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Self Management

# Do pre-existing diabetes social support or depressive symptoms influence the effectiveness of a diabetes management intervention?

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ABSTRACT

*Objective:* Examine influences of diabetes-specific social support (D-SS) and depressive symptoms on glycemic control over time, among adults randomized to a diabetes self-management education and support (DSME/S) intervention or usual care.
*Methods:* Data were from 108 African-American and Latino participants in a 6-month intervention trial. Multivariable linear regression models assessed associations between baseline D-SS from family and friends and depressive symptoms with changes in HbA1c. We then examined whether baseline D-SS or depression moderated intervention-associated effects on HbA1c.
*Results:* Higher baseline D-SS was associated with larger improvements in HbA1c (adjusted ΔHbA1c −0.39% for each +1-point D-SS, $p = 0.02$), independent of intervention-associated HbA1c decreases. Baseline depressive symptoms had no significant association with subsequent HbA1c change. Neither D-SS nor depression moderated intervention-associated effects on HbA1c.
*Conclusions and practice implications:* Diabetes self-management education and support programs have potential to improve glycemic control for participants starting with varying levels of social support and depressive symptoms. Participants starting with more support for diabetes management from family and friends improved HbA1c significantly more over 6 months than those with less support, independent of additional significant DSME/S intervention-associated HbA1c improvements. Social support from family and friends may improve glycemic control in ways additive to DSME/S.
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## 1. Introduction

Improving glycemic control among adults with diabetes is important to decreasing mortality and morbidity from this increasingly common condition. Improvement of glycemic control is especially important among urban, low-income Latino and African American adults with diabetes who, on average, have worse glycemic control than non-Latino white adults with diabetes [1]. Efforts to improve glycemic control through diabetes self-management education and support (DSME/S) are widespread and often successful [2,3]. However, the effectiveness of DSME/S interventions varies widely across studies and, within studies, across individual participants [4–6].

To date, little is known about patient-level factors that influence the effectiveness of diabetes interventions in improving glycemic control. Several studies have shown that participants starting with higher levels of HbA1c are more likely to benefit from DSME/S [7–10]; and one review found a stronger effect with higher patient age [11]. However two recent systematic reviews of self-management interventions concluded that there is very little information available about which subgroups of patients (e.g. age, gender, or race/ethnicity) will benefit more from these interventions [12,13]. In particular, psychosocial factors known to affect diabetes management in observational studies have rarely been examined as moderating factors in DSME/S effectiveness, even though they have often been theorized to affect the potential to benefit from diabetes treatment [14]. The exception is patient

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health literacy, which was found not to moderate DSME/S effectiveness in one study [15], but in another study patients with low health literacy benefited from a DSME/S intervention more than those with high health literacy [16].

Two factors that observational studies suggest may be especially important in influencing whether participants fully benefit from DSME/S interventions are: (1) the level of social support participants receive from family and friends; and (2) whether participants are experiencing depressive symptoms. In semi-structured interviews, adults with diabetes named diabetes-specific social support from family and friends as a critical factor when initiating or sustaining changes in self-management routines [17–21]. Social support itself is defined as "an exchange of resources between at least two persons, aimed at increasing the well-being of the receiver" [22]. Diabetes-specific social support (D-SS) refers to social support for diabetes care tasks, and is frequently studied in the context of laypeople such as family members, friends, or peers with diabetes. In observational studies, higher levels of social support are associated with better diabetes self-management, including better medication adherence, consistent blood glucose monitoring, healthier eating, and more physical activity [23,24]. However, a direct association between D-SS and subsequent glycemic control has not been conclusively established, and most previous studies of the association between social support and glycemic control have been limited by cross-sectional design [25–30]. In addition, no known previous studies have examined whether people starting a comprehensive diabetes management intervention with low social support have more improvement in their glycemic control from the intervention.

