnosed with type 2 diabetes within the past 5 years and follow their behavior over 6 months. Recognizing that race interacts with a variety of categories to affect health, we adopted an intersectional approach and included sex as well as race in all analyses. In our initial report, we examined effects of race and sex on diabetes outcomes (15). Here we expand on those findings by examining racial differences in several diabetes outcomes over 2 weeks and most diabetes outcomes 6 months after enrollment; thus, we are examining racial differences in changes in psychological, behavioral, and physical health. We also broadened the scope of our investigation by focusing on individual domains of diabetes distress, a broad set of self-care behaviors that includes self-report as well as objective measures and HbA_{1c}.

RESEARCH DESIGN AND METHODS

Participants

We enrolled 207 persons who had been diagnosed with type 2 diabetes within the past 5 years in the study. Because a primary focus of this study was race, we eliminated the three mixed race participants from all analyses, leaving a sample of 204. We also eliminated 11 individuals who did not meet the inclusion criterion of being within 5 years of diagnosis, as described below. This left us with a final sample of 193. Of these 193, 25% were Black men, 20% were Black women, 31% were White men, and 24% were White women. Ages ranged from 25 to 82 years, with a mean of 53.25 (SD 11.09). Median household income ranged from $40,000 to $59,999, and 26% were college graduates. A majority of couples were married (72%), and average relationship length was 19 years. The average time since diagnosis was 1.62 years (SD 1.28); 82% were taking oral medication for diabetes, 25% were taking insulin, and 9% were taking no diabetes medication.

Procedures

The study was approved by the institutional review boards of Carnegie Mellon University and the University of Pittsburgh. Participants were recruited from the community via advertisements on mass transit, newspapers, community centers, churches, and physician offices. Interested participants contacted us and were screened for eligibility. Eligibility requirements included being diagnosed with type 2 diabetes within the past 5 years, having no other chronic illness that affected daily life more than diabetes (e.g., cancer), and living with a spouse/romantic partner who did not have diabetes. Although being diagnosed <5 years ago was an eligibility requirement, participants who self-referred to the study had their diagnosis date verified by their physicians after study procedures had been completed. Because 11 participants had been diagnosed between 5 and 8 years ago, we eliminated those participants from the analyses. Eligible participants were scheduled for an in-person interview that took place in either their home (72.5%) or the university with mileage reimbursement (27.5%).

During the in-person interview (time 1), participants completed a baseline interview that assessed psychological health and self-care behavior. Participants brought their diabetes medication to the session for a pill count, described below. HbA_{1c} was measured with the DCA Vantage at the end of the session.

After the in-person session, patients completed a daily diary once a day for the next 14 days (data not included in this report) and wore an Actical accelerometer for 5 days. At the end of the 2-week session, the number of pills that remained in the bottle was counted, taking refills into consideration. During the 2-week session, a research assistant contacted the patient by phone at the end of the day on 3 randomly chosen days to conduct a 24-h dietary recall interview to assess diet, as described below.

Six months later (time 2), participants were recontacted for a follow-up interview. Psychological health, self-care behavior, and HbA_{1c} were reassessed. Of the original 193 participants, 188 (97%) completed the 6-month follow-up interview.

Psychological Health Instruments Measured at Time 1 and Time 2

Depressive Symptoms

Depressive symptoms were measured using the Center for Epidemiological Studies scale, a widely used 20-item self-report measure of depressive symptoms with strong convergent and divergent validity (16). Participants indicated the extent to which they had experienced each symptom during the past week on a 0 to 3 scale. Items were summed (time 1 $\alpha = 0.91$; time 2 $\alpha = 0.92$).

Diabetes Distress

The 17-item Diabetes Distress Scale (17) measured participants' experience of distress associated with living with diabetes in four empirically derived domains: emotional burden (time 1 $\alpha = 0.89$; time 2 $\alpha = 0.88$), interpersonal distress (time 1 $\alpha = 0.88$; time 2 $\alpha = 0.87$), regimen distress (time 1 $\alpha = 0.86$; time 2 $\alpha = 0.89$), and physician distress (time 1 $\alpha = 0.86$; time 2 $\alpha = 0.86$). Participants indicated the extent to which each item bothered them on a 1 (not a problem) to 6 (very serious problem) scale. The total scale and subscales have been shown to be reliable and valid (17).

