Journal of Health Disparities Research and Practice

Volume 12 | Issue 2 Article 4

© Center for Health Disparities Research, School of Public Health, University of Nevada, Las Vegas

2018

Predictors and Missed Opportunities for Blood Glucose Screening among African Americans: Implications for Church-based Populations

Alexandria G. Bauer , *University of Missouri-Kansas City*, alexandria.bauer@rutgers.edu
Jannette Berkley-Patton , *University of Missouri-Kansas City*, berkleypattonj@umkc.edu
Carole Bowe Thompson , *University of Missouri-Kansas City*, bowethompsonc@umkc.edu

See next page for additional authors

Predictors and Missed Opportunities for Blood Glucose Screening among African Americans: Implications for Church-based Populations

Abstract

African Americans (AAs) are disproportionately diagnosed with prediabetes, diabetes, and related complications. Guidelines for prediabetes/diabetes screening emphasize reaching at-risk adults. The AA church has potential to increase reach of BGS with AA church members and community members. The current study identified predictors of blood glucose screening (BGS) and individuals with missed opportunities for BGS among church-affiliated AA adults. Participants were drawn from a previous pilot study (Project Faith Influencing Transformation) conducted in six AA churches over eight months. Eligibility criteria included self-identifying as AA and being aged 18 or older. Participants who had previously been diagnosed with diabetes were excluded, resulting in a final sample of *N* = 274. Participants were primarily female (68%), with an average age of 52 years. Slightly more than half of participants (54%) had obtained BGS in the past year. Logistic regression revealed that BGS was less likely among participants who had less routine doctor visits. Among church members, likelihood of BGS increased with number of years as a member. Participants who were older and uninsured were more likely to have a missed opportunity for BGS. Implications for diabetes prevention efforts, particularly faith-based diabetes prevention interventions for AAs, are discussed.

Keywords

prediabetes; diabetes; prevention; community health; African American; faith-based

Cover Page Footnote

This study was funded by National Institute on Minority Health and Health Disparities grant 1R24MD007951-01. Special thanks to Delwyn Catley, Kathy Goggin, Andrea Bradley Ewing, Reverend Eric Williams, Pastor Cassandra Wainright, and the Calvary Community Outreach Network for their assistance with project development and implementation.

Authors

Alexandria G. Bauer, Jannette Berkley-Patton, Carole Bowe Thompson, and Kelsey Christensen

Journal of Health Disparities Research and Practice
Volume 12, Issue 2, Summer 2019, pp. 72-87

Predictors and Missed Opportunities for Blood Glucose Screening among African Americans: Implications for Church-based Populations

Alexandria G. Bauer, MA, University of Missouri-Kansas City
Jannette Berkley-Patton, PhD, University of Missouri-Kansas City
Carole Bowe Thompson, BS, University of Missouri-Kansas City
Kelsey Christensen, MA, University of Missouri-Kansas City
Corresponding Author: Alexandria G. Bauer, MA, University of Missouri-Kansas City, agb28d@mail.umkc.edu

ABSTRACT

African Americans (AAs) are disproportionately diagnosed with prediabetes, diabetes, and related complications. Guidelines for prediabetes/diabetes screening emphasize reaching at-risk adults. The AA church has potential to increase reach of blood glucose screening (BGS) with AA church members and community members. The current study identified predictors of BGS and individuals with missed opportunities for BGS among church-affiliated AA adults. Participants were drawn from a previous pilot study (Project Faith Influencing Transformation) conducted in six AA churches over eight months. Eligibility criteria included self-identifying as AA and being aged 18 or older. Participants who had previously been diagnosed with diabetes were excluded, resulting in a final sample of $N = 274$. Participants were primarily female (68%), with an average age of 52 years. Slightly more than half of participants (54%) had obtained BGS in the past year. Logistic regression revealed that BGS was less likely among participants who had fewer routine doctor visits. Among church members, likelihood of BGS increased with number of years as a member. Participants who were older and uninsured were more likely to have a missed opportunity for BGS. Implications for diabetes prevention efforts, particularly faith-based diabetes prevention interventions for AAs, are discussed.

Keywords: prediabetes; diabetes; prevention; community health; African American; faith-based

INTRODUCTION

Prediabetes and diabetes, including Type 1 and Type 2 diabetes, are recognized as major health concerns in the U.S. Type 1 diabetes causes impaired insulin production, while Type 2 diabetes results in insulin resistance and accounts for more than 90% of diabetes diagnoses nationwide (Centers for Disease Control and Prevention, 2017b). In national reports, over 12% of adults aged 18 and older were living with either Type of diabetes. Risk for Type 2 diabetes is influenced by lifestyle (e.g. being overweight or obese, lack of exercise, poor diet) and personal factors (e.g., age, racial/ethnic background). An additional 34% of adults have prediabetes, which can progress to Type 2 diabetes without medication or lifestyle changes (e.g., physical activity, healthy eating; Centers for Disease Control and Prevention, 2017b). Furthermore, it is estimated that 24% of people living with diabetes and 22% of people with prediabetes are unaware of their status (Centers for Disease Control and Prevention, 2017b). Untreated and poorly controlled diabetes can lead to a number of debilitating and life-threatening complications including blindness, lower-limb amputations, and heart and kidney disease (Centers for Disease Control and Prevention, 2017b).

