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## The Role of Socioeconomic Status in a Community-Based Study of Diabetes Secondary Prevention Among African Americans

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### Introduction

We know that race and socioeconomic status contribute independently to disparities in health and healthcare, but we know less about how to reduce these disparities (Pyatak et al. 2013; James 2017) Some population health improvement efforts can actually cause disparities to widen by disproportionately benefiting those whose health is better from the start (Mechanic 2005), indicating a need to understand how different populations respond to population health interventions. This paper addresses the role of socioeconomic status in recruitment, retention, and change in clinical status for a community-based participatory research study testing outcomes of individualized health coaching and peer support groups on diabetes management among African-American adults.

A large research literature documents disparities between the health status of White Americans and US racial and ethnic minorities, as well as disparities in the provision of medical care to minority groups (AHRQ 2011; Dentzer 2011; James 2017). The disproportionate impact of diabetes on African Americans exemplifies the unnecessary morbidity and mortality associated with health disparities. According to the Centers for Disease Control and Prevention, over 30 million people now have diabetes, with an estimated, age-adjusted prevalence of 12.7% among non-Hispanic Blacks vs. 7.4% for

non-Hispanic Whites (CDC 2017). Moreover, serious complications of the disease – such as amputations, vision problems, and end-stage renal disease -- disproportionately impact African Americans (CDC 2012).

Racial health disparities persist even after controlling for socioeconomic status and insurance coverage, with research indicating contributing factors ranging from chronic stress induced by racism, exposure to adverse conditions over the lifecourse, differences in neighborhood characteristics, and provider bias (Sternthal, Slopen, and Williams 2011; LaVeist et al. 2011) (AHRQ 2011; James 2017). Research also indicates that the health implications of *socioeconomic status* persist when race is statistically controlled in the analysis. (Williams, Priest, and Anderson 2016; Signorello et al. 2014).

Despite our awareness that race and socioeconomic status both contribute to disparities, the reality and implications of socioeconomic diversity within racial groups has not been well-studied as it relates to health interventions (Pyatak et al. 2013). Research now indicates that higher levels of education and economic resources for African Americans (and other racial/ethnic minorities) are not associated with the same magnitude of health benefit as for White Americans. Minorities Diminished Returns theory posits that this weaker association between SES and health results from the ways in which racism impedes the translation of higher SES into greater access to quality healthcare and other health-related resources, the costs of upward mobility for minority populations, and other factors associated with structural racism (Assari, 2018). We also know that standard socioeconomic status measurements may operate differently for different racial and ethnic groups (Pyatak et al. 2013). For example, Blacks and Hispanics on average have less income than Whites with the same education levels, and less wealth at the same income levels (Williams, Priest, and Anderson 2016). However, there has been insufficient attention to the role of SES in response to health *interventions* within racial/ethnic groups. and even less attention to these issues as they affect recruitment and retention in interventions. Research that disaggregates intervention outcomes by race and/or socioeconomic status tells us only about the potential of these interventions to help those who participate. Not participating in or dropping out of an intervention excludes people from the potential benefits of that intervention and from analysis of its outcomes. Reporting of recruitment and retention statistics by race in health research has not been routine and knowledge about the effectiveness of recruitment strategies for enrolling and retaining a socioeconomically diverse group of under-represented racial minorities is limited (Bonevski et al, 2014; Caesar et al, 2017; Brand et al. 2019). The question of how social inequalities affect participation in health improvement efforts has -- profound implications for both research and program design. The unknown magnitude and direction of the differences between participants and non-participants complicates efforts to generalize research findings. From a programmatic point of view, differential subgroup participation in an intervention may undercut efforts to reduce health disparities.

This issue is of particular importance for community-based participatory research (CBPR) studies. CBPR has been defined as “a collaborative approach to research that equitably involves, for example, community members, organizational representatives, and researchers in all aspects of the research process” (Israel et al. 1998). While there are a variety of practices associated with CBPR, it commonly includes ongoing, extensive, and

iterative participation of community members in defining the research question, writing proposals, designing interventions, designing the research plans and instruments, recruiting participants, interpreting results, and writing and disseminating findings. CBPR explicitly values action in addition to research, with a goal of improving, not just understanding, health. It aims to change power relations and increase researchers' and community members' collective ability to identify community-level factors affecting health and design approaches for addressing those factors. CBPR processes are designed to create more equitable distribution of benefits (Wallerstein et al. 2018). Assessment of sub-group participation rates is thus well aligned with the goals and values of CBPR.