Higher levels of depressive symptoms have been more conclusively linked with worse glycemic control among people with diabetes, particularly through worse self-management behaviors [31–33]. It should be noted that depressive symptoms, defined as a count of the number or severity of symptoms of major depressive disorder not associated with a particular life circumstance, is a distinct entity from diabetes distress, defined as emotional distress linked specifically to diabetes and its management. Key studies have demonstrated that patients' depressive symptoms affect diabetes management differently than diabetes distress [34,35]. Improving depressive symptoms concurrently with diabetes self-management has been attempted in a few specialized DSME/S interventions, while improving diabetes distress is often a core goal of general DSME/S. No known previous studies have examined whether pre-existing depressive symptoms moderate the effectiveness of a general DSME/S intervention.

We sought to address these gaps in knowledge by examining the influences of baseline D-SS and depressive symptoms, separately and together, on changes in glycemic control over a 6-month period among adults who were randomized to receive either a comprehensive DSME/S intervention or usual care over that time period. We hypothesized that higher baseline levels of D-SS and lower baseline levels of depressive symptoms would be associated with larger subsequent improvements in HbA1c among participants in both groups. We were uncertain, however, whether baseline D-SS or depressive symptoms would moderate the ability of those in the intervention group to improve their glycemic control, beyond any improvements made by the control group. It is possible that a diabetes intervention would be more beneficial to those with depressive symptoms or without other sources of support for diabetes management. On the other hand, because DSME/S interventions most often focus on individuals and not their support systems or mental health, it is possible that those with better pre-existing social support and mental health would be better able to engage in the intervention to make greater improvements in glycemic control.

## 2. Methods

### 2.1. Intervention content, participants, and overall effectiveness

We analyzed data from a randomized-controlled trial of a culturally tailored, empowerment-based [36], community health worker (CHW)-led intervention that aimed to improve diabetes self-management and glycemic control. The intervention design, implementation, and outcomes have been described in detail elsewhere [37–40]. The intervention was developed, conducted, and evaluated by a collaborative of community, health system, and academic partners (the REACH Detroit Partnership) using community-based participatory research (CBPR) principles. [41]. The study was approved by the University of Michigan and Henry Ford Health System Institutional Review Boards.

Participants were African-American or Latino adults with type 2 diabetes, identified from medical records at a federally-qualified community health center and an urban health care system. Eligible participants lived in pre-specified zip codes in either eastside Detroit, which is predominantly African-American (80%) and had a median household income of $25,020, or southwest Detroit, whose residents are predominantly Latino (70%) and had an annual median household income of $11,000, based on 2007 U.S. Census statistics. Individuals found to have serious diabetes-related complications, such as kidney failure (defined as being on dialysis), on a screening survey were excluded. The 6-month intervention included CHW-delivered group diabetes management classes, home visits to help participants set and follow up on diabetes management goals, and accompaniment to physician appointments to model activated participation. Neither increasing diabetes social support from family and friends, nor reducing depressive symptoms were goals of the intervention. Participants were individually randomized between September 2004 and July 2006 to either receive the 6-month intervention or usual care. Due to concern about certain participants' need for prompt assistance with severe medical conditions, the participating health centers requested that five participants originally randomized to the control group be switched to the intervention group. In as-randomized, intention-to-treat analyses, intervention participants had an −0.8% additional decrease in HbA1c over the 6-month study period as compared to control participants [37].

### 2.2. Independent variable measures

Independent variables were measured through survey instruments with validated scales. Surveys were conducted in participants' homes at enrollment, 6 months, and 12 months after enrollment, in either English or Spanish. Diabetes social support was measured with the Diabetes Care Profile [42,43] on a 0–4 scale, with higher scores indicating more D-SS (Cronbach alpha in our sample 0.95). The PHQ-9 [44] was used to measure depressive symptoms, raw scores ranged from 0 to 27; for this analysis raw scores were multiplied by 4/27 to create a 0–4 scale to facilitate comparisons with D-SS (Cronbach alpha in our sample 0.83). Other variables measured with survey data included sex, age, race/ethnicity, education level, year of diabetes diagnosis, marital/partner status, diabetes medication regimen, and self-rated health status with the SF-1 [45].

### 2.3. Primary outcome measure

Our main outcome measure for this study was change in HbA1c, from baseline to 6-months. Participants were asked at the time of their baseline and 6-month interviews to go to the laboratory at their health care site within 1 week to give samples for HbA1c analysis. All recruitment sites sent lab samples to the central

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