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Division of Type 1 Diabetes Responsibility in Latinx and Non-Latinx White Mother-Adolescent Dyads

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Abstract

Incidence rates of type 1 diabetes are increasing faster in Latinx youth than other ethnic groups, yet this population remains understudied. The current study (1) tested differences in division of diabetes-related responsibility (adolescent alone, mother alone, and shared) across Latinx and non-Latinx White families (N = 118 mother-adolescent dyads, 56 = Latinx dyads, M_{age}=13.24 years), and (2) examined associations between diabetes responsibility and adolescent health (HbA1c, diabetes self-management behaviors, and depressive symptoms). Latina mothers reported more shared and less adolescent responsibility than non-Latinx White mothers, but there were no ethnic differences in adolescent reports of responsibility. Independent of demographic and illness-related characteristics, mother- and adolescent-reports of shared responsibility were associated with higher self-management behaviors, while individual responsibility (adolescent or mother alone) was generally associated with lower self-management behaviors. Shared responsibility associations with higher mother-reported self-management behaviors occurred among Latinx families, but not non-Latinx White families. Shared and individual responsibility were not associated with HbA1c or depressive symptoms. The findings suggest the importance of shared responsibility for diabetes management in adolescence, particularly in Latinx families.

Keywords Latinx Adolescents · Non-Latinx White Adolescents · Type 1 diabetes · Diabetes responsibility · Self-management

Adolescence is a pivotal time for individuals with type 1 diabetes, as evidenced by deterioration in self-management and blood glucose levels as well as relatively high levels of depressive symptoms across the adolescent years (Helgeson et al., 2009; King et al., 2014; Reynolds & Helgeson, 2011). Between 2003 and 2012, diagnoses of type 1 diabetes in Latinx youth in the United States increased by 3.7% each year, significantly higher than the 0.8% annual increases seen in non-Latinx White youth (Mayer-Davis et al., 2017). There is some evidence that Latinx youth have higher blood glucose levels and lower self-management during adolescence than non-Latinx White adolescents, but data are limited and inconsistent (see Mello & Wiebe, 2020 for a review). Despite rising incidence rates and possible health disparities, research focusing on diabetes management in Latinx youth is limited. It is imperative that we understand potential risk or protective factors for Latinx youth with diabetes, given that lower self-management and elevated blood glucose during adolescence predict heightened risk of long-term microvascular complication (White, 2015). Parent-adolescent responsibility sharing for diabetes management tasks has been identified as one potential protective factor in samples of primarily non-Latinx White adolescents (e.g., Helgeson et al., 2008; Marker et al., 2018), but this variable has not been examined as thoroughly in Latinx families.

There is a great deal of research in primarily non-Latinx White samples supporting the idea that shifts in whether and how parents are involved in diabetes management are major factors in explaining deterioration in diabetes self-management across adolescence (see Wiebe et al., 2016; Young et al., 2014). Declines in parental responsibility for diabetes management tasks (such as checking blood glucose) tend to be associated with declines in diabetes self-management, especially when declines in parental involvement occur prematurely (Wiebe et al., 2014). When parents are uninvolved

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or less involved in helping adolescents cope with diabetes-related stressors, adolescents report lower self-management behaviors and more depressive symptoms than when parents are more involved (Berg et al., 2007; Wiebe et al., 2005). The related construct of collaboration between parents and adolescents has been found to be important for diabetes management. Specifically, adolescents who report less collaboration with caregivers in managing their type 1 diabetes have been found to have higher blood glucose (HbA1c), lower self-management behaviors, and lower health-related quality of life than adolescents who report more collaboration (Wysocki et al., 2009). Indeed, interventions encouraging parent-adolescent teamwork and collaboration have been successful, leading to lowered HbA1c and decreased hospitalizations (Hilliard et al., 2016).