This paper addresses the following research questions:

1. Were we able to use our CBPR approach to recruit a socioeconomically-diverse population of African Americans with Type II diabetes?
2. Did retention in the study differ significantly by socioeconomic status?
3. Among those retained did change in blood sugar control differ by socioeconomic status?

## Materials and Methods

### Context

In 2005, the African-American Health Improvement Partnership (AAHIP) was created through a planning grant to the Duke Department of Community and Family Medicine from what is now known as the National Institute for Minority Health and Health Disparities, part of the National Institutes for Health. AAHIP consisted of: a research team (RT), comprising researchers from Duke University and two providers from a local community organization, the Community Health Coalition (CHC); and a Community Advisory Board (CAB), representing a spectrum of Durham, North Carolina's African-American and health care communities, e.g., health care providers, community advocates, people with diabetes, business people, ministers, and government officials. Two faculty from North Carolina Central University, a Historically Black University, were contracted to evaluate collaboration between the RT and the CAB. To launch this new partnership, the AAHIP RT and CAB decided to address type 2 diabetes among adult African Americans in Durham through a study we called the Diabetes Improvement Project (DIP). Diabetes is identified by the Durham County Health Assessment as demonstrating large racial disparities in mortality (DCHD 2003).

From its inception, the African-American Health Improvement Partnership (from here on referred to as AAHIP) of Durham, NC had a goal of serving African Americans at all socioeconomic status levels, in order to be able to adequately conduct sub-group analyses and to address our team's concern with meeting the needs of a broad population. Durham has a large, well established, middle and upper class African-American population dating back to the early 1900s, when African-Americans in the city responded to segregation by establishing their own bank, library, hospital, insurance company, and other institutions. North Carolina Mutual Life Insurance Company, founded in 1908, is the country's largest

African-American-owned financial institution (Franklin et al. 2000). At the time that the study began, best estimates indicated that 19% of African-Americans in Durham were living below the poverty level in 1999, in contrast to 23.6% nationally (Census 2000). In 1997, 21.9% of firms in Durham were minority-owned – approximately double the percentage for the state as a whole (Census 2000).

## Intervention

A DIP pilot study was developed based on CAB and RT insights and the existing literature. The pilot included a six-month intervention, combining one-on-one health coaching from professional community health educators (CHEs) with peer-led support groups. The intervention was designed to be patient-centered and built on existing social networks, particularly predominantly African-American churches, which provided a platform for support groups and recruitment of study participants. At each site, a paid AAHIP ‘ambassador’ helped with recruitment and led the support group. Ambassadors were trained in group facilitation and provided with resources and support by the health education staff. Meetings were held twice/month, but each group decided when and where it would meet, the format of its meetings, and the content. On an individual basis, participants set their own goals with the help of health educators, were provided with individualized education and referrals, and met health educators at the location that best suited them, or by phone if the participant preferred. The goal was for health educators to meet with participants once a month, but health educators were available for additional sessions and actual utilization depended on the participant.

## Recruitment of Study Participants

During the pilot phase of DIP, support group sites were limited to African American churches. Upon review of pilot results, we were concerned that we had not adequately recruited individuals of lower socioeconomic status. 74.2% (95% CI 66.7%–82.0%) of pilot participants had some education beyond high school, vs. 56.1% of African Americans in Durham at the beginning of the decade (Census 2000). In addition, only 8.1% (95% CI 3.6%–13.2%) were uninsured, at a time when adult uninsurance rates in Durham County were approximately double that rate.<sup>1</sup>