Although African Americans (AAs) have a similar prevalence of prediabetes as non-Hispanic Whites (36% and 32%, respectively), AAs are nearly twice as likely to be diagnosed with Type 2 diabetes (13% versus 7%, respectively; Centers for Disease Control and Prevention, 2017b). AAs also experience disproportionate rates of diabetes-related complications and have shorter life expectancy related to diabetes compared to their non-Hispanic White counterparts (Centers for Disease Control and Prevention, 2017b; Office of Minority Health, 2016). They also have far more risk factors for diabetes, including low levels of exercise, poor diet, overweight/obesity, and high blood pressure (Zhou, Remsburg, Caufield, & Itote, 2012). Also, AAs are at even greater risk for prediabetes/diabetes than other ethnicities, due to the high prevalence of family history of diabetes and African ancestry genetic susceptibility (American Diabetes Association, 2016). However, AAs may not be aware of their risk for developing diabetes, even if they have multiple risk factors (Graham et al., 2006), and may not receive early prediabetes screening to limit progression to diabetes (Centers for Disease Control and Prevention, 2017b).

The U.S. Preventive Services Task Force (USPSTF) recommends preventative blood glucose screening (BGS) for individuals who are 40 years and older, overweight/obese (body mass index [BMI] >25 kg/m), or a member of a high-risk racial/ethnic group, including AAs (U.S. Preventive Services Task Force, 2015). For persons with abnormal BGS values, the USPSTF also recommends referral to intensive lifestyle programs that promote healthy eating and physical activity, such as the National Diabetes Prevention Program (DPP; Knowler et al., 2002). Preventative BGS screening has been determined to be cost-effective, with an even greater cost-benefit ratio for AAs, due to the increased risk for diabetes diagnosis and complications (American Diabetes Association, 2014; Engelgau, Narayan, & Herman, 2000; Kahn et al., 2010). Yet, disparities exist in diabetes screening between racial/ethnic groups (Tung, Baig, Huang, Laiteerapong, & Chua, 2017), and those who are at risk may have missed opportunities for screening during physician visits – possibly due to physician's unawareness of screening guidelines (Tseng et al., 2017). Also, studies indicate few physicians recommend patients with abnormal BGS results to lifestyle programs (Mainous, Tanner, Scuderi, Porter, & Carek, 2016; Tseng et al., 2017). There has been a clarion call from national health organizations to increase prediabetes/diabetes screening and referral to intensive lifestyle change interventions in community settings, especially for high-risk populations (American Diabetes Association, 2002; American Medical Association, 2016; National Institute of Diabetes and Digestive and Kidney Diseases, 2016; U.S. Preventive Services Task Force, 2015).

Studies that have examined rates of BGS, and how to increase BGS as a prevention strategy in AA populations, are limited. Existing studies have found similar rates of BGS among AAs compared to Whites (59% and 60%, respectively; Tung et al., 2017), although others have suggested that AAs are less likely to be aware of their prediabetes status (Centers for Disease Control and Prevention, 2017b) and less likely to receive BGS and other preventative services (Office of Minority Health, 2016; Okeke, 2011; Pu & Chewning, 2013). In particular, AAs who are younger, low-SES, and without health insurance are less likely to report receipt of BGS (Engelgau et al., 2000; Pu & Chewning, 2013). Additional multilevel barriers to BGS (e.g., cost, transportation, mistrust of health systems, poor quality of services) are possible for AAs (Jacobs, Rolle, Ferrans, Whitaker, & Warnecke, 2006; Okeke, 2011; Pu & Chewning, 2013). Given the increased risk for diabetes experienced by AAs and the current guidelines for BGS screening and referral to prevention interventions, it is crucial to understand and improve the frequency of BGS rates among AAs in medical settings. Additionally, consideration should be given to settings in AA communities that can assist in reaching AAs for needed BGS.

Black churches (i.e., churches that primarily serve AAs) are institutions that could potentially extend the reach of BGS in AA communities. Black churches have traditionally held a position of respect and trusted influence in AA communities, and AAs have shown high religious belief and engagement (e.g., church attendance, church membership; Chatters, Taylor, Bullard, & Jackson, 2009; Pew Research Center, 2009). Additionally, most AA churches provide social services (e.g., food/clothing pantries, daycares, recovery programs) to underserved community members through ongoing church outreach ministries, and many have health ministries that implement health promotion activities (Berkley-Patton et al., 2010; Berkley-Patton et al., 2012; Collins, 2015; Odulana et al., 2014). Increasingly, studies are reporting on Black Church participation in health screening and prevention interventions. For instance, faith-based interventions have been successful at promoting testing for HIV; mental health; and colorectal, breast, and prostate cancers (Berkley-Patton et al., 2016; Campbell et al., 2004; Hankerson et al., 2015; Mann et al., 2000; Moore, Berkley-Patton, Berman, Burleson, & Judah, 2016; Saunders et al., 2015). These strengths uniquely position Black churches to increase reach of BGS services with church and community members in ways that health organizations cannot achieve.

Faith-based diabetes prevention interventions have offered health screenings in church settings for fasting blood glucose, A1C, and blood pressure (Boltri, Davis-Smith, Okosun, Seale, & Foster, 2011; Cené et al., 2013; Davis-Smith, 2007; Dodani & Fields, 2010; Dodani, Kramer, Williams, Crawford, & Kriska, 2009; Sattin et al., 2016). However, screenings were performed to assess intervention effects, rather than uptake of screening itself. No studies have examined rates of, and factors related to, preventative BGS within church-affiliated AA populations, nor have previous studies examined missed opportunities for BGS in routine physician visits. This is an important gap in the literature, as recent studies indicate higher rates of diabetes among AA church-populations than general AA populations (e.g., Berkley-Patton et al., 2018; Whitt-Glover, Porter, Yore, Demons, & Goldmon, 2014).