While there is a need for parents to remain involved in diabetes management, scholars have noted that it is important for parental involvement to be developmentally appropriate and supportive of adolescent autonomy, and more parental involvement is not always better (Wiebe et al., 2016). For example, when it comes to family diabetes responsibility (i.e., who in the family is responsible for diabetes management tasks), more parental responsibility is not always related to the most positive outcomes for adolescent health (Helgeson et al., 2008). Family diabetes responsibility has often been measured as a continuum ranging from parental responsibility (i.e., the parent completes a task alone) to adolescent responsibility (the adolescent completes a task alone) with shared responsibility (both are responsible for completing a task) in the middle of the scale (e.g., Ingerski et al., 2010; Vesco et al., 2010; Wiebe et al., 2014). However, conceptualizing the construct of family responsibility in this way can obscure the unique relationship between shared responsibility and positive outcomes, as shared responsibility tends to be associated with more positive outcomes than adolescent or parental responsibility. When parents and adolescents are equally responsible for diabetes management tasks, adolescents report higher self-management behaviors (i.e., report completing more recommended diabetes management tasks) and report fewer depressive symptoms, whereas individual (parent or adolescent responsibility) is associated with fewer self-management behaviors (Helgeson et al., 2008). Shared responsibility has also been linked to less glycemic variability compared to greater parental responsibility (Marker et al., 2018). Although there seems to be good evidence that shared responsibility is related to desirable health outcomes, some studies have failed to find a direct association between shared responsibility and blood glucose levels (Marker et al., 2018; Vloemans et al., 2019). According to Helgeson et al. (2008), shared responsibility may be uniquely beneficial because it encompasses collaboration between parents and adolescents on the same task at the same time, as well as instances when parents and adolescents alternate who completes a given task, with both believing it is their responsibility and being inclined to complete the task when needed. In these ways, shared responsibility may allow parents to model self-care behaviors, teach problem-solving skills, and become more aware of the adolescent's need for support for diabetes management, while providing opportunities for both parties to complete diabetes management tasks which may not be as feasible when parents or adolescents solely responsible for a diabetes management task.

Family processes such as the sharing of diabetes responsibility between family members may promote positive health outcomes during the high-risk developmental period of adolescence (e.g., Wiebe et al., 2016; Helgeson et al., 2008), but the relationship between family diabetes responsibility sharing and diabetes outcomes has rarely been studied in Latinx families. Limited literature exists on family processes among Latinx adolescents with diabetes, but data from the same study as the current manuscript suggests that there are key differences between Latinx and White families regarding relationship processes such as conflict (Main et al., 2014) and parent-adolescent agreement on reports of diabetes stressors (Mello et al., 2017). In a qualitive investigation, both Latinx adolescents and their healthcare providers identified balancing the need for adolescent independence with parental involvement as a key issue for Latinx adolescents with type 1 diabetes (Reitblat et al., 2016). In a second qualitative study, both Latinx adolescents and their parents described a sense of unity and family support in managing type 1 diabetes (Joiner et al., 2019).

Although the available qualitative data seem to indicate that diabetes responsibility sharing is an important issue in Latinx families, there are no quantitative studies we are aware of examining shared responsibility for diabetes management in Latinx families. To our knowledge, two quantitative studies have examined individual diabetes responsibility in Latinx families. Nicholl et al. (2019) found longitudinal declines in parental responsibility to be similar across ethnic groups, while Hsin et al. (2009) found that more adolescent responsibility was associated with lower self-management in Latinx adolescents, replicating findings in non-Latinx White families. Although little is known about shared responsibility for diabetes management in Latinx families, cultural values such as familism (i.e., valuing caregiving, maintaining close relationships, and relying on community to define oneself; see Knight et al., 2010) may promote greater collaboration within Latinx families compared with non-Latinx White families. Indeed, Latinx children have been shown to collaborate with their siblings more when performing a planning task than non-Latinx White children, suggesting that Latinx family interactions

may be more collaborative than those in non-Latinx White families (Alcalá et al., 2018).

This investigation explored associations between diabetes responsibility (adolescent, shared, and mother) and diabetes management in a sample of non-Latinx White and Latinx mother-adolescent dyads. The first aim was to examine whether mother and adolescent reports of responsibility diabetes management tasks varied across ethnic groups. We hypothesized that Latinx families would report more shared responsibility and less individual responsibility (adolescent or mother alone) than non-Latinx White families. The second aim was to examine whether shared versus individual (i.e., mother or adolescent) responsibility was linked to better diabetes health outcomes (lower HbA1c, higher self-management behaviors, and fewer depressive symptoms) among Latinx and non-Latinx White families. Consistent with findings from predominantly non-Latinx White families, we hypothesized that shared responsibility would be linked with lower HbA1c, higher self-management behaviors, and fewer depressive symptoms, whereas mother and adolescent individual responsibility would be associated with higher Hba1c, lower self-management behaviors, and more depressive symptoms. The third aim was to test if ethnicity moderated the association between the division of diabetes responsibility and diabetes health outcomes. We did not have a specific hypothesis about the role of ethnicity in this relationship. Given increasing rates of type 1 diabetes in Latinx adolescents (Mayer-Davis et al., 2017) and the relationship between shared responsibility and adolescent health outcomes (Helgeson et al., 2008), it is important to understand how Latinx families divide diabetes responsibility and how responsibility is related to diabetes health outcomes in this population.