For the full intervention study, therefore, conducted from 2009–2012, we drew broadly on community expertise in the RT and CAB to broaden our sample. We identified recruitment/support group sites beyond churches and expanded referral sources. In the end, we established support groups in 20 churches (all but one predominantly African American) and four other community sites (one service agency, one subsidized housing facility for elderly/disabled, one predominantly African-American Shriner/Masonic Lodge, and a conference room at the NC Mutual Life Insurance headquarters that drew attendees from around the county. We recruited intensively through these sites, as well as at health fairs. As in the pilot, we received some referrals through a limited number of provider offices. We also developed a significant new referral source in the form of Local Access to Coordinated Health Care, a care management program for the uninsured. Moreover, as the project evolved, the CAB

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<sup>1</sup>County adult uninsurance rates were estimated using historic data from the Durham County Health Assessment.<sup>32</sup> (DCHD 2011)

went from advising the RT on recruitment strategies to active involvement in the recruitment process – developing new recruitment materials, using their contacts to give us new points of entrée, and proactively spreading news about the study through word-of-mouth.

### Study Participants

Participants were community-dwelling African Americans, ages 18+, who lived, worked, or attended church in the vicinity of Durham County, and who reported a physician-diagnosis of type 2 diabetes. Individuals wishing to join the project who did not have that diagnosis were enrolled and screened (HbA1c and glucose). If they were in the diabetic range they were asked to provide confirmation of their diabetes diagnosis by a physician. If they were subsequently found not to be diabetic, they were removed from the study. Individuals participating in another diabetes management program/study (other than standard provider care) at the time of the research were excluded if that program/study was judged to be sufficiently intense (ex. participation in a clinical drug trial) to influence DIP study results.

### Data Sources

Clinical measurements and written surveys of knowledge, attitudes, and behavior were administered at baseline and six-month follow up.

### Metrics

For the purposes of this paper, there were two key dependent variables: retention in study, and change in HbA1c (3-month average blood sugar) from baseline to end-of-study. Retention was operationalized as completion of six-month measurement, with attrition being the inverse of retention. HbA1c was measured by trained staff using a DCA2000; measurement took place at time of enrollment and 6 months later (within a 90-day window following that date). Measurement was usually done at an enrollment event or an end-of-study measurement event. When participants could not make these events, measurements were taken by the CHE in their homes. The DCA2000 was recalibrated every time it was moved to a new location.

Our goal was to understand the role of socioeconomic status in these two outcomes; primary SES variables were education, average income per household member, and insurance status (some vs. none). To identify potential co-variates for multiple regression, we conducted bivariate analysis on demographic, health status, and psychosocial variables. Those included in multivariate analysis were: 1) identified as important because they were significantly associated with the outcome in bivariate analysis or were required for face validity and 2) had sufficient non-missing data to maintain adequate sample size for analysis. Details on these variables and how they were operationalized are provided in Table 1.

### Analysis

Analyses of retention involved comparison of sub-groups within the enrolled study population; analysis of change in blood sugar involved comparison of sub-groups within the retained study population. In addition to socioeconomic status, other metrics were included in the latter analyses as potential confounders or mediating variables. These were age, gender, stress, depression, perceived health, perceived impact of diabetes on finances,

perceived impact of diabetes on relationships, perceived impact of diabetes on time with friends, life satisfaction, self-assessed social status, ability to control diabetes, use of support groups, use of community health educators, baseline HbA1c, and score on the Diabetes PAID scale. The PAID (Problem Areas in Diabetes) measures emotional distress (e.g., fear, worry, and anger) associated with having diabetes. (Polonsky et al. 1995)

Bivariate associations between categorical variables were assessed using Pearson's chi-square. Bivariate associations between categorical and continuous variables were testing using independent t-tests of means. Multiple logistic regression was conducted for retention, using variables found to be associated with the dependent variable in bivariate analysis, and multiple linear regression for change in HbA1c. The threshold for statistical significance was  $p < .05$ .

We also provide a descriptive comparison of the study population and the pilot to address our effectiveness in increasing recruitment of lower SES participants.