Determining BGS predictors and missed opportunities among faith-based AAs is an important first step to: a) improving rates of BGS, referrals, and linkages to care services for high-risk AAs; b) improving reach of faith-based BGS and diabetes prevention interventions; and c) understanding needed capacity for such interventions. The current study examined rates and traditional predictors of BGS. Novel to this study is the examination of nontraditional predictors that are culturally salient (e.g., religiosity) for AA church members and inclusion of community members served through outreach ministries (e.g., food/clothing pantries, social services). This study also uniquely explores AA church-community members meeting USPSTF guidelines for BGS and missed opportunities for screening in routine physician visits for AA church-populations. Implications for church-based BGS and diabetes prevention programs are discussed.

METHODS

Participants

This study used baseline survey data from Project Faith Influencing Transformation (FIT). Eligibility criteria included being aged 18 or over, self-identifying as AA, and being either a regular church member attending church > once/month or a community member regularly using church outreach ministries > four times/year. Participants who self-reported a diabetes diagnosis were excluded from the current study. Among participants retained for analyses (N = 274), 90% were church members and 10% were community members who used church outreach services (e.g., food pantry). The average age was 52 years old (SD = 13.4), with 82% aged ≥ 40 years old. The most commonly reported education and income levels were some college and more than $3,000 per month, respectively, as shown in Table 1. Among church members, the average length of church membership was 22.5 years (SD = 18 years; range = 1-72 years).

Measures

Demographics. Participants were asked to provide demographic information, including age, gender, educational level, monthly household income, years as a church member, and marital status.

Receipt of BGS and Healthcare Access. Participants were asked to report whether they had BGS (i.e., screening for "blood glucose [sugar]") in the past 12 months (1 = Yes, 0 = No). One item assessed health insurance status (i.e., Medicare, Medicaid, private, other, no insurance). Routine doctor visits were assessed with one item, which asked how long it had been since participants had seen a doctor for a routine checkup (i.e., 12 months, in the past 13 to 24 months, more than 2 years ago, never). Participants were also asked where they received routine medical care, with response options including a hospital outpatient department, clinic or health center, doctor or HMO office, or no place for routine medical care.

Religious Engagement. One dichotomous item asked whether participants were members of the church. One item also asked, "How long have you been a member or attended services at this church?" and participants wrote in number of years or months. Religiosity was measured with seven items, which asked participants to describe their level of religious belief (1 = Atheist to 5 = Religious) and rate how often they engaged in six religious behaviors (e.g., thought of God, prayed, attended church services; 1 = Never to 8 = More than once a day). Items were summed to create a total religiosity score (Cronbach's α = .743), ranging from 7 (low religiosity) to 53 (high religiosity).

Table 1: Demographic characteristics of participants

	Overall	Church Members[a]	Community Members
	N (% of sample)	*N* (%)	*N* (%)
Gender			
Female	182 (68)	164 (90)	17 (10)
Male	87 (32)	76 (87)	11 (13)
Highest Level of Education			
11th grade or below	13 (5)	7 (54)	6 (46)
High school/GED[b]	44 (17)	36 (82)	8 (18)
Post high school tech training	5 (2)	4 (80)	1 (20)
Some college	70 (26)	62 (89)	8 (11)
Associates Degree/tech school certificate	36 (13)	32 (89)	4 (11)
Bachelor's degree or higher	101 (37)	99 (98)	1 (1)
Monthly household income			
0-1000	26 (11)	18 (69)	8 (31)
1,001-2,000	41 (18)	35 (85)	4 (10)
2,001-3,000	59 (26)	57 (98)	1 (2)
More than 3,000	91 (39)	82 (90)	8 (10)
Don't know	14 (6)	9 (64)	4 (14)
Marital status			
Single, never married	70 (26)	62 (89)	8 (11)
Living with partner, not married	5 (2)	2 (40)	3 (60)
Married	102 (38)	96 (94)	6 (6)
Separated	15 (5)	13 (87)	2 (13)
Divorced	58 (21)	49 (85)	8 (14)
Widowed	19 (7)	18 (95)	1 (5)
Fat intake[c]	68.5 (13.1)	67.8 (12.7)	75.2 (15.8)
F/V intake[c]	7.2 (2.6)	7.3 (2.7)	6.4 (1.9)
Family history of diabetes			
Yes	151 (55)	133 (88)	15 (10)
No	123 (45)	107 (86)	13 (11)
A1C[c]	5.7 (.46)	5.7 (.48)	5.7 (.33)
BMI			
Underweight (< 18.5)	0 (0)	0 (0)	0 (0)
Normal weight (18.5-24.5)	29 (15)	20 (69)	7 (24)
Overweight (25-29.9)	57 (29)	50 (88)	7 (12)
Obese (30-39.9)	89 (45)	80 (90)	8 (9)
Extreme Obesity (≥ 40)	23 (11)	20 (87)	3 (13)

[a]Percentages may not add to 100 due to participants with who did not indicate church affiliation.
[b]GED = General Educational Development, BMI = body mass index.
[c]Values represent mean (standard deviation).