Method

Participants

Participants were 118 Latinx and non-Latinx White mother-adolescent dyads (56 = Latinx, 62 = non-Latinx White) recruited from a pediatric endocrinology clinic in the southwestern United States to participate in a study of diabetes management in early to middle adolescence. Of the 247 qualifying families who were approached to be in the study, 183 expressed interest, and 118 of those participated. The most common reason for not participating was scheduling difficulties (40%), followed by being too busy (33%), and distance/transportation issues (27%). There were no differences in adolescent ethnicity, age, gender, pump status, or HbA1c between those who participated versus those who did not. Adolescents were eligible to participate if they were between 10 and 15 years of age, had a diagnosis of type 1 diabetes for at least one year, and both mothers and adolescents were able to speak English or Spanish. Mothers were eligible to participate if they lived with adolescents > 50% of the time; stepmothers and adoptive mothers were eligible if they had lived with adolescents for at least one year.

Demographic data were collected from mother self-reports obtained in the lab. Families' ethnicity was coded as Latinx if mothers reported the adolescent was Hispanic/Latino and non-Latinx White if mothers reported the adolescent was not Hispanic/Latino and was Caucasian/White. Latinx participants were 12% first generation (mother and adolescent born outside the U.S.), 57% second generation (mother born outside the U.S., adolescent born inside the U.S.), and 31% third generation or higher (both born in the U.S.). Of mothers who reported a specific birth country outside of the U.S., 29 were born in Mexico, and 1 was born in Argentina, Bolivia, El Salvador, and Guatemala respectively. 43% of Latina mothers reported English was the primary language spoken at home. Descriptive statistics of the sample are presented in Table 1.

Procedure

The present study was part of a larger investigation about diabetes management in mother-adolescent dyads (Main et al., 2014; Mello et al., 2017; Tucker et al., 2018). The procedures were approved by the IRB at the appropriate sites, informed consent was obtained from mothers, and assent was obtained from adolescents. Data were collected between 2009 and 2011. Participants completed surveys in either English or Spanish, and all measures were translated and back translated from English to Spanish by bilingual and bicultural staff. Surveys were administered in person to mothers and adolescents separately using an electronic survey platform, but participants could opt for a paper copy if they preferred. As part of the larger study, mothers and adolescents were also interviewed about diabetes stressors, but these interviews were not used in the present investigation. Each participant received a $40 gift card upon completion of the study.

Measures

Diabetes Responsibility

Diabetes responsibility was assessed with mother and adolescent report using a modified version of the Diabetes Family Responsibility Questionnaire (DFRQ; Anderson et al., 1990). Respondents indicated on a five-point

Table 1 Descriptive Statistics for the Full Sample and Across Ethnicity

Variable	Full Sample (*M/SD*)	non-Latinx White (*M/SD*)	Latinx (*M/SD*)	*t*, X^2 (df)	[CI 95%]
N	118	62	56		
Female sex, %	54.2	46.8	62.5	2.93 (1)	
Adolescent age	13.24 (1.69)	13.19 (1.63)	13.30 (1.78)	−0.37 (116)	[-0.74, 0.50]
Pump status, % yes	25.42	30.64	19.64	1.88 (1)	
Mother education	5.71 (2.13)	6.85 (1.45)	4.44 (2.0)	7.40 (114)**	[1.77, 3.06]
Median neighborhood income	$62,000 ($26,000)	$71,000 ($27,000)	$50,000 ($18,000)	4.66 (106)**	[12,000, 31,000]
Years since dx	4.62 (2.84)	4.90 (3.14)	4.31 (2.45)	1.13 (116)	[-0.45, 1.63]
Latinx, %	45.5				
Adolescent responsibility (A)	0.44 (0.23)	0.45 (0.24)	0.43 (0.23)	0.47 (116)	[-0.06, 0.10]
Adolescent responsibility (M)	0.30 (0.19)	0.35 (0.20)	0.24 (0.16)	3.52 (116)**	[0.05, 0.18]
Shared responsibility (A)	0.28 (0.21)	0.27 (0.19)	0.30 (0.23)	−0.77 (116)	[-0.11, 0.05]
Shared responsibility (M)	0.29 (0.18)	0.26 (0.14)	0.33 (0.20)	-2.40 (116)*	[-0.14, −0.01]
Parent responsibility (A)	0.26 (0.21)	0.28 (0.22)	0.25 (0.19)	0.72 (116)	[-0.05, 0.10]
Parent responsibility (M)	0.35 (0.20)	0.37 (0.19)	0.32 (0.20)	1.37 (116)	[-0.02, 0.12]
Hba1c	8.55 (1.55)	8.35 (1.43)	8.77 (1.67)	-1.47 (116)	[-0.98, 0.15]
Self-management behaviors (A)	4.04 (0.68)	4.09 (0.57)	3.97 (0.78)	0.93 (114)	[-0.13, 0.37]
Self-management behaviors (M)	3.91 (0.73)	3.82 (0.73)	4.01 (0.72)	-1.34 (109)	[-0.46, 0.09]
Depressive symptoms (A)	8.36 (6.09)	7.69 (5.32)	9.11 (6.83)	-1.27 (115)	[-3.66, 0.80]

