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Is Relationship Quality Linked to Diabetes Risk and Management?: It Depends on What You Look At

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Introduction: Although the quality of marriage and marriage-like relationships (e.g., cohabitation) has been linked to the risk of developing diabetes and being able to effectively manage the disease once developed, it is unclear which aspects of marital quality drive these associations. ***Method:*** Using nationally representative data (Midlife in the United States, $N = 800$), the present study therefore examines how aspects of marriage (e.g., strain, support, marital risk, and constructive communication) are linked to diabetes outcomes and whether these links vary as a function of sociodemographic characteristics related to health (e.g., gender, race, and income). ***Results:*** Strain and marital risk were linked to an increased risk of developing diabetes and strain and poor communication were linked to an increased risk of poor diabetes management. Finally, marital support was linked to a lower risk of diabetes but only for those with lower income. ***Discussion:*** These findings inform prevention and intervention programs focusing on social support mechanisms to potentially reduce the risk of developing diabetes (e.g., reduced marital strain and marital instability) and improving diabetes control (e.g., improved communication and reduced marital strain).

Keywords: romantic relationships, diabetes risk, diabetes management, social determinants of health

Diabetes is one of the fastest growing chronic diseases and is an emerging global epidemic (World Health Organization [WHO], 2011). In the U.S., 29.1 million individuals have developed diabetes with 37.8% (8.1 million) of them being undiagnosed (Centers for Disease Control and Prevention [CDCP], 2014). The majority of cases are preventable with simple diet and exercise (CDCP, 2011; WHO, 2011). For those already diagnosed with diabetes, management of the disease requires changing many aspects of their daily behaviors (e.g., increasing exercise and healthy eating, adhering to medication regimen; American Association of Diabetes Educators, 2008). In addition to an individual's health behaviors, their social context (e.g., support from a marriage), has consistently been linked to lower risk for diabetes and more effective management of the disease. Although support and the quality of the marriage providing the support are clearly linked to diabetes outcomes (Bailey & Kahn, 1993; Seidel, Franks, Stephens, & Rook, 2012), it is less clear how and to what extent *specific* aspects of the marriage (e.g., communication, strain, support, stability) contribute uniquely to diabetes risk and diabetes management. The risk of diabetes and its effective management can also differ depending on sociodemographic determinants of health including gender, race, and income (CDCP, 2011, 2014; Hsu et al., 2012). It is quite possible that marital quality may alter the risk of developing diabetes or the ability to manage the disease differently depending on specific demographic characteristics. The present study will examine how different aspects of

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marriage are related to diabetes risk and management and if the association differs by gender, race, and income.

Marital Quality and Diabetes

There are two prominent explanations of *why* marital quality is linked to diabetes risk (Whisman, Li, Sbarra, & Raison, 2014) and management (Beverly, Miller, & Wray, 2008; Chopik & O'Brien, 2017): physiological and behavioral. An individual's physiological response to stress in the marriage (e.g., interluken-6 [IL-6], metabolic syndrome [MetS]) is hypothesized as the mechanism linking marital quality and health outcomes in general (Kiecolt-Glaser, Gouin, & Hantsoo, 2010; Wood, 1993; Woods, in press) and specifically to diabetes outcomes (Ford, Li, & Sattar, 2008; Spranger et al., 2003). In fact, there is empirical evidence that positivity and negatively in the marriage is linked to IL-6 (Uchino et al., 2013; Whisman & Sbarra, 2012) and MetS (Whisman & Uebelacker, 2012; Whisman, Uebelacker, & Settles, 2010). These elevated physiological responses to stress reduce effective blood glucose (A1c) regulation (Collier, Dossett, May, & Diaz, 2008; Donath, & Shoelson, 2011; Goetsch, Wiebe, Veltum, & Van Dorsten, 1990) and increase the risk of developing diabetes or difficulty in managing the disease.