Diabetes Risk Factors. Fat intake was assessed with eighteen items that asked participants to report how often they consumed several foods/drinks (e.g., fast foods) over the past year, with response options including 1 = never to 8 = two or more times per day. Scores for healthy items (e.g., fruit) were reverse coded and all eighteen items were summed (Cronbach's $\alpha = .823$), so that the total range of scores was 18 (low fat intake) to 144 (high fat intake). Two items asked participants how often they consumed either fruits or vegetables over the past seven days, with response options ranging from 1 = never to 6 = two or more times per day. Items were summed to create a total fruit and vegetable (F/V) score (Cronbach's $\alpha = .805$), ranging from 2 (low F/V intake) to 12 (high F/V intake). One dichotomous item assessed family history of diabetes (1 = Yes, 0 = No). A1C was assessed during the health screening. Height (inches) and weight (pounds), both without shoes, were used to calculate BMI for each participant.

Procedure

Members of the research team recruited participants for Project FIT by making announcements in church services, before weekly church events (e.g., Bible study), and during outreach ministries. A baseline survey and health-screening event was held at each church, with opportunities for participation before, during, and after Sunday church services. Pre-enrolled participants set a time to complete their survey and health screening, and received a reminder call prior to the event. Interested individuals could also be screened for eligibility and enrolled in the study on site on the day of the event. After reading an informed consent form, participants took 45 to 60 minutes to complete the survey and health screenings (e.g., blood pressure, A1C, BMI). A similar 8-month survey and health screening was held at the conclusion of the study, for which all participants received a reminder call. For the purposes of this study, only relevant survey procedures and measures are described. Participants were compensated $20 at baseline and 8-month follow-up.

Project FIT was an 8-month diabetes, heart disease, and stroke prevention intervention piloted in six predominately African American churches, all of which were located in the urban metropolitan area of Kansas City, Missouri. Project FIT compared a diabetes and heart disease/stroke prevention intervention, based on the DPP (Knowler et al., 2002), to a standard health education program. The Project FIT intervention and main outcomes are described elsewhere. Study procedures were approved by the University of Missouri-Kansas City Institutional Review Board.

Data Analysis

Descriptive analyses were used to examine participants' demographic backgrounds and overall receipt of BGS. Correlational analyses were performed to examine preliminary bivariate relationships between receipt of BGS and continuous variables. Chi-square analyses were performed to determine preliminary bivariate relationships between receipt of BGS and categorical variables. Logistic regressions were performed to analyze predictive relationships between receipt of BGS and all variables with bivariate relationships approaching significance (i.e., $p \leq .10$). Multicollinearity was assessed between variables in each of the four categories (i.e., demographics, healthcare access, religious engagement, diabetes risk factors), which revealed VIF ≤ 1.4 in each category. Categories were combined for variables with cell sizes < 10 among the overall sample (i.e., education, doctor's visits), resulting in final regression categories as shown in Table 3. Percentage of participants with missed physician visit BGS opportunity was calculated based on the percentage of participants who: a) met the general USPSTF BGS guidelines (overweight/obese adults aged 40 to 70 years; U.S. Preventive Services Task Force, 2015), b) reported a routine physician visit in the last 12 months, and c) reported that they did not receive BGS (last 12 months). All analyses were run with SPSS version 22.0.

RESULTS

Slightly more than half of participants (54%) reported receipt of BGS in the past year. There were significant positive relationships between receipt of BGS with age and education (Table 2). The logistic regression model demonstrated a significant improvement over the null model ($\chi 2 = 52.5$, $p < .001$), accounting for slightly more than one-third of the variance in receipt of BGS (Nagelkerke $R^2 = .343$) and correctly classifying 74% of cases. However, there were no significant relationships between receipt of BGS with age and education in the logistic regression (Table 3).

Healthcare Access

Overall, 81% of participants had insurance, and the majority of participants (79%) reported having visited their doctor for a routine visit in the past 12 months. Most participants (66%) reported receiving routine medical care in a doctor's office or HMO office, while 18% received routine medical care in a clinic or health center. Insurance, regular doctor visits, and place of routine medical care were positively related to receipt of BGS in preliminary analyses. Participants who had a regular doctor's visit within the past year were more than 88% more likely to report receipt of BGS compared to participants who had not had a regular doctor's visit in the past 13-24 months, with an even greater discrepancy compared to participants with additional time between visits (i.e., more than 2 years/never). Insurance status and having a place for routine medical care were not significant predictors of BGS.

Religious Engagement

The majority of participants (90%) were church members. The average religiosity score was 45.3 (SD = 6.5; range = 15-53), and the most common daily activities were thinking of God (82%) and prayer (68%). Furthermore, 91% of participants reported attending church services once a week or more. Religiosity was not significantly related to BGS. Although being a church member did have a significant preliminary association with receipt of BGS, church membership was not a significant predictor of BGS in the logistic regression. However, among church members, the number of years as a church member was positively related to receipt of BGS (OR = 1.030, p = .001, SE = .009, 95% CI [1.011, 1.049]).

Diabetes Risk Factors

Participants' fat intake scores ranged from 40 to 105 (Table 1). The most common sources of fat, consumed 1-2 times per week or more, were fried chicken or fish (25%), snack foods (e.g., chips, crackers, cookies; 27%), and fries or hash browns (23%). F/V intake scores ranged from 2 to 12, with participants commonly reporting intake of fruit and vegetables 3-4 times per week (29% and 31%, respectively). Only 17% of participants reported intake of fruit or vegetables two or more times per day. More than half of participants reported a family history of diabetes. Half of participants had an A1C in the normal range, while 46% had a high A1C (i.e., 5.7% to 6.4%) and an additional 4% had a very high A1C (6.5% or above). The average BMI was 32.86 (SD = 7.7). In preliminary analyses, fat and F/V intake, family history of diabetes, and A1C were significantly associated with receipt of BGS, but were not significant predictors of BGS in the logistic regression.