Survey Self-Report Self-care Instruments Measured at Time 1 and Time 2

Self-care

The Summary of Diabetes Self-Care Behavior was administered (18), which assesses diet, exercise, blood glucose checking, and medication adherence (time 1 $\alpha = 0.91$; time 2 $\alpha = 0.83$). The instrument has been shown to be reliable and valid, correlating with other measures of diet, exercise, glucose monitoring, and medication adherence (18).

Medication Adherence

We administered the four-item Medication Adherence Scale (19) at time 1 ($\alpha = 0.91$) and time 2 ($\alpha = 0.76$), which reflects reasons for nonadherence that include forgetting, carelessness, stopping medication when feeling better, and starting medication when feeling worse.

Physical Activity

We used the Paffenbarger Physical Activity Questionnaire (20) to assess frequency of regular exercise, stairs climbed, distance walked, and sports participation at both time 1 and time 2.

Two-Week Daily Diary Self-care Measures

Medication Adherence

For participants taking oral medication ($n = 158$), we measured medication adherence with a pill count for the 2 weeks following the time 1 session. Participants brought their diabetes medication to the time 1 session for an initial pill count. A research assistant counted the pills and recorded the prescribed medicine regimen (i.e., one or two pills per day). At the end of the 2-week session, the research assistant recorded the final pill count, taking refills into consideration. We compared how many pills were missing from the bottle with how many pills were prescribed. Because participants could err in either direction (i.e., taking too many or not enough pills), we computed the absolute value of the discrepancy from the recommended number for our pill count measure. Higher numbers represent greater discrepancy from the prescribed medical regimen. Because not all participants complied with our request to bring their pills to the two sessions, we have this variable available for 132 of the 158 participants who were prescribed oral medication. The pill count discrepancy variable was moderately correlated with self-reported medication adherence at time 1 ($r = -0.45$; $P < 0.001$).

Physical Activity

We gave participants the Actical accelerometer to wear for the first 5 days after the time 1 interview. The Actical is a small device that attaches to a belt that is worn around the patient's waist. Participants were instructed to press a button on the Actical twice before they went to sleep at night and twice when they awoke in the morning to indicate when they were sleeping so that we could calculate activity while awake. The Actical is waterproof, but participants were encouraged to remove the device when showering or swimming. Because day 1 and day 5 were not complete days (i.e., the Actical was placed on the participant after the interview on day 1 and removed during day 5), we discarded days 1 and 5 from the analyses and averaged across days 2–4. We used the average number of minutes in either moderate or vigorous physical activity as our index of physical activity. Moderate to vigorous activity was defined as 0.083 kcal/min/kg, or the metabolic equivalent of 6.

Diet

We used the 24-h recall methodology to assess dietary intake on 3 different days during the 2 weeks after the time 1 interview. This method reviews all foods consumed on a single day and averages across multiple days. Its validity has been supported by numerous studies (21). With this method, trained interviewers conduct a structured interview using standardized probes. Briefly, the interviewer prompted the participant to recall the day's events in chronological order. The participant was asked to recall the time that he or she woke up and the first thing that he or she ate. The interviewer then proceeded to the next meal or snack until the entire day had been described. Next, the interviewer reviewed each item in sequence and prompted for specific details about food preparation, portion size, brand names, and recipes. Last, the interviewer read the recall aloud and asked the participant to add anything that was missed. To provide participants with information on serving size, we reviewed information on portion size at the end of the time 1 interview and provided examples of serving sizes for common foods.

Dietary intakes were analyzed for nutritional content with the Food Processor

Nutrition Analysis Software (22). We examined calories consumed as well as protein, carbohydrate, saturated fat, sodium, and cholesterol intake. We calculated the percentage of each nutrient group consumed compared with recommendations based on age, sex, activity level (which we defined as sedentary for all, because this was a largely sedentary sample based on Actical data), height, and weight, as people vary in caloric needs based on these factors. Because these interviews were extremely labor intensive, we only had the resources to conduct 24-h dietary recall interviews for the first half of the sample (White participants *n* = 49 [male *n* = 29; female *n* = 20]; Black participants *n* = 44 [male *n* = 24; female *n* = 20]).