There are mixed findings, however, for studies that examine the association between marital quality and blood glucose (A1c). Some studies find that marital quality is not linked to A1c (Olson, Trevino, Islam, & Denner, 2010; Trief, Grant, Elbert, & Weinstock, 1998; Trief, Himes, Orendorff, & Weinstock, 2001; Trief, Wade, Britton, & Weinstock, 2002) whereas others find that marital stress (Trief et al., 2006) and spousal criticism are linked to higher A1c (Klausner et al., 1995). However, marital support is a possible buffer against the negative effects of life stress on A1c (Griffith, Field, & Lustman, 1990). One study provided insight into the potential complexity of the association between family dynamics and A1c control by showing that negative family behaviors were linked to A1c only when family support and individual medical literacy were considered (Mayberry, Rothman, & Osborn, 2014). These inconsistent findings may reflect the failure to assess the specific aspects of marital quality that elicit a physiological stress response and thus, reduces A1c regulation. Therefore, it is important to determine which specific aspects of marital quality are linked to diabetes outcomes in order to understand diabetes risk and mismanagement.

Health behaviors also link marriage to diabetes outcomes through social promotion or learned behaviors (e.g., diet, exercise Beverly et al., 2008; Chopik & O'brien, 2017; Kiecolt-Glaser & Newton, 2001; Weihs, Fisher, & Baird, 2002). For diabetes management, there are inconsistent findings when examining the link between marital quality and specific diabetes maintenance behaviors. For example, marital support is linked to maintenance behaviors such as diet, following physician recommendations, and blood glucose control but not but glucose testing and exercise (Trief, Ploutz-Snyder, Britton, & Weinstock, 2004). Emotional marital support is only linked to dietary adherence (Miller & Brown, 2005). The reason for these mixed findings may be that individual responses are different depending on the type of support given. The inconsistency of responses could also reflect the quality of the marriage in which the support is provided as both agreed expectations of support (Seidel et al., 2012) and the perception of partner's motivation for support (August, Rook, Franks, & Parris Stephens, 2013; Bailey & Kahn, 1993) can influence the effectiveness of the support on changes in health behaviors. Therefore, it is not just the presence of marital support that improves diabetes health outcomes, but the quality of the relational context in which it is provided (Bailey & Kahn, 1993; Rosland, Heisler, Choi, Silveira, & Piette, 2010). These mixed findings may be attributed to different forms of support (emotional vs. instrumental) in addition to the quality of the marriage in which the support is provided. Better understanding of the influence of specific aspects of marital quality may help clarify current, mixed findings. Therefore, we will first examine how multiple aspects of marital quality may each contribute to diabetes risk and management (Research Question 1).

Sociodemographic Determinants of Health and Diabetes

The likelihood of developing diabetes varies across demographic groups. Latinos and African Americans are more likely to develop dia-

betes compared with Whites (CDCP, 2014), a higher percentage of men (13.6%) develop diabetes compared with women (11.2%; CDCP, 2014), and individuals living under the poverty line have a 2.2 greater likelihood of developing diabetes compared with their middle-income peers (Hsu et al., 2012). Among those who have developed diabetes, some groups tend to have poorer management of the disease. For example, compared with Whites, African Americans and Latinos are more likely to have poorer blood glucose control and poorer medication adherence (Mayberry et al., 2016), however, Latinos have better diets compared with the other groups. As regards gender, stress from diabetes may impact men more than women (Franks, Lucas, Stephens, Rook, & Gonzalez, 2010) and therefore lead to more difficulty managing the disease. Finally, low-income individuals are more likely to mismanage their diabetes. For example, they are less likely to visit diabetic clinics (Hsu et al., 2012).

There is limited but promising data that marriages may impact diabetes outcomes depending on demographics. For instance, Latinos and African Americans rely more on friends and family for social support whereas White patients rely more on support from medical and health professionals (Strom & Egede, 2012). For White and Latino patients, distinct aspects of family life are linked to diabetes management behaviors (Fisher et al., 2000). This could indicate that marriage differentially affects diabetes outcomes across racial/ethnic groups as they differ in preferred source of support.