Table 2: Preliminary associations with receipt of BGS

Variables	*r*	X^2	*p*
Demographics			
Age	.170		.005
Gender		.573	.449
Education		9.94	.007
Healthcare access			
Health insurance		24.12	< .001
Routine doctor visits		34.37	< .001
Place for routine medical care		29.29	< .001
Religious engagement			
Church member		.796	.005
Religiosity	-.029		.657
Diabetes Risk Factors			
Fat intake	-.211		.002
F/V intake	.137		.024
Family history of diabetes		2.90	.089
A1C	.151		.013
BMI[a]	.069		.285

[a]BMI = Body mass index.

Table 3: Logistic regression for receipt of BGS among church and community members

				95% CI	
	OR	*SE*	*p*	Lower	Upper
Age	1.008	.016	.621	.977	1.04
Highest Level of Education					
High school/GED or below[a]	.791	.593	.693	.247	2.53
Some college/tech training	.925	.465	.867	.372	2.30
Associate's degree/tech school certificate	1.285	.614	.683	.386	4.28
College degree or higher	Ref.				
Insurance					
Insured	Ref.				
Uninsured	.339	.590	.067	.107	1.08
Routine doctor visit					
Past 12 months	Ref.				
Past 13-24 months	.119	.701	.002	.030	.471
More than 2 years/Never	.098	.824	.005	.019	.490
Place for routine medical care					
No routine place	Ref.				
Hospital outpatient department	.133	1.15	.079	.014	1.26
Clinic or health center	.274	1.05	.216	.035	2.13
Doctor's office or HMO office	.450	1.06	.449	.057	3.57
Church membership					
Yes	Ref.				
No	.771	.736	.724	.182	3.26
Fat intake	.984	.015	.279	.955	1.01
F/V intake	.989	.079	.889	.848	1.15
Family history of diabetes					
No	Ref.				
Yes	.591	.367	.152	.288	1.21
A1C	1.63	.468	.294	.654	4.09

[a]GED = General Educational Development, HMO = Health Maintenance Organization, F/V = Fruit and Vegetable, Ref. = Reference group.

Missed Opportunities

Out of 274 participants, 14% (n = 39) met USPSTF guidelines (i.e., aged ≥ 40 and overweight or obese) and had visited their doctor in the past year, but had not received BGS in this time frame. Participants with no health insurance were five times more likely to have missed opportunities for BGS (OR = 5.06, p = .031, SE = .754, 95% CI [1.156, 22.184]), and odds of having a missed opportunity for BGS significantly increased with age (OR = 1.05, p = .046, SE = .025, 95% CI [1.001, 1.102]).

DISCUSSION

This study is one of the first to report on receipt, predictors, and missed opportunities for preventative BGS among church-affiliated AAs without diabetes. Slightly more than half of participants reported receipt of BGS in the last year, which is lower than preventative BGS rates demonstrated by previous studies of AAs (Tung, Baig, Huang, Laiteerapong, & Chua, 2017). Although age has been associated with BGS (Lavielle & Wacher, 2014), this was not supported by the current study. Education was also not a significant predictor of BGS, despite previous studies linking socioeconomic status to receipt of preventative BGS among minority populations (Lavielle & Wacher, 2014; Pu & Chewning, 2013).

Most participants had health insurance, were practicing routine doctor visits, and had a doctor's office or HMO office for regular medical care, although AAs have historically faced multilevel barriers to effective healthcare access and use (e.g., financial strain, mistrust, poor quality of care; Boulware, Cooper, Ratner, LaVeist, & Powe, 2003; Copeland, 2005; Jacobs, Rolle, Ferrans, Whitaker, & Warnecke, 2006; Kaiser Foundation, 2000; Okeke, 2011; Pu & Chewning, 2013; Williams, 2015). A recent study discussed improvements in healthcare access for AAs following implementation of the Affordable Care Act (Chen, Vargas-Bustamante, Mortensen, & Ortega, 2015). However, several studies have described continued healthcare disparities for AAs (Artiga, Foutz, Cornachione, & Garfield, 2016; Centers for Disease Control and Prevention, 2017a; Manuel, 2017; Moonesinghe, Chang, & Truman, 2013), and studies to improve healthcare access for AAs continue to be needed (Brooks & Hopkins, 2017). The current finding that BGS was substantially less likely among participants who had not had a routine doctor visit in the past year highlights the need to address these key barriers to healthcare.

Many participants, particularly those who were older and uninsured, had missed opportunities for BGS. This finding supports previous research that found that AAs might not regularly receive preventative BGS, even when attending routine physician visits (Office of Minority Health, 2016; Okeke, 2011; Pu & Chewning, 2013). Previous studies have suggested that primary care providers may not be aware of all of the recommendations for prediabetes screening (Tseng et al., 2017) and can vary in attitudes toward prediabetes screening (e.g., useful in practice, effective for diabetes prevention, evidence-based; Mainous, Tanner, Scuderi, Porter, & Carek, 2016). Furthermore, physician attitudes toward prediabetes have influenced provision of BGS and patient recommendations, and only half of physicians in a previous study followed recommended screening guidelines (Mainous et al., 2016). Future research should continue to investigate the comprehensive, multilevel strategies to address healthcare disparities (e.g., improvements in cultural competency of providers, addressing structural and environmental issues, tailored interventions to address psychosocial beliefs and cultural norms) that are recommended by national health agencies (American Medical Association, 2007; General, 2014; Jackson & Gracia, 2014; Moonesinghe et al., 2013). There is a particular need to investigate targeted strategies for disparities facing AAs, such as extending BGS to accessible, trusted settings like the Black Church. Notably, older adults, who were at greater risk for having missed opportunities for BGS in the current study, have been shown to be more likely to attend worship services than their younger counterparts (Brown, Taylor, & Chatters, 2015). Thus, AA churches may be in a unique position to encourage BGS among their at-risk congregations.