Notes: Pump status = use of insulin pump, Maternal education coded as: 1 = less than 7th grade, 2 = junior high school (9th grade), 3 = partial high school (10th grade or 11th grade), 4 = high school graduate, 5 = GED, 6 = partial college, 7 = associate's/vocational degree, 8 = bachelor's degree, 9 = graduate or professional degree, (A) = adolescent report, (M) = mother report, *$p < .05$; **$p < .01$, ***$p < .001$

scale (*1 = child alone, 2 = mostly child, 3 = shared equally, 4 = mostly parent, 5 = parent alone*) who was responsible for 23 diabetes management tasks. Sample tasks included "Taking more or less insulin according to the results of a blood sugar or urine test" and "Remembering the day of clinic appointment." Responses of *child alone* and *mostly child* were coded as "adolescent responsibility," responses of *equally* were coded as "shared responsibility," and responses of *mostly parent* and *parent alone* were coded as "mother responsibility." Using similar methods to Helgeson et al. (2008), the proportion of each type of responsibility was calculated for mother and adolescent reports separately (adolescent report: $\alpha = 0.89$, $\alpha = 0.85$, $\alpha = 0.89$; mother report $\alpha = 0.84$, $\alpha = 0.72$, $\alpha = 0.81$ for adolescent, parent and shared responsibility respectively.)

Self-Management Behaviors

Mothers and adolescents reported on adolescent self-management behaviors using a modified version of the Self-Care Inventory (SCI; Lewin et al., 2009). This commonly used measure assesses how often recommended diabetes management tasks (e.g., checking blood glucose, administering insulin) are completed on a 5-point scale ranging from 1 (*never do it*) to 5 (*always do this as recommended without fail*) with an option of "not applicable" to items not relevant to their regimen. In order to reflect current treatment standards, two items regarding counting carbohydrates were added to the original scale through consultation with a diabetes educator. Scores were computed by averaging across items, and higher scores indicate higher self-management behaviors (adolescent report: $\alpha = 0.85$; mother report: $\alpha = 0.92$).

HbA1c

Blood glucose was indexed by HbA1c obtained from adolescents' medical records. HbA1c is a measurement of blood glucose in the past ~3 months, with higher values indicating poorer diabetes control. The HbA1c value obtained during the clinic visit closest to the study was used to capture blood glucose; most (72%) occurred within one month of the survey (range = 117 days before to 12 days after survey completion). Covarying time elapsed between survey and HbA1c measures did not alter findings.

Depressive Symptoms

Depressive symptoms were measured using the 27-item version of the Children's Depressive Inventory (CDI; Kovacs, 1985). Adolescents indicated to what extent they experienced symptoms of depression in the past two weeks (e.g., 1 = *I am sad once in a while*, 2 = *I am sad many times*, 3 = *I*

am sad all the time; α = 0.84). This measure has been associated with diabetes management in previous studies (e.g., Grey et al., 2001).

Analysis Plan

For all survey measures, a mean replacement strategy was used for missing items on a given scale when less than 20% of the items were missing (Downey & King, 1998). Overall, < 4% of items had missing data, including items that participants reported were not applicable to their regimen. To address Aim 1, independent samples *t*-tests were initially conducted to test differences between mother and adolescent reports of adolescent, mother, and shared responsibility across Latinx and non-Latinx White families. Analyses of covariance (ANCOVAS) were subsequently conducted to test whether ethnic differences remained after controlling for adolescent gender, age, and socioeconomic status (SES). SES was derived by standardizing maternal education and median household income and calculating the mean of these two values. These covariates were selected because each was significantly associated with at least one type of diabetes responsibility and have been associated with relevant diabetes health outcomes in prior literature (e.g., Borschuk & Everhart, 2015; King et al., 2013).