For gender, there is also limited evidence that marital quality may differentially be linked to diabetes outcomes. Women receive less marital support than men (Iida, Parris Stephens, Rook, Franks, & Salem, 2010) and report more relational barriers in diabetes related self-care compared to men (Rosland et al., 2010). Whereas marital context may differentially impact diabetes depending on gender and race, there is a gap in the literature regarding poverty. Because of the differential rates of diabetes outcomes and the limited research on sociodemographic differences, the present study will also explore how aspects of marital quality differentially impact diabetes risk and management by, race, gender and poverty status (Research Question 2).

Method

Participants

Participants comprised two samples from the national Midlife in the United States (MIDUS) data set. MIDUS sampled participants across the United States. For the present study, we extracted two subsamples from the full MIDUS sample. The *diabetes risk sample* (Sample 1, $N = 800$) included participants who completed the MIDUS II survey (main study; 2004–2006) and the MIDUS II, Project 4 (biomarker project; 2004–2009) and reported being in a marriage at MIDUS II. The *diabetes management sample* (Sample 2, $N = 125$), was limited to those in the diabetes risk sample who had developed diabetes. All participants were in marriage or marriage-like relationships (i.e., cohabitation). Demographic information for each sample are presented in Table 1.

Procedures

Data for this study come from the Project 1 (phone interview) of MIDUS II (Ryff et al., 2012) and Project 4 (biomarker study) of MIDUS II (Ryff, Seeman, & Weinstein, 2013). The original MIDUS I study is a publicly available national dataset which recruited a total of 3,487 participants. The present study only uses MIDUS II which is a follow up and extension of the original MIDUS study. The goal of the MIDUS studies is to "delineate the biopsychosocial pathways through which converging processes contribute to diverse health outcomes" (Singer & Ryff, 1999, p. 18) and they have a wide range of telephone survey questions and subprojects to target specific biopsychosocial pathways including cognition study, twin study, and a biomarkers study. Project 4, used in this study, was specifically designed to obtain biomarkers of health for a subsample ($n = 1,255$) of MIDUS II participants. Participants in Project 4 also participated in MIDUS II and completed a 2-day clinical visit where samples of saliva, blood, and urine were drawn, blood pressure, medication usage, and heart rate variability were assessed, and a comprehensive physical exam was given. Participants also completed a self-reported health exam. Data for this project was completed between 2004 and 2009. A complete description of the protocol is de-

Table 1
Descriptive Statistics of the Diabetes Risk Sample (Sample 1; N = 800) and the Diabetes Management Sample (Sample 2; N = 125)

	Sample 1	Sample 2
	M (*SD*) or %	*M* (*SD*) or %
Gender		
Women	50.1%	43.2%
Men	49.9%	56.8%
Age	55.00 (11.54)	66.33 (11.00)
Annual income	$1,785.00 (7,298.00) Median = $.00	$1,806.00 (4,804.09) Median = $.00
Government assistance		
Yes	13.8%	16.8%
No	86.2%	83.2%
Race		
White	89.0%	88.0%
African American	2.3%	3.2%
Latino	3.8%	3.2%
Native American	2.8%	4.0%
Other	<1%	<1%
Diabetes		
Yes	15.6%	—
No	84.4%	—
Controlled	—	19.2%
Uncontrolled	—	47.2%
Undiagnosed	—	31.2%

scribed in Love, Seeman, Weinstein, & Ryff (2010) and on the project website: http://midus.wisc.edu/scopeofstudy.php.

Measures

Outcome variables. *Diabetes risk* was coded to identify who, among those married ($N = 800$), had diabetes (1 = *diabetic*) and who did not have diabetes (0 = *nondiabetic*). To identify those with diabetes we used a previously established method (Liu, Waite, & Shen, 2016). Individuals were coded as diabetic in two ways: (a) if they self-reported being diagnosed with diabetes in MIDUS II, Project 1 and/or; (b) if their blood glucose (A1c) level collected in MIDUS II, Project 4 reached the threshold of diabetes in accordance with the American Diabetes Association, A1c $\geq$ 6.5% (American Diabetes Association, 2010). The second method effectively included participants who were undiagnosed with diabetes as *diabetics*. All other participants were coded as *nondiabetic*. In total, 15% were coded as having diagnosed or undiagnosed diabetes.