Participants were primarily church members, who had been members of the church for an average of twenty years. In addition, they reported very high religiosity, which supports previous estimates (Chatters, Taylor, Bullard, & Jackson, 2009; Pew Research Center, 2009). Among church members, likelihood of BGS increased with the number of years spent as a church member. These findings continue to emphasize the potential for AA churches to extend the reach of diabetes prevention interventions, particularly those that are religiously and culturally tailored and designed to promote BGS.

Participants had moderately high fat intake, and findings suggested they were far below the recommendations for daily F/V intake (U.S. Department of Health and Human Services, 2015). As demonstrated in national reports (Centers for Disease Control and Prevention, 2017b; Office of Minority Health, 2016), church-affiliated AAs in this study endorsed risk factors (e.g., family history) and had biometric values that put them at increased risk (e.g., A1C above 5.7%, overweight/obese BMI). These findings underscore the need for diabetes prevention programs targeted for AAs with several risk factors, particularly in community-based settings such as the AA church. This is particularly true for faith-based AAs with poor diet, who could benefit from the combination of increased nutrition education, faith-based lifestyle change interventions, and routine BGS to monitor diabetes risk.

Faith-based interventions have the potential to reach a large proportion of the AA community, including those at highest risk for diabetes. For instance, a recent study by Sattin et al. (2016) conducted a church-based diabetes prevention intervention and found significant, sustained weight loss among church members. The DPP (Knowler et al., 2002) has also been implemented in Black churches, with resulting changes in weight loss, physical activity, and dietary change (e.g., Boltri, Davis-Smith, Okosun, Seale, & Foster, 2011; Davis-Smith, 2007; Dodani & Fields, 2010; Dodani, Kramer, Williams, Crawford, & Kriska, 2009; Sattin et al., 2016). These programs frequently used religiously and culturally tailored educational materials, held workshops or classes, and utilized community health liaisons. Future faith-based programs could include promotion of preventative BGS, in combination with typical behavior change outcomes. For instance, faith-based interventions could increase awareness and education among participants on how BGS is conducted, where testing can be performed, the guidelines for interpretation of BGS results (e.g., range and direction of values), and the importance of monitoring diabetes risk through regular preventative BGS. Faith-based diabetes messaging may be more feasible and acceptable among AAs (Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003), which can increase the impact of prevention education in this community. Furthermore, churches can play an important role in reaching their communities. However, there is limited research on effectiveness of diabetes prevention programs among church-affiliated community members. Faith-based diabetes prevention programs should consider targeted efforts to recruit community members served by church outreach ministries (e.g., food pantries, daycare), who may be willing to participate in church-based interventions designed to promote healthy lifestyle changes and uptake of screening.

As the number of faith-based obesity and diabetes interventions for AAs continues to grow (Lancaster, Carter-Edwards, Grilo, Shen, & Schoenthaler, 2014), consideration should be given to include uptake of preventative BGS as a behavioral outcome, in addition to typical results (e.g., increases in knowledge, weight loss). This can provide insight into whether intervention strategies are effective at motivating borderline and high-risk participants to maintain behavior change (e.g., seeking regular BGS; Booker, Malcarne, & Sadler, 2014). In addition, research should examine whether receipt and feedback from BGS may lead to health-related lifestyle changes, including healthy food consumption and physical activity.

It is debated whether provision of screening a church settings is effective at monitoring or reducing diabetes risk, due to concerns about improper protocols, inaccuracy of tests, and insufficient linkage to care (American Association of Diabetes Educators, 2014; American Diabetes Association, 2004, 2014; West, Parikh, Arniella, & Horowitz, 2010). Individuals with abnormal BGS results may not visit a doctor to receive the necessary confirmatory testing (American Diabetes Association, 2002, 2014; Engelgau, Narayan, & Herman, 2000; Porterfield et al., 2004), and those screened may not represent those at greatest risk (American Association of Diabetes Educators, 2014). Additionally, people who obtain BGS results in the normal range from a church-based screening event may not seek repeat testing at a later date, even if they remain high-risk. However, there has been some research in support of health screenings, including BGS, in church-community settings (McKeever, Koroloff, & Faddis, 2006; Saffar et al., 2011). Some AAs have reported receiving health screenings exclusively in community settings, in part because these environments are perceived as more trustworthy, comfortable and culturally sensitive (McKeever et al., 2006), which may be particularly true for church-affiliated AAs. Thus, routine screenings in clinical settings may not be a viable option for all individuals.

AA churches are well positioned to promote BGS by preaching the importance of preventative screening, tapping into existing health ministries (Collins, 2015; Odulana et al., 2014), and targeting hard-to-reach AA community members at high risk for prediabetes and diabetes. Researchers contemplating provision of BGS in faith-based diabetes prevention studies should consider recommendations by the American Association of Diabetes Educators, including tests performed by qualified professionals and provision of clear, detailed feedback about test results (American Association of Diabetes Educators, 2014). Additionally, any faith-based BGS should be combined with a strong linkage to care component, which can be accomplished by forming partnerships between health care organizations, providers, and the community (American Association of Diabetes Educators, 2014), with potential to decrease barriers to continued BGS for AAs. To foster development of these partnerships, efforts should be made to obtain pastoral support and clarify the roles and responsibilities of churches and health organizations (Collins, 2015). Researchers and health organizations should also consider incentives for AA churches, including support for church capacity (Collins, 2015). Ongoing partnerships between church-community sites and health organizations may promote sustainability of diabetes prevention efforts, increase referrals to church-based diabetes programs, and formalize linkage to care.