To address our second and third aims, hierarchical multiple regressions were conducted to determine if associations between diabetes responsibility and diabetes health outcomes remained after controlling for demographic variables and adding both reporters (see Helgeson et al., 2008). These models also allowed us to test whether ethnicity moderated associations between diabetes responsibility and diabetes health outcomes. In addition to the covariates specified above, we also included whether the adolescent was on an insulin pump and years since diagnosis because these variables have been found to predict HbA1c (e.g., Wiebe et al., 2010). Dependent variables in all regression models were adolescent- and mother-reported self-management behaviors, HbA1c, and adolescent depressive symptoms. Separate regressions were conducted for adolescent, mother, and shared responsibility, resulting in a total of 12 models. Regression analyses were conducted using the following steps: In Step 1, ethnicity (effect coded as -1 = non-Latinx White and 1 = Latinx) and covariates were entered.[1] In Step 2, mother and adolescent reports of diabetes responsibility were entered. In Step 3, the interaction between ethnicity and diabetes responsibility was entered. Mother and adolescent reports of diabetes responsibility were centered around their mean and multiplied with ethnicity to create a diabetes responsibility X ethnicity interaction term for each model.

[1] Parent and adolescent reports were added in the same regressions to minimize the total number of statistical tests, and to allow for comparisons of the change in R^2 from parent and adolescent reports of responsibility combined. Exploratory analyses were conducted with only a single reporter in each model, and the findings were unchanged. Parent and adolescent reports were only moderately correlated ($r = .26$ to 0.44), so correlations between reporters did not introduce collinearity concerns.

Results

Ethnic Differences in the Division of Diabetes Responsibility

Descriptive statistics of demographic and study variables and results of *t*-tests comparing these variables across Latinx and non-Latinx White participants are displayed in Table 1. Latina mothers reported their adolescents were less individually responsible for diabetes management tasks compared with non-Latinx White mothers (22% of items indicated individual responsibility for Latina mothers, 36% for non-Latinx White mothers), and Latina mothers reported more shared responsibility compared with non-Latinx White mothers (34% versus 27%). After controlling for adolescent gender, age and SES, these differences remained statistically significant (Adolescent Responsibility: $F(4, 113) = 4.33$, $p = .04$, $\eta^2 = 0.04$; Shared Responsibility: $F(4, 113) = 4.66$, $p = .03$, $\eta^2 = 0.04$). There were no ethnic differences for adolescent report or mother responsibility.

Associations Between Diabetes Responsibility and Health Outcomes

Zero-order correlations among demographic and study variables across the full sample are shown in Table 2. There were multiple associations between shared responsibility and adolescent health. Specifically, when mothers reported more shared responsibility, mothers and adolescents both reported higher self-management behaviors. Similarly, when adolescents reported more shared responsibility, mothers reported higher self-management behaviors. Adolescent individual responsibility was also associated with lower self-management behaviors. Specifically, when adolescents reported being individually responsible for more diabetes management tasks, adolescents and mothers both reported lower self-management behaviors. Mother individual responsibility was not associated with health outcomes. In contrast to support for hypothesized associations for self-management behaviors, there were no associations for HbA1c or depressive symptoms.

Table 2 Correlations Between Demographic, Illness, and Study Variables

	1. Sex	2. Age	3. Pump	4. SES	5. Years Since Dx	6. Ad. Res.(A)	7. Ad. Res.(M)	8. Shared Res.(A)	9. Shared Res. (M)	10. Mother Res. (A)	11. Mother Res. (M)	12. HbA1c	13. SMB (A)	14. SMB (M)	15. DS
1.	-														
2.	−0.01	-													
3.	−0.05	−0.07	-												
4.	−0.30**	−0.02	0.29**	-											
5.	−0.03	0.09	0.30**	0.12	-										
6.	0.03	0.57**	0.06	−0.08	0.10	-									
7.	0.03	0.35**	0.13	0.33**	0.00	0.44*	-								
8.	0.09	−0.34**	0.05	0.09	−0.17	−0.51**	−0.18	-							
9.	0.01	−0.11	−0.01	−0.10	−0.11	−0.21*	0.22*	0.26**	-						
10.	−0.17	−0.21*	−0.10	0.01	0.11	−0.51**	−0.25**	−0.39**	−0.09	-					
11.	−0.32**	−0.42**	−0.04	0.18*	−0.06	−0.45**	−0.30**	0.06	−0.18	0.43**	-				
12.	−0.15	0.20*	−0.23*	−0.20*	0.23*	0.15	−0.06	−0.17	−0.04	0.03	−0.02	-			
13.	−0.19*	−0.25**	0.12	0.12	0.04	−0.19*	−0.17	0.12	0.19*	0.08	0.15	−0.22*	-		
14.	0.04	−0.29**	−0.01	0.00	−0.16	−0.24*	−0.11	0.23*	0.26**	−0.02	−0.13	−0.27**	0.30**	-	
15.	0.09	0.15	−0.10	−0.09	0.12	0.08	−0.01	−0.05	0.01	−0.04	0.01	0.20*	−0.50**	−0.14	-