Overview of Analysis

We used the same selection of covariates described in our previous report (15). We statistically controlled for income, marital status, relationship length, and diabetes duration, all factors that influence self-care. To examine the effects of race on psychological health, self-care behaviors, and HbA_{1c}, we conducted race-by-sex ANCOVA. When the time 2 outcome had a parallel measure at time 1, we controlled for the respective time 1 outcome to examine chan-ges over time.

RESULTS

Psychological Health

As shown in Table 1, there was a race-by-sex difference in depressive symptoms, such that Black women showed the highest increase in depressive symptoms from time 1 to time 2.

Among the four diabetes distress scales, there were no effects of race or sex for changes in emotional burden or interpersonal distress, but there were significant racial effects for changes in regimen distress and physician distress. In both cases, there was a greater increase in distress among White compared with Black participants from time 1 to time 2.

Self-care Behavior

There were no racial or sex differences in changes in global self-care behavior over time (Table 2). However, there was a race-by-sex interaction on changes in medication adherence. Black women and White men reported a decline in medication adherence over time. There were no racial differences in the 2-week pill count variable, but there was a single outlier participant who took none of the recommended medication. When a square root transformation was applied (which reduced skewness from 2.95 to 0.75 and kurtosis from 13.85 to 0.51), the racial difference was significant (P = 0.02; partial η^2 = 0.05), indicating that Black participants deviated more than White participants from their prescribed medication regimen.

There were no racial or sex differences in changes in self-report of physical activity. There also were no racial or sex differences in time spent in moderate or vigorous activity measured by the Actical accelerometer.

There were racial differences in nearly all components of diet from 24-h recall (Table 2). There were racial and sex differences in calories consumed compared with recommendations, such that Black participants had higher calorie consumption than White participants, and women had higher calorie consumption than men based on recommendations. There were racial differences in proteins, saturated fats, and cholesterol, all in the direction of greater intake among Black compared with White participants. There were sex differences in carbohydrate consumption, in the direction of women consuming more than men, and in cholesterol consumption, in the direction of men consuming more than women.

HbA_{1c}

There were no racial or sex differences in changes in glycemic stability. Black participants had significantly higher levels of HbA_{1c} than White participants at time 1 (Black participants mean 7.54%; SD 2.07% [59 mmol/mol]; White participants mean 6.77%; SD 1.27% [50 mmol/mol]; F[1, 189] = 8.97; $P < 0.005$) and at time 2 (Black participants mean 7.43%; SD 1.94% [58 mmol/mol]; White participants mean 6.71%; SD 1.04% [50 mmol/mol]; F[1, 183] = 9.35; $P < 0.005$). However, neither difference was significant with adjustment for covariates. The mean HbA_{1c} at time 2 adjusted for covariates and time 1 was 7.14% (SE 0.13%; 55 mmol/mol) for Black participants and 6.92% (SE 0.12%; 52 mmol/mol) for White participants.

CONCLUSIONS

Although prior research has been inconsistent as to whether there are racial differences in psychological distress (5,6), this study showed an intersection of race with sex on depressive symptoms. Over a 6-month period, Black women showed the highest increase in depressive symptoms. At baseline, there were no racial or sex differences (15). Increased depressive symptoms in Black women may be explained by the weathering hypothesis, in which Black women face social and economic stressors that require sustained coping (23), as well as by the downsides associated with maintaining a "strong Black woman" schema, in which Black women may expect themselves to be self-reliant and to be the providers but not receivers of support (24). Maintaining this schema could lead to more difficulty

Table 1—Means (standard deviations) in psychological health for Black and White men and women

	Black participants		White participants		P (effect size)		
	Men	Women	Men	Women	Race	Sex	Race × sex
Depressive symptoms	10.95 (1.07)	17.17 (1.25)	13.38 (0.99)	12.60 (1.08)	n.s.	0.04*	0.06**
Diabetes distress							
Emotional burden	2.26 (0.14)	2.40 (0.16)	2.36 (0.13)	2.32 (0.14)	n.s.	n.s.	n.s.
Regimen distress	2.46 (0.15)	2.45 (0.17)	2.80 (0.14)	2.84 (0.15)	0.03*	n.s.	n.s.
Interpersonal distress	1.59 (0.14)	1.87 (0.17)	1.93 (0.13)	2.01 (0.15)	n.s.	n.s.	n.s.
Physician distress	1.36 (0.13)	1.32 (0.15)	1.76 (0.12)	1.78 (0.13)	0.05**	n.s.	n.s.