This research had some limitations. All measures used were self-report, and relied on recall for report of several measures (e.g., health behaviors). Although the BGS question asked broadly over the past year, it is unclear if participants had received BGS beyond that time frame and other information related to screening (e.g., where, why, and how they received BGS). Future research is needed on multilevel strategies to improve access to BGS for AAs and development of targeted interventions for AAs at greater risk, particularly those with missed screening opportunities. Given the high level of religious engagement among AAs, faith-based interventions have potential to increase rates of preventative BGS among church members, as well as increasing receipt of BGS among community members served by the church. This research could inform intervention strategies and capacity needed to provide these interventions for at-risk AAs, in order to address continued burden of diabetes within the AA community.

REFERENCES

American Association of Diabetes Educators. (2014). Recommendations for Community-Based Screening for Prediabetes and Diabetes. Retrieved from https://www.diabeteseducator.org/docs/default-source/practice/practice-resources/white-papers_test/community_screening_position_statement_final.pdf?sfvrsn=2

American Diabetes Association. (2002). Screening for diabetes. *Diabetes Care*, *5*, S21-S24.

American Diabetes Association. (2004). Screening for Type 2 diabetes. *Diabetes Care, 27*(S1), S11-S14.

American Diabetes Association. (2014). Standards of Medical Care in Diabetes--2014. *Diabetes Care, 37*(S1), S14-S80.

American Medical Association. (2007). Addressing health care disparities: Recommended goal, guiding principles, and key strategies for comprehensive policies. Retrieved from https://www.ama-assn.org/delivering-care/reducing-disparities-health-care

Artiga, S., Foutz, J., Cornachione, E., & Garfield, R. (2016). Key facts on health and health care by race and ethnicity. Retrieved from https://www.kff.org/disparities-policy/report/key-facts-on-health-and-health-care-by-race-and-ethnicity/

Boltri, J. M., Davis-Smith, M., Okosun, I. S., Seale, P., & Foster, B. (2011). Translation of the National Institutes of Health Diabetes Prevention Program in African American Churches. *Journal of the National Medical Association, 103*(3), 194-202.

Booker, A., Malcarne, V., & Sadler, G. (2014). Evaluating outcomes of community-based cancer education interventions: a 10-year review of studies. *Journal of Cancer Education, 29*(2), 233-240.

Boulware, L. E., Cooper, L. A., Ratner, L. E., LaVeist, T. A., & Powe, N. R. (2003). Race and Trust in the Health Care System. *Public Health Reports, 118*(4), 358-365.

Brooks, R. T., & Hopkins, R. (2017). Cultural Mistrust and Health Care Utilization: The Effects of a Culturally Responsive Cognitive Intervention. *Journal of Black Studies, 48*(8), 816-834.

Brown, R. K., Taylor, R. J., & Chatters, L. M. (2015). Race/Ethnic and Social-Demographic Correlates of Religious Non-Involvement in America: Findings From Three National Surveys. *Journal of Black Studies, 46*(4), 335-362.

Centers for Disease Control and Prevention. (2017a). African American health: Creating equal opportunities for health. Retrieved from https://www.cdc.gov/vitalsigns/pdf/2017-05-vitalsigns.pdf

Centers for Disease Control and Prevention. (2017b). National Diabetes Statistics Report, 2017. Retrieved from http://www.diabetes.org/assets/pdfs/basics/cdc-statistics-report-2017.pdf

Chatters, L. M., Taylor, R. J., Bullard, K. M., & Jackson, J. S. (2009). Race and Ethnic Differences in Religious Involvement: African Americans, Caribbean Blacks and Non-Hispanic Whites. *Ethn Racial Stud, 32*(7), 1143-1163.

Chen, J., Vargas-Bustamante, A., Mortensen, K., & Ortega, A. N. (2015). Racial and Ethnic Disparities in Health Care Access and Utilization Under the Affordable Care Act. *Medical Care, 54*(2), 140-146.

Collins, W. L. (2015). The Role of African American Churches in Promoting Health Among Congregations. *Social Work & Christianity, 42*(2), 193-204.

Copeland, V. C. (2005). African Americans: Disparities in Health Care Access and Utilization. *Health and Social Work, 30*(3), 265-270.

Davis-Smith, M. (2007). Implementing a diabetes prevention program in a rural African-American church. *Journal of the National Medical Association*, *99*(4), 440-446.

Dodani, S., & Fields, J. (2010). Implementation of the Fit Body and Soul, a church-based life style program for diabetes prevention in high-risk African Americans: A feasibility study. *Diabetes Educator*, *36*(3), 465-472.

Dodani, S., Kramer, M. K., Williams, L., Crawford, S., & Kriska, A. (2009). Fit Body and Soul: A church-based behavioral lifestyle program for diabetes prevention in African Americans. *Ethn & Dis, 19*, 135-141.

Engelgau, M., Narayan, K., & Herman, W. (2000). Screening for type 2 diabetes. *Diabetes Care, 23*(10), 1563-1580.