Diabetes management was coded using the *diabetic* subsample ($N = 125$) of the diabetes risk sample. Diabetes management was coded using variables from both Project 1 (self-reported diabetes diagnosis) and Project 4 (A1c blood draw). Individuals were coded into three categories: (a) *controlled* = diagnosed with diabetes and their blood glucose was under control (19.2%); (b) *uncontrolled* = diagnosed with diabetes and their blood glucose is not under control (47.2%); and (c) *undiagnosed* = undiagnosed with diabetes and their blood glucose is not under control (31.2%). This coding method to identify diabetes management categories have been previously established (Liu et al., 2016).

Marital quality variables. All marital quality variables were developed by MIDUS (Singer & Ryff, 1999) and collected during MIDUS II, Project 1. *Marital strain* is an average of six items (e.g., "How often does your spouse or partner make too many demands on you?" and "How often does he or she argue with you?") with response options ranging from 0 = *never* to 3 = *often*. Internal consistency was adequate (Cronbach's alpha = .88) and the average of the combined scale was 1.16 ($SD = 1.17$). *Marital support* is an average of six items (e.g., "How much do you rely on him or her [your partner/spouse] for help if you have a

serious problem?" and "How much does your spouse or partner really care about you?") with response options ranging from 0 = *not a lot* to 3 = *a lot*. Internal consistency was adequate (Cronbach's alpha = .90) and the average score on the combined scale was 2.62 (*SD* = 2.83). *Marital risk* was the summed score of two items: *relationship trouble* ("During the past year, how often have you thought your relationship might be in trouble?"; 0 = *never* to 4 = *all the time*) and *separate risk* ("It is always difficult to predict what will happen in a relationship, but realistically, what do you think the chances are that you and your partner will eventually separate?"; 0 = *not likely at all* to 3 = *very likely*). Internal consistency was adequate (Cronbach's alpha = .71) and the totaled sum had an average of 1.09 (*SD* = 1.49). *Constructive communication* was a sum of four items (e.g., "My partner and I are a team when it comes to making decisions," and "When I have to make decisions about medical, financial, or family issues, I ask my partner for advice") with response options ranging from 0 = *strongly disagree* to 7 = *strongly agree*. Internal consistency was adequate (Cronbach's alpha = .90) and the totaled sum had an average of 20.82 (*SD* = 4.46).

Sociodemographic determinants of health (SDDH). *Gender* was reported by the respondent (0 = woman [50.1%], 1 = man [49.9%]). *Government assistance* used as a potential indicator of poverty and income. Government assistance was coded from multiple self-reported items. Participants who reported no form of government assistance were coded as 0 = no (83.2%); Participants who had one or more form of government assistance (e.g., food stamps [1.6%], temporary assistants for needy families [.2%], welfare benefits [.7%], social security disability [3.7%], unemployment [6.2%], other disability [2.8%], veteran's benefits [4.9%], supplemental security income [3.3%]) were coded as 1 = yes (16.8%). *Race* was coded as a dichotomous variable based on self-report (0 = *White/Caucasian* [89.0%], 1 = *race/ethnic minority* [11.0%]).

Results

Marital Quality and Diabetes Risk/Management

First, we used logistic regression models in Mplus to examine how components of marital quality were linked to diabetes risk while controlling for the moderation variables (see Table 2). Marital risk was linked to an 18% greater likelihood of having diabetes and marital strain was associated with a 56% greater likelihood of having diabetes.