Data are presented as mean (SD). n.s., not significant. *$P < 0.05$, **$P < 0.01$.

Table 2—Race by sex ANCOVA on time 2 self-care outcomes (controlling for time 1): adjusted means

	Black		White		*P* (effect size)		
	Men	Women	Men	Women	Race	Sex	Race × sex
Global self-care	0.04 (0.06)	0.04 (0.08)	−0.04 (0.06)	0.03 (0.07)	n.s.	n.s.	n.s.
Medication adherence	4.63 (0.08)	4.29 (0.08)	4.35 (0.07)	4.50 (0.08)	n.s.	n.s.	0.06**
Pill count (absolute value)[1]	9.05 (1.62)	7.43 (1.86)	5.25 (1.45)	5.05 (1.70)	n.s.	n.s.	n.s.
Physical activity	2,254.56 (283.28)	1,529.28 (330.06)	1,580.52 (261.69)	1,607.92 (284.72)	n.s.	n.s.	n.s.
Moderate/vigorous activity, min	9.58 (1.10)	9.56 (1.26)	10.94 (1.00)	9.49 (1.07)	n.s.	n.s.	n.s.
Calories/rec	0.82 (0.06)	0.94 (0.07)	0.69 (0.06)	0.78 (0.07)	0.05*	0.04†	n.s.
Protein/rec	1.39 (0.11)	1.24 (0.13)	0.95 (0.10)	1.04 (0.12)	0.08*	n.s.	n.s.
Carbohydrates/rec	0.60 (0.06)	0.79 (0.07)	0.58 (0.06)	0.68 (0.07)	n.s.	0.06*	n.s.
Saturated fat/rec	1.08 (0.11)	1.24 (0.12)	0.84 (0.10)	0.97 (0.11)	0.05*	n.s.	n.s.
Cholesterol/rec	1.34 (0.12)	1.09 (0.13)	0.90 (0.11)	0.61 (0.13)	0.12**	0.06*	n.s.

Data are presented as mean (SD). n.s., not significant; rec, recommendation based on sex, age, and activity level. †$P < 0.10$, *$P < 0.05$, **$P < 0.01$. [1]When a square root transformation is applied to this highly skewed variable to normalize it, a significant racial difference appears: F(1, 124) = 5.89; $P < 0.05$ (effect size = 0.05).

adjusting to diabetes from a psychological perspective.

This pattern did not hold when examining individual domains of diabetes distress. White participants reported increasing levels of distress in terms of difficulties managing the diabetes regimen and in terms of stressful or unhelpful interactions with physicians compared with Black participants. This finding is in sharp contrast to previous research (7,8). One explanation for this finding is habituation: because diabetes is more prevalent in Black than in White communities, diabetes difficulties may be more common and come to be normalized. Alternatively, because Black individuals often face a litany of social and economic hardships, they may have developed coping mechanisms to deal with stressors (25), including diabetes. The Diabetes Distress Scale does not ask participants whether specific issues occur, but rather how bothered they are by each issue.

Although there were no racial differences in the global self-report measure of self-care, differences emerged for specific domains. These findings are consistent with the recent systematic review (10) showing that racial differences in self-care are not consistent across domains. In terms of medication, the self-report measure showed poorer adherence among Black women, whereas the relatively more objective pill count variable suggested that there may be poorer adherence among Black compared with White individuals. This racial difference is consistent with a large amount of literature (10). Black individuals may have competing demands that interfere with medical adherence, or they may be more reluctant to take medication because of a greater mistrust of physicians based on structural racism and historical maltreatment by the health care system (26). This racial difference also may be explained by socioeconomic and health access factors. Black individuals are likely to have lower access to quality health care and have lower incomes compared with White individuals (3,27). Although Black and White participants in this sample were equally likely to have seen a physician during the intervening 6 months (79%) and equally likely to have health insurance (95%), there was a racial difference in the source of insurance ($P < 0.05$), such that White participants were more likely than Black participants to be insured through work (61% vs. 40%), and Black participants were more likely than White participants to be insured through the government (44% vs. 23%). Importantly, Black participants reported more frequently than White participants that they did not have enough money to pay for medication ($t[182] = 3.88$; $P < 0.001$).