Notes: Sex = adolescent sex (0 = male 1 = female), Age = adolescent age, Pump = use of insulin pump (0 = no pump, 1 = pump), SES = socioeconomic status, Dx = diagnosis, Res = diabetes responsibility, Ad.=adolescent, (A) = adolescent report, (M) = mother report, SMB = self-management behaviors, DS = depressive symptoms, *$p < .05$., **$p < .01$

Ethnic Differences in Associations Between Diabetes Responsibility and Health Outcomes

Results of hierarchical regressions testing associations between diabetes responsibility and diabetes health outcomes after controlling for demographic (gender, age, SES, and ethnicity) and illness variables (insulin pump status and years since diagnosis) are displayed in Table 3. In Step 2 of the regressions, the association between mother-reported shared responsibility and mother-reported self-management behaviors remained statistically significant. In addition, there was a unique association between mother-reported mother responsibility and fewer mother-reported self-management behaviors that emerged. In Step 3 of the regressions, there was one significant interaction with ethnicity. Probing of the interaction revealed that among Latina mothers, reports of shared responsibility were associated with higher self-management behaviors, but this association was not significant among non-Latinx White mothers (see Fig. 1). No other interactions between diabetes responsibility and ethnicity were significant.

Discussion

The present study is the first to our knowledge to compare the roles of shared versus individual diabetes responsibility in adolescent diabetes management among Latinx and non-Latinx White families. This investigation revealed some differences in diabetes responsibility across ethnic groups, with Latina mothers reporting more shared and less adolescent responsibility for diabetes management than non-Latinx White mothers. Regardless of ethnicity, shared responsibility tended to be associated with higher self-management behaviors, whereas individual responsibility tended to be associated with lower self-management behaviors. However, hypothesized associations that were present for diabetes self-management did not extend to outcomes such as HbA1c or depressive symptoms. Though findings were largely consistent across ethnic groups, there was some evidence that associations between shared responsibility and self-management behaviors were stronger in the Latinx families. We elaborate on these findings in detail below.

Some differences between Latinx and non-Latinx White families in diabetes responsibility emerged. Specifically, Latina mothers (but not adolescents) reported more shared and less adolescent responsibility than non-Latinx White mothers. This finding regarding shared responsibility corroborates qualitative data indicating that Latinx parents and adolescents express a sense of family support when describing diabetes management (Joiner et al., 2019), but this investigation is the first of which we are aware to quantify diabetes responsibility distribution in Latinx families. The higher levels of shared responsibility reported by mothers may also be due to the cultural value of familism, as caregiving and maintaining close relationships between family members are both central aspects of familism (see Knight et al., 2010). Conversely, non-Latinx White families may be more likely to practice adolescent responsibility for diabetes management tasks due to the value of independence/self-reliance, which has been found to be more prevalent in non-Latinx White culture (Knight et al., 2010). Future studies can explore within group variation to examine directly the relationship between cultural values and diabetes responsibility.

Ethnic differences in diabetes responsibility sharing only appeared for mother reports, so future work can focus on how Latina mothers specifically approach family diabetes responsibility. We do not know of any extant literature on this topic to date, but outside of diabetes literature, a case study of adults teaching children a novel task found that non-Latinx White adults tended to direct the child's attention more overtly, while Latinx adults tended to allow children the autonomy to disengage and reengage with the task (Paradise et al., 2014). Although our study focused on a very different context, it is possible that Latinx parents may allow adolescents to engage and disengage with diabetes management tasks. For example, rather than directing adolescents to check blood sugar by themselves, Latina mothers may be more likely to allow adolescents to only begin checking alone after the adolescent expresses interest or demonstrates competence in doing so, and care may instead be more collaborative. This hypothesis can be tested directly in future studies.