## Results

### Recruitment

451 individuals enrolled in the study. Of these, 71 (15.7%) were withdrawn or withdrew; of these 71, 46 (64.8%) were lost to contact before completion of baseline data collection, 11 (15.5%) withdrew voluntarily, 7 were deemed ineligible or were unable to confirm eligibility (9.9%), 4 (5.6%) died, and 3 (4.2%) moved out of the county. This left an enrollment group of 380 individuals. Our change in recruitment strategy from the pilot to the main study was effective in changing the composition of our study participants. As shown in Table 2, the participants in the full intervention study were less likely than those in the pilot ( $n = 121$ ) to have any formal education beyond high school (63.2% (95% CI: 58.3–68.0%) vs. 74.2% (95% CI: 66.6–82.2%) in pilot) and less likely to have insurance (67.7% (95% CI: 62.9–72.3%) vs. 91.9% (95% CI 86.8–96.6%) in pilot). Average household income per person was lower in the full study than in the pilot (\$19,263 vs. \$25,103).

### Retention

Of the 380 enrollees, 323 or 85% were retained. The retained population can be described as high-need, with 28.7% uninsured. However, those retained were older, more educated and more likely to have insurance than those who left the study. They also had higher incomes per household member. Their baseline HbA1c was lower than that of those who were not retained, and they scored lower on PAID, signifying less diabetes-related distress. All of these differences were significant in bivariate analysis. Income per household member was not included in the multiple regression because of a large number of missing values and collinearity with education. As shown in Table 2, in multiple logistic regression, education had near-significance with a p-value of .08, but insurance coverage lost significance. Age and baseline HbA1c were both significant. Baseline HbA1c was also inversely correlated with SES in bivariate analysis. These results together suggest that baseline blood sugar control may play a partial mediator role in the relationship between SES and retention.



## Change in Blood Sugar

On average, the six-month change in HbA1c for study participants was  $-0.36$  (baseline  $=7.96$ , follow-up  $=7.60$ ). Socioeconomic status was not associated with the degree of change in bivariate analysis or, as shown in Table 3, multiple regression. Higher baseline HbA1c was associated with greater reductions in blood sugar, a finding that was statistically significant in both bivariate analysis and multiple regression. Lower self-reported ability to control diabetes at baseline was also associated with greater reductions in HbA1c.

## Discussion

In this study of peer support and professional coaching for African Americans with type 2 diabetes, there was an average six-month change in HbA1c of  $-.36$ , with no association between SES and change in blood sugar. Given the large literature indicating a positive association between SES and health, this result may be surprising. Two potential explanations might account for this result. First, the finding is consistent with Minorities Diminished Returns theory; i.e., perhaps we should not expect a significant association between SES and change in blood sugar in response to this intervention because the association between SES and health is much smaller for African Americans than for Whites. Alternatively, the lack of association between SES and blood sugar change could be due to the greater attrition of individuals from lower SES backgrounds, which would have reduced SES variation among those completing the intervention making it more difficult to detect an association between SES and blood sugar change.

Either way, if we assume that retention in the study was associated with greater reduction in blood sugar than leaving, then the study findings suggest that SES *did* play a role in potential benefit from the study – not necessarily because of an association with blood sugar change among those retained, but because of the greater attrition among lower SES participants. We cannot know whether the assumption of greater blood sugar reduction among retainees is correct. At a minimum, however, this finding underscores the importance of subgroup analyses focused on socioeconomic status in intervention research aiming to improve the health of US racial minorities.

That said, our research speaks to the potential benefits of studies like this one for lower SES African Americans. Changes in recruitment strategy made in response to the high socioeconomic status composition of our pilot study improved enrollment of individuals from lower socioeconomic backgrounds. With a retention rate of 85%, this study, like some other CBPR interventions was effective in recruiting and retaining an under-served racial minority population (Yancy, Ortega, and Kumanyika 2006), many of whom ( $> 25\%$ ) had no health insurance.