Next, we examined four multinominal logistic regressions in Mplus to examine how components of marital quality were linked to diabetes management with "controlled diabetes" as the reference group controlling for SDDH (see Table 3). Constructive communication reduced the likelihood of having uncontrolled

Table 2
Logistic Regression Results for Marital Risk, Constructive Communication, Spousal Support, and Spousal Strain Predicting Diabetes Risk ("No Diabetes" as the Reference Group; N = 800)

	Model 1: Marital risk		Model 2: Decision making		Model 3: Spousal support		Model 4: Spousal strain	
	B (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e
Marital risk	**.17 (.09)***	**1.18**	—	—	—	—	—	—
Decision making	—	—	−.02 (.03)	.98	—	—	—	—
Spousal support	—	—	—	—	−.23 (.24)	.80	—	—
Spousal strain	—	—	—	—	—	—	**.45 (.19)***	**1.56**
Gender	.25 (.22)	1.28	.27 (.22)	1.31	.25 (.22)	1.28	.26 (.22)	1.29
Race	.05 (.35)	1.05	.06 (.35)	1.06	.08 (.35)	1.08	.09 (.35)	1.10
Govt asst.	−.08 (.30)	.92	−.02 (.29)	.98	−.04 (.29)	.96	−.07 (.29)	.94

Note. Govt asst. = government assistance; B^e = Exponentiated parameter to interpret odds ratio. Bold estimates are statistically significant.
$^t p < .10$. $^* p < .05$.

Table 3
Multinomial Logistic Regression Results for Marital Risk, Constructive Communication, Spousal Support, and Spousal Strain Predicting Diabetes Management (N = 125)

	Model 1: Marital risk				Model 2: Constructive communication				Model 3: Spousal support				Model 4: Spousal strain			
	Uncont (1) vs. Cont (0)		Undiag (1) vs. Cont (0)		Uncont (1) vs. Cont (0)		Undiag (1) vs. Cont (0)		Uncont (1) vs. Cont (0)		Undiag (1) vs. Cont (0)		Uncont (1) vs. Cont (0)		Undiag (1) vs. Cont (0)	
	B (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e	*B* (*SE*)	B^e
Marital risk	.41 (.25)^t	1.50	.34 (.27)	1.41	—	—	—	—	—	—	—	—	—	—	—	—
Decision making	—	—	—	—	**−.36 (.13)***	**.70**	**−.33 (.13)***	**.72**	—	—	—	—	—	—	—	—
Spousal support	—	—	—	—	—	—	—	—	−1.64 (.89)^t	.19	−.30 (.88)	.27	—	—	—	—
Spousal strain	—	—	—	—	—	—	—	—	—	—	—	—	**1.00 (.44)***	**2.71**	**1.16 (.48)***	**3.20**
Gender	−.74 (.58)	.48	−.42 (.58)	.65	−.71 (.58)	.49	−.39 (.58)	.68	−.81 (.58)	.44	−.46 (.58)	.63	−.68 (.55)	.51	−.44 (.59)	.64
Race	−.41 (.81)	.66	−.56 (.58)	.57	−.75 (.92)	.47	−.82 (.96)	.44	−.60 (.81)	.55	−.63 (.88)	.53	−.34 (.77)	.71	−.59 (.94)	.56
Govt asst.	.01 (.68)	1.01	−.85 (.84)	.43	.33 (.74)	1.39	−.60 (.88)	.55	.25 (.68)	1.28	−.68 (.83)	.51	.22 (.66)	1.25	−.65 (.81)	.52

Note. Govt asst. = government assistance; B^e = Exponentiated parameter to interpret odds ratio. Bold estimates are statistically significant.
$^t p < .10$. $^* p < .05$.

diabetes by 30% and reduced the likelihood of having undiagnosed diabetes by 28%. Conversely, strain was linked to a 171% higher likelihood of having uncontrolled diabetes and a 220% higher likelihood of having undiagnosed diabetes.

Do Sociodemographic Determinants of Health Moderate Diabetes Risk?

To examine Research Question 2—whether the influence of marital quality components on diabetes risk was moderated by gender, race, or government assistance—interaction terms for the moderating variables were added to the same logistic regressions described above (see Table 4). The appropriate variables were centered in order to reduce multicollinearity and statistically significant interactions were probed with simple slopes analysis.