Consistent with hypotheses, greater shared responsibility tended to be associated with higher diabetes self-management behaviors across ethnic groups. Specifically, mother and adolescent reports of shared responsibility were correlated with higher mother-reported self-management behaviors, whereas mother reports of shared responsibility were correlated with higher adolescent-reported self-management behaviors. These cross-reporter associations increase confidence that associations do not reflect simple reporting biases. Furthermore, the association between mother (but not adolescent) reports of shared responsibility and mother reports of self-management behaviors remained significant after controlling for demographic and illness variables. These results are consistent with Helgeson et al. (2008) findings in a non-Latinx White sample that shared responsibility was associated with higher self-management behaviors and individual responsibility was associated with lower self-management behaviors.

Table 3 Hierarchical Regressions Predicting Diabetes Management from Diabetes Responsibility

	HbA1c		Self-Management (A)		Self-Management (M)		Depressive Symptoms (A)	
Regressions using Adolescent Responsibility as a Predictor								
β[CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	
Step 1		0.24**		0.11*		0.13*		0.07
Adolescent sex (0 = male, 1 = female)	− 0.22* [-1.22, − 0.15]		− 0.18 [-0.49, 0.02]		0.03 [-0.24, 0.31]		0.08 [-1.40, 3.24]	
Adolescent age	0.14 [-0.02, 0.28]		− 0.24** [-0.17, − 0.02]		− 0.29** [-0.20, − 0.04]		0.13 [-0.21, 1.13]	
Socioeconomic status	− 0.19 [-0.71, 0.05]		0.03 [-0.16, 0.20]		0.12 [-0.09, 0.31]		0.01 [-1.59, 1.67]	
Adolescent ethnicity (-1 = NLW, 1 = Latinx,)	0.06 [-0.38, 0.88]		− 0.02 [-0.16, 0.13]		0.17 [-0.03, 0.28]		0.10 [-0.70, 1.95]	
Years Since Dx	0.31** [0.08, 0.27]		0.03 [-0.04, 0.05]		− 0.13 [-0.09, 0.02]		0.16 [-0.07, 0.76]	
Pump status (0 = no pump, 1 = pump)	− 0.26** [-1.56, − 0.28]		0.08 [-0.19, 0.42]		− 0.02 [-0.35, 0.30]		− 0.12 [-4.41, 1.15]	
Step 2		0.00		0.02		0.01		0.00
Adolescent Responsibility (A)	0.09 [-0.89, 2.05]		− 0.02 [-0.75, 0.66]		− 0.13 [-1.22, 0.37]		0.00 [-6.29, 6.51]	
Adolescent Responsibility (M)	− 0.02 [-1.85, 1.56]		− 0.14 [-1.31, 0.29]		0.12 [-0.53, 1.48]		− 0.01 [-7.86, 6.95]	
Step 3		0.01		0.02		0.01		0.02
Adolescent Responsibility (A) X Ethnicity	0.13 [-0.44, 2.16]		− 0.10 [-0.92, 0.33]		0.06 [-1.23, 1.79]		0.00 [-5.64, 5.79]	
Adolescent Responsibility (M) X Ethnicity	− 0.07 [-2.31, 1.18]		− 0.09 [-1.16, 0.47]		− 0.15 [-3.30, 1.04]		0.14 [-2.82, 12.37]	
Regressions using Shared Responsibility as a Predictor								
	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2
Step 1		0.23**		0.11		0.13*		0.07
Step 2		0.00		0.03		0.06*		0.00
Shared Responsibility (A)	− 0.02 [-1.52, 1.26]		0.02 [-0.61, 0.71]		0.04 [-0.55, 0.83]		0.02 [-5.65, 6.80]	
Shared Responsibility (M)	− 0.03 [-1.80, 1.31]		0.18 [-0.02, 1.44]		0.24* [0.19, 1.96]		0.01 [-6.33, 7.34]	
Step 3		0.01		0.00		0.04		0.01
Shared Responsibility (A) X Ethnicity	− 0.12 [-2.24, 0.43]		− 0.01 [-0.67, 0.60]		− 0.02 [-0.71, 0.59]		0.09 [-3.24, 8.51]	
Shared Responsibility (M) X Ethnicity	0.07 [-1.10, 2.30]		0.03 [-0.71, 0.90]		0.22* [0.13, 1.92]		− 0.03 [-8.66, 6.33]	
Regressions using Mother Responsibility as a Predictor								
	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2	β [CI 95%]	ΔR^2
Step 1		0.24**		0.11		0.13*		0.07
Step 2		0.00		0.00		0.08**		0.02
Mother Responsibility (A)	− 0.04 [-1.71, 1.07]		0.00 [-0.67, 0.68]		0.06 [-0.50, 0.91]		− 0.08 [-8.32, 3.75]	
Mother Responsibility (M)	0.04 [-1.33, 2.03]		− 0.03 [-0.90, 0.72]		− 0.34** [-0.2.29, − 0.51]		0.19 [-1.49, 12.96]	
Step 3		0.00		0.03		0.01		0.03
Mother Responsibility (A) X Ethnicity	0.05 [-1.11, 1.80]		0.01 [-0.65, 0.74]		0.01 [-0.70, 0.78]		− 0.20 [-12.01, 0.51]	
Mother Responsibility (M) X Ethnicity	− 0.07 [-2.10, 0.94]		0.18 [-0.10, 1.33]		− 0.13 [-1.39, 0.32]		0.05 [-4.88, 8.07]	