General, U. S. S. (2014). National prevention strategy: Elimination of health disparities. Retrieved from https://www.surgeongeneral.gov/priorities/prevention/strategy/health-disparities.pdf

Jackson, C. S., & Gracia, J. N. (2014). Addressing Health and Health-Care Disparities: The Role of a Diverse Workforce and the Social Determinants of Health. *Public Health Reports, 129*, 57-61.

Jacobs, E., Rolle, I., Ferrans, C., Whitaker, E., & Warnecke, R. (2006). Understanding African Americans' views of the trustworthiness of physicians. *Journal of General Internal Medicine, 21*(6), 642-647.

Kaiser Foundation. (2000). Health insurance coverage and access to care among African Americans. Retrieved from https://kaiserfamilyfoundation.files.wordpress.com/2013/01/health-insurance-coverage-and-access-to-care-among-african-americans.pdf

Knowler, W. C., Barrett-Connor, E., Fowler, S. E., Hamman, R. F., Lachin, J. M., Walker, E. A., & Nathan, D. M. (2002). Reduction in the Incidence of Type 2 Diabetes With Lifestyle Intervention or Metformin. *New England Journal of Medicine, 346*(6), 393-403.

Kreuter, M. W., Lukwago, S. N., Bucholtz, D. C., Clark, E. M., & Sanders-Thompson, V. (2003). Achieving Cultural Appropriateness in Health Promotion Programs: Targeted and Tailored Approaches. *Health Education and Behavior, 30*(2), 133-146.

Lancaster, K., Carter-Edwards, L., Grilo, S., Shen, C., & Schoenthaler, A. (2014). Obesity interventions in African American faith-based organizations: a systematic review. *Obesity Reviews, 15*(S4), 159-176.

Lavielle, P., & Wacher, N. (2014). The predictors of blood glucose screening: the contribution of risk perception. *BMC Family Practice, 15*, 108-113.

Mainous, A. G., Tanner, R. J., Scuderi, C. B., Porter, M., & Carek, P. J. (2016). Prediabetes Screening and Treatment in Diabetes Prevention: The Impact of Physician Attitudes. *Journal of the American Board of Family Medicine, 29*, 663-671.

Manuel, J. I. (2017). Racial/Ethnic and Gender Disparities in Health Care Use and Access. *Health Services Research, 53*(3), 1407-1429.

McKeever, C., Koroloff, N., & Faddis, C. (2006). The African American Wellness Village in Portland, Ore. *Preventing Chronic Disease, 3*(3), 1-6.

Moonesinghe, R., Chang, M.-h., & Truman, B. I. (2013). CDC Health Disparities and Inequalities Report — United States, 2013. *Morbidity and Mortality Weekly Report, 62*(3), 61-64.

Odulana, A. A., Kim, M. M., Isler, M. R., Green, M. A., Taylor, Y. J., Howard, D. L., . . . Corbie-Smith, G. (2014). Examining Characteristics of Congregation Members Willing to Attend Health Promotion in African American Churches. *Health Promot Pract, 15*(1), 125-133.

Office of Minority Health. (2016). Diabetes and African Americans. Retrieved from http://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlID=18

Okeke, E. (2011). Diabetes care for African Americans: Navigating the healthcare system. *EmPower, 4*(1), 11-26.

Pew Research Center. (2009). A Religious Portrait of African-Americans. Retrieved from http://www.pewforum.org/2009/01/30/a-religious-portrait-of-african-americans/

Porterfield, D. S., Din, R., Burroughs, A., Burrus, B., Petteway, R., Treiber, L., . . . Engelgau, M. (2004). Screening for diabetes in an African-American community: the Project DIRECT experience. *Journal of the National Medical Association, 96*(10), 1325-1331.

Pu, J., & Chewning, B. (2013). Racial difference in diabetes preventive care. *Research in Social & Administrative Pharmacy, 9*, 790-796.

Saffar, D., Perkins, D. W., Williams, V., Kapke, A., Mahan, M., Milberger, S., . . . Wisdom, K. (2011). Screening for Diabetes in an African American Community: Identifying Characteristics Associated With Abnormal Blood Glucose Readings. *Journal of the National Medical Association, 103*(3), 190-193.

Sattin, R. W., Williams, L. B., Dias, J., Garvin, J. T., Marion, L., Joshua, T. V., . . . Narayan, K. M. V. (2016). Community Trial of a Faith-Based Lifestyle Intervention to Prevent Diabetes Among African-Americans. *Journal of Community Health, 41*, 87-96.

Tseng, E., Greer, R. C., O'Rourke, P., Yeh, H.-C., McGuire, M. M., Clark, J. M., & Maruthur, N. M. (2017). Survey of primary care providers' knowledge of screening for, diagnosing and managing prediabetes. *Journal of General Internal Medicine, 32*(11), 1172-1178. doi:10.1007/s11606-017-4103-1

Tung, E. L., Baig, A. A., Huang, E. S., Laiteerapong, N., & Chua, K.-P. (2017). Racial and Ethnic Disparities in Diabetes Screening Between Asian Americans and Other Adults: BRFSS 2012–2014. *Journal of General Internal Medicine, 32*(4), 423-429.

U.S. Department of Health and Human Services. (2015). Dietary guidelines for Americans 2015-2020. Retrieved from https://health.gov/dietaryguidelines/2015/resources/2015-2020_Dietary_Guidelines.pdf

West, B., Parikh, P., Arniella, G., & Horowitz, C. R. (2010). Observations and Recommendations for Community-Based Diabetes Screenings. *Diabetes Educator, 36*(6), 887-893.

Williams, D. (2015). Racial Bias in Health Care and Health: Challenges and Opportunities. *JAMA, 314*(6), 555-556.