First, we examined marital support. Government assistance moderated the influence of support on diabetes risk such that support is not significantly associated with diabetes risk for individuals without government assistance ($B = -.39$, $B^e = .68$ $t = -.76$, $p = .44$). However, for individuals with government assistance, support was linked to 80% lower odds of developing diabetes ($B = -1.71$, $B^e = .20$, $t = -3.09$, $p < .05$).

The next significant interaction was with government assistance and constructive communication. Simple slopes revealed that neither individuals with government assistance ($B = -.24$, $t = -.05. = .96$) or those without government assistance ($B = -.40.$ $t = -.01$, $p = .99$) differed from zero though these groups differed from each other.

Do Sociodemographic Determinants of Health Moderate Diabetes Management?

Finally, we examined whether aspects of marital quality are linked to diabetes management differently depending on gender, race, and government assistance (see Table 5). Only one significant moderating effect emerged: Gender significantly moderated marital risk linked to uncontrolled versus controlled diabetes; however, simple slopes revealed that the associations did not differ significantly from zero for men ($B = 1.92$, $t = 1.14$, $p = .26$) and women ($B = 3.47$, $t = 1.58$, $p = .12$).

Table 4
Results of a Logistic Regression for Moderation Models for Spousal Strain, Spousal Support, Constructive Communication, and Marital Risk Predicting Diabetes Risk (N = 800)

	B (*SE*)	B^e
Model 1: Marital strain		
Spousal strain	**.44 (.18)***	**1.56**
Gender	.27 (.22)	1.31
Race	.14 (.35)	1.15
Gov't assistance	−.09 (.30)	1.15
Spousal Strain × Gender	−.47 (.35)	.62
Spousal Strain × Race	−.21 (.52)	.81
Spousal Strain × Govt asst.	.65 (.50)	1.91
Model 2: Spousal support		
Spousal support	−.39 (.23)^t	.68
Gender	.17 (.25)	1.19
Race	.13 (.36)	.14
Govt asst.	.23 (.35)	1.26
Spousal Support × Gender	.37 (.46)	1.45
Spousal Support × Race	.64 (.53)	1.90
Spousal Support × Gov't Assistance	**−1.32 (.68)***	**.27**
Model 3: Constructive communication		
Constructive communication	−.04 (.03)	.96
Gender	.25 (.23)	1.29
Race	.21 (.37)	1.23
Govt asst.	.15 (.34)	1.16
Constructive Communication × Gender	.04 (.05)	1.04
Constructive Communication × Race	.09 (.06)	1.09
Constructive Communication × Govt asst.	**−.20 (.10)***	**.82**
Model 4: Marital risk		
Marital risk	**.19 (.08)***	**1.21**
Gender	.22 (.23)	1.24
Race	.11 (.36)	1.11
Govt asst.	−.11 (.30)	.90
Marital Risk × Gender	−.26 (.17)	.77
Marital Risk × Race	−.13 (.25)	.88
Marital Risk × Govt asst.	.08 (.21)	1.08

Note. Govt asst. = government assistance; B^e = Exponentiated parameter to interpret odds ratio. Bold estimates are statistically significant.
$^t p < .10$. $^* p < .05$.

Across all the models, there were several interactions nearing statistical significance ($p < .10$) and replication with a larger sample is needed. Also, the support model could not be identified despite increasing the number of starts.