Consistent with the systematic review (10), we found no racial differences in exercise, whether it was measured by self-report or the more objective accelerometer. However, contrary to this review, we found racial differences in diet. Black participants consumed more calories than White participants compared with what is recommended based on sex, weight, height, and activity level. Similar differences appeared for proteins, saturated fats, and cholesterol, but not carbohydrates. The higher intake of saturated fats and cholesterol is concerning, given their linkage to heart disease, which is also greater in Black populations (28,29). These findings suggest that diet is an important area for targeted interventions. Lack of access to grocery stores with fresh fruits and vegetables may be an important contributor to poorer outcomes for those with diabetes who live in underserved communities (3,4). However, clinicians and researchers should also be sensitive to the extent that food is embedded in culture.

In terms of glycemic stability, we found that Black participants had lower levels of stability than White participants, but these differences attenuated when controls for demographic and background variables were taken into consideration. This finding does not negate that a racial difference exists; instead, it underscores the importance of taking contextual variables that are linked to race into account when trying to understand effects attributed to race.

Taken collectively, these findings not only point to the importance of fostering cultural humility in the training of health care professionals, but also emphasize the importance of a patient-centered approach to care. We do not suggest that practitioners treat patients differently on the basis of race, which would exacerbate existing stereotypes, but that practitioners instead recognize there may be social and environmental factors that affect each person's ability to manage diabetes.

Study strengths include the attention to distinct domains of diabetes distress and the varied measures of self-care that extended beyond self-report. However, even our more objective measures of medication adherence, physical activity, and diet have limitations. Pill counts tend to overestimate compliance (30). Diet is one of the most challenging behaviors to assess. The labor-intensive 24-h recall method is superior to self-report methods, but resource constraints made it impossible to collect dietary information for the entire sample.

In summary, we found that the early years of adjustment to a type 2 diabetes diagnosis are influenced by both race and sex and depend on the specific adjustment domain. Whereas Black women seem to be the most at-risk group for increases in depressive symptoms over time, White individuals express increases in diabetes distress, particularly from managing the medical regimen and interacting with physicians. In terms of self-care, we found similar levels of physical activity across groups, but Black individuals are at risk for declines in medication and dietary adherence. Racial differences in HbA_{1c} were accounted for by demographic covariates. Future research should examine social determinants of health as mediators of racial and sex differences in the psychological and behavioral health of individuals with diabetes.

Acknowledgments. The authors thank Abigail Kunz Vaughn, Tiona Jones, Jenn Melynk, Gianna Davis, and students from Carnegie Mellon who contributed to data collection.

Funding. This study was supported by National Institutes of Health grant R01 DK095780.

Duality of Interest. No potential conflicts of interest relevant to this article were reported.