Nonetheless, those who were retained were more educated and more likely to have health insurance and higher incomes than those who left the study, underscoring the challenges of providing equal benefits across socioeconomic status strata even when serving a single racial group, employing a patient-centered approach, and following CBPR principles. Hence, our findings may indicate a need for more tailored interventions, or minimally, increased attention within CBPR interventions to participation barriers that disproportionately impact

individuals from lower-socioeconomic backgrounds. Our multiple regression findings indicate that higher baseline HbA1c may play a mediator role in the relationship between SES and retention. Therefore, future research might proactively allocate greater support resources early on, to those with higher baseline HbA1c

## Conclusion

Our CBPR intervention successfully recruited a reasonably large and socioeconomically diverse group of African Americans living with Type 2 diabetes in a mid-size city in the Southeastern US. While retention was quite high overall, individuals who had fewer economic resources and higher baseline blood sugar were more likely to drop-out prior to completing the intervention (with baseline blood sugar seeming to play a partially mediating role in the relationship between SES and retention). Even though higher baseline blood sugar was associated with a greater likelihood of dropping out, among those who remained in the study, higher baseline blood sugar (as well as less baseline ability to control diabetes) was associated with greater improvements in blood sugar control. Other things being equal, this suggests that those who dropped out might have been among the greatest beneficiaries of the intervention. Collectively, then, our findings not only underscore the importance of reaching socioeconomically diverse racial minority populations with CBPR interventions, but also challenges likely to be encountered when attempting to address their diverse needs. Different projects will present different challenges, and thus require approaches tailored for a specific setting; but as a general proposition, our experience underscores the importance of developing a sound, empirically-based understanding, early on, of study participants' baseline health conditions, and how their financial, social, and psychological resources might influence their ability to fully engage and benefit from the intervention. Our study provides additional evidence that CBPR is not just for the poor, but holds promise for helping a broad spectrum of individuals, including middle-class African Americans, pursue and perhaps achieve higher levels of health and wellbeing.

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**Table 1.****VARIABLES**

<b>Variable</b>	<b>Source</b>	<b>How Operationalized</b>
Retention	Study administrative records	Completion of six-month data collection
Change in HbA1c	DCA2000	Change in HbA1c from time of enrollment to six-month follow-up
Education	Survey	Six ordinal response options to question of highest grade/year of school completed. Collapsed into three categories for regression analysis (high school education or less, some college, college completion or more) and two (high school or less, some college or more) for point estimates comparing pilot and main study.
Income	Survey	Income per household member calculated using response to two questions: household income and number of household members. Household income had six ordinal response options of dollar ranges. For income per household member, used range midpoint.
Insurance	Survey	Multiple response options collapsed to some insurance and none for analysis purposes
Gender	Survey	Male/female
Baseline HbA1c	DCA2000	HbA1c at time of enrollment
Diabetes Worry Score	Survey	Problem Areas in Diabetes Scale or PAID (Polonsky et al, 1995)
Diabetes Control Ability Score	Survey	Diabetes Care Profile Self-Care Ability Scale (Fitzgerald et al, 1996)

**Table 2.**

## REGRESSION ON RETENTION (n=380)

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Quare	Pr>Chi-Square
Intercept	1	0.4977	1.1240	0.1961	0.6579
Age	1	0.0372	.0144	6.6869	0.0097
Education	1	0.3837	0.2197	3.0499	0.0807
Health Care Coverage	1	0.3099	0.2022	2.3496	0.125
HbA1c (baseline)	1	-0.1590	0.0677	5.5094	0.018
Diabetes Worry Score	1	-0.00497	0.00864	0.3309	0.5651

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**Table 3.**REGRESSION ON 6-MONTH CHANGE IN HBA1C (n=296)<sup>\*,\*\*</sup>

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr> t
Intercept	1	5.27409	0.80404	6.56	<.0001
Age	1	-0.00587	.00768	-0.76	0.4453
Education	1	-0.14184	0.09955	-1.42	0.1553
Health Care Coverage	1	-0.07152	0.10557	0.68	0.4987
Male Gender	1	-0.08558	0.17383	-0.49	0.6229
HbA1c (baseline)	1	-0.49917	0.04050	-12.33	<.0001
Diabetes Worry Score	1	0.00399	0.00505	0.79	0.4295
Diabetes Control Ability Score	1	-0.09585	0.02935	-3.27	0.0012

\* Cases missing data for one or more of the variables were removed from the data set, resulting in a sample size of 296.

\*\* Negative sign indicates improvement in blood sugar.

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