Discussion

The present study examined how aspects of marriages or marriage-like relationships (e.g., cohabitation) are linked to diabetes risk and diabetes management and determined whether these associations differed depending on sociodemographic determinants of health (i.e., gender, income, and race). First, we found that marital strain and marital risk were linked to a higher likelihood of developing diabetes whereas constructive communication and marital strain were linked to a greater likelihood of controlling diabetes. Marital strain was the only aspect of marital quality linked to both diabetes risk and diabetes management. Therefore, aspects of marital quality can function differently

Table 5
Results of a Multinomial Logistic Regression for Moderation Models for Spousal Strain, Spousal Support, Constructive Communication, and Marital Risk Predicting Diabetes Management (N = 125)

	Uncontrolled (1) vs. Controlled (0)		Undiagnosed (1) vs. Controlled (0)	
	B (*SE*)	B^e	*B* (*SE*)	B^e
Model 1: Spousal strain				
Spousal strain	.89 (.49)^t	2.44	**1.18 (.54)***	3.25
Gender	−.50 (.61)	.61	−.16 (.63)	.85
Race	−.28 (1.05)	.76	−.26 (1.13)	.77
Govt asst.	.62 (.84)	1.87	−.35 (.97)	.70
Spousal Strain × Gender	1.80 (.98)^t	6.08	1.97 (1.08)^t	7.17
Spousal Strain × Race	2.98 (1.88)	19.64	−.16 (.199)	.85
Spousal Strain × Govt asst.	1.50 (.97)	4.48	1.08 (.98)	2.93
Model 2: Spousal support (not identified)				
Model 3: Constructive communication				
Constructive communication	**−.40 (.15)***	**.67**	**−.35 (.15)***	**.70**
Gender	−1.05 (.87)	.35	−.67 (.92)	.51
Constructive Communication × Gender	.21 (.29)	1.23	.12 (.29)	1.13
Race	−.64 (1.48)	.53	−.44 (1.24)	.64
Constructive Communication × Race	−.20 (.44)	.81	−.09 (.46)	.92
Govt asst.	−.35 (.99)	.70	−1.67 (1.17)	.19
Constructive Communication × Govt asst.	.36 (.34)	1.43	.53 (.36)	1.70
Model 4: Marital risk				
Marital risk	.43 (.37)	1.54	.37 (.39)	1.44
Gender	−.21 (.70)	.81	.38 (.75)	1.46
Marital Risk × Gender	1.13 (.72)	3.10	**1.55 (.78)***	**4.73**
Race	−.64 (1.27)	.53	−.99 (1.39)	.37
Marital Risk × Race	.60 (1.60)	1.82	−.54 (1.63)	.58
Govt asst.	−.20 (.76)	.82	−1.46 (1.01)	.23
Marital Risk × Govt Assistance	−.59 (.78)	.56	−1.76 (1.05)^t	.17

Note. Govt asst. = government assistance; B^e = Exponentiated parameter to interpret odds ratio. Bold estimates are statistically significant.
$^t p < .10$. $^* p < .05$.

in relation to diabetes risk and management outcomes.

One mechanism hypothesized to link marital quality and diabetes outcomes is the individual's physiological response to stress in the marriage. The physiological stress response (e.g., inflammation) is linked to problematic blood glucose regulation even when the individual maintains good health behaviors such as diet and exercise (Collier et al., 2008; Donath, & Shoelson, 2011). Our findings linking marital strain to poorer diabetes outcomes may be because of the stress individuals experience because of the strain in the marriage. For patients with diabetes and those at risk for diabetes (prediabetes), in addition to the typical doctor recommendations (e.g., diet and exercise) or treatment as usual (e.g., medication), doctors may consider recommending patients reduce stress from marriages by either improving individual coping (e.g., mindfulness training) or changing the dynamics of the marriage to reduced strain (e.g., couple therapy, marital education). Future research should also explore the direction of this link in future studies.

A second hypothesized mechanism is health behaviors (Beverly et al., 2008; Chopik & O'Brien, 2017) which may account for our findings that constructive communication is associated with good diabetes management. There are unique health behavior challenges (e.g., dietary, regular blood glucose checks, doctor visits) fac-

ing families with a diabetic member because of the complexities of diabetes management. For one, meals are often communal activities in the family and the ability to effectively communicate is imperative for the spouses to collaborate and decide how to manage the required dietary changes (either both spouses change or only the diagnosed spouse; Miller & Brown, 2005). In fact, spousal collaboration and acceptance surrounding diabetes specific health behavior decisions are linked to improved diabetes outcomes (Nicklett, Heisler, Spencer, & Rosland, 2013). Therefore, effective marital communication could ease the transition to the required diabetes health behaviors and their maintenance leading to long-term diabetes control. Conversely, poor communication could reduce the diabetic spouse's willingness to acquiesce to their spouse's behavioral health reminders thus increasing the likelihood of mismanaging diabetes or to the disease going undiagnosed.