Author Contributions. V.S.H. drafted the manuscript and conducted the analyses. J.B.N. contributed to the writing of and reviewed and edited the manuscript. M.T.K. reviewed and edited the manuscript and contributed to the discussion of findings. T.L.G.-W. reviewed and edited the manuscript and contributed to the discussion of findings. V.S.H. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. Centers for Disease Control and Prevention. *Diabetes Report Card 2019*. Accessed 24 July 2021. Available from www.cdc.gov/diabetes/library/reports/congress.html
2. Chiou T, Tsugawa Y, Goldman D, Myerson R, Kahn M, Romley JA. Trends in racial and ethnic disparities in diabetes-related complications, 1997-2017. J Gen Intern Med 2020;35:950–951
3. Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social determinants of health and diabetes: a scientific review. Diabetes Care 2020;44:258–279
4. Ogunwole SM, Golden SH. Social determinants of health and structural inequities—root causes of diabetes disparities. Diabetes Care 2021;44:11–13
5. Naranjo D, Hessler DM, Deol R, Chesla CA. Health and psychosocial outcomes in U.S. adult patients with diabetes from diverse ethnicities. Curr Diab Rep 2012;12:729–738
6. Roy T, Lloyd CE. Epidemiology of depression and diabetes: a systematic review. J Affect Disord 2012;142(Suppl.):S8–S21
7. Peyrot M, Egede LE, Campos C, et al. Ethnic differences in psychological outcomes among people with diabetes: USA results from the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study. Curr Med Res Opin 2014;30:2241–2254
8. Williams IC, Clay OJ, Ovalle F, Atkinson D, Crowe M. The role of perceived discrimination and other psychosocial factors in explaining diabetes distress among older African American and White adults. J Appl Gerontol 2020;39:99–104
9. Özcan B, Rutters F, Snoek FJ, et al.; Diabetes Pearl from the Parelsnoer Initiative. High diabetes distress among ethnic minorities is not explained by metabolic, cardiovascular, or lifestyle factors: findings from the Dutch Diabetes Pearl cohort. Diabetes Care 2018;41:1854–1861
10. Mayberry LS, Bergner EM, Chakkalakal RJ, Elasy TA, Osborn CY. Self-care disparities among adults with type 2 diabetes in the USA. Curr Diab Rep 2016;16:113
11. Kirk JK, D'Agostino RB Jr, Bell RA, et al. Disparities in HbA1c levels between African-American and non-Hispanic White adults with diabetes: a meta-analysis. Diabetes Care 2006;29:2130–2136
12. Carson AP, Muntner P, Selvin E, et al. Do glycemic marker levels vary by race? Differing results from a cross-sectional analysis of individuals with and without diagnosed diabetes. BMJ Open Diabetes Res Care 2016;4:e000213
13. Bergenstal RM, Gal RL, Connor CG, et al.; T1D Exchange Racial Differences Study Group. Racial differences in the relationship of glucose concentrations and hemoglobin A1c levels. Ann Intern Med 2017;167:95–102
14. Selvin E. Are there clinical implications of racial differences in HbA1c? A difference, to be a difference, must make a difference. Diabetes Care 2016;39:1462–1467
15. Naqvi JB, Helgeson VS, Gary-Webb TL, Korytkowski MT, Seltman HJ. Sex, race, and the role of relationships in diabetes health: intersectionality matters. J Behav Med 2020;43:69–79
16. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385–401
17. Polonsky WH, Fisher L, Earles J, et al. Assessing psychosocial distress in diabetes: development of the diabetes distress scale. Diabetes Care 2005;28:626–631
18. Toobert DJ, Glasgow RE. Assessing diabetes self-management: the summary of diabetes self-care activities questionnaire. In *Handbook of Psychology and Diabetes*. Bradley C, Ed. Chur, Switzerland, Harwood Academic, 1994, pp. 351–375
19. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care 1986;24:67–74
20. Paffenbarger RS Jr, Blair SN, Lee I-M, Hyde RT. Measurement of physical activity to assess health effects in free-living populations. Med Sci Sports Exerc 1993;25:60–70
21. Thompson FE, Subar AF. Dietary assessment methodology. In *Nutrition in the Prevention and Treatment of Disease*. Coulston AM, Boushey C, Ferruzzi M, Delahanty L, Eds. Cambridge, MA, Academic Press, 2017, pp. 5–48
22. ESHA Research. Food Processor Nutrition Analysis & Fitness Software. Accessed 23 July 2021. Available at https://esha.com/products/food-processor/
23. Geronimus AT, Hicken M, Keene D, Bound J. "Weathering" and age patterns of allostatic load scores among Blacks and Whites in the United States. Am J Public Health 2006;96:826–833
24. Watson-Singleton NN. Strong Black Woman schema and psychological distress: The mediating role of perceived emotional support. J Black Psychol 2017;43:778–788
25. Robinson MN, Thomas Tobin CS. Is John Henryism a health risk or resource? Exploring the role of culturally relevant coping for physical and mental health among Black Americans. J Health Soc Behav 2021;62:136–151
26. Mateo CM, Williams DR. Addressing bias and reducing discrimination: The professional responsibility of health care providers. Acad Med 2020;95:S5–S10
27. Hill-Briggs F, Gary TL, Hill MN, Bone LR, Brancati FL. Health-related quality of life in urban African Americans with type 2 diabetes. J Gen Intern Med 2002;17:412–419
28. Clifton PM, Keogh JB. A systematic review of the effect of dietary saturated and polyunsaturated fat on heart disease. Nutr Metab Cardiovasc Dis 2017;27:1060–1080
29. Blesso CN, Fernandez ML. Dietary cholesterol, serum lipids, and heart disease: are eggs working for or against you? Nutrients 2018;10:1–12
30. El Alili M, Vrijens B, Demonceau J, Evers SM, Hiligsmann M. A scoping review of studies comparing the medication event monitoring system (MEMS) with alternative methods for measuring medication adherence. Br J Clin Pharmacol 2016;82:268–279