Intervention which target marriages to improve diabetes often include units on "speaker-listener techniques" or "time-out" (e.g., Trief et al., 2006) all of which are part of constructive communication. However, some of these interventions were not as effective at reducing A1c (e.g., Trief, Grant, Elbert, & Weinstock, 1998; Trief et al., 2002). The present findings, linking strain and constructive communication to diabetes management, suggest that future interventions could aim to target the reduction of strain (or perceived strain) from the marriage in addition to improving constructive communication. Brief intervention which focus on both increasing the positives and decreasing the negatives in a marriage simultaneously (e.g., marriage check-up; Cordova et al., 2014) may be particularly helpful for improving diabetes management.

Overall, marital quality was consistently linked to diabetes across the sociodemographic variables of gender, race, and poverty status. The one exception was the link between marital support and diabetes risk. For those who qualify for government assistance, increases in marital support were linked to a lower risk of developing diabetes, but this was not true for their peers with no government assistance. Those living at or below the poverty level experience substantial external stress—financial insecurity, neighborhood safety, job instability, transportation instability, availability of quality food, sleep disturbances—which are linked to poorer health outcomes (Kershaw & Pender, 2016; Krishnan, Cozier, Rosenberg, & Palmer, 2010). Further, low-income couples are particularly vulnerable to divorce (or even opting into marriage; Gibson-Davis, Edin, & McLanahan, 2005) and health problems (Hsu et al., 2012) which perpetuate the cycle of poverty. For this group, higher support from their spouse may serve as a buffer against the harmful external stress experienced by low-income couples and reduce the risk of developing the costly disease of diabetes. Therefore, low-income couples with diabetes may uniquely benefit from interventions focusing on increasing couple positivity which may, in turn, improve the stability of their marriage in addition to improving diabetes-related health outcomes.

The findings of this study need to be interpreted in light of its limitations. Although the Midlife in the Unites States (MIDUS) is a large nationally represented study with many positive attributes, the sample is predominantly white and within middle- to upper-income brackets. Therefore, this study should be replicated with a more racially and economically diverse population to ensure generalizability to multiple groups. Additionally, even though the two data sets (MIDUS II, Project 1 and MIDUS II, Project 4) span two different time periods, there is some overlap in the data collection. Therefore, there is no guarantee that this study is a true longitudinal study due to the overlap in sampling years. The study should therefore be replicated with a more stringent sampling period to ensure temporal ordering. The indicator variables were self-reported variables and the present findings may therefore reflect social desirability biases. Finally, the sample for the diabetes management analyses is relatively small compared to the diabetes risk sample. Therefore, there may have insufficient statistical power to detect smaller effects that may exist in the moderation analyses. Though small, these smaller effects may be critical to understanding risk factors important for managing diabetes. Therefore, future research should replicate these finds with a larger sample size.

Conclusion

The complexities of diabetes make its management a difficult task for an individual to undertake alone, and it is therefore imperative to understand how the social context in which

the individual spends his or her day-to-day life can impact diabetes outcome. We found that aspects of marital relationships which are linked to diabetes risk (i.e., marital risk) are different from those linked to diabetes management (i.e., constructive communication). However, we also found that one aspect of the marriage, marital strain, was linked to both diabetes risk and management. Prevention programs seeking to reduce the risk of developing diabetes should consider reducing aspects of marriages which are linked to stress. Intervention programs seeking to help individuals improve the management of their diabetes should focus on both reducing marital strain and improving the couple's ability to communicate effectively. Finally, for low-income couples experiencing the stress of financial strain, marital support may uniquely improve their diabetes health outcomes.

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