Notes: Demographic variables were controlled for in Step 1 in all models. Pump status = use of insulin pump, (A) = adolescent report, (M) = mother report, NLW = Non-Latinx White, β s are standardized, *$p < .05$., **$p < .01$

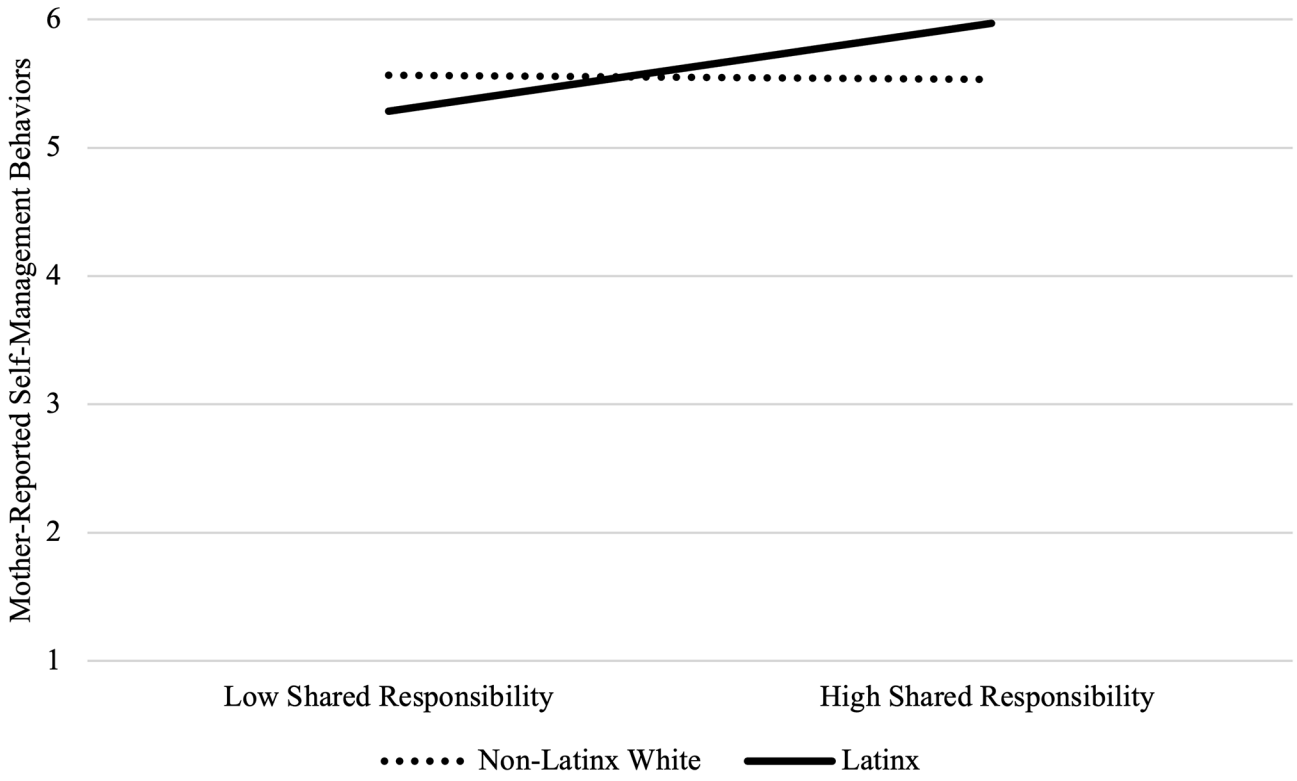

Fig. 1 Interaction Between Ethnicity and Mother-Reported Shared Responsibility Predicting Mother-Reported Self-Management Behaviors

Also consistent with hypotheses, while shared responsibility tended to be associated with higher self-management, individual responsibility (both mother and adolescent responsibility) tended to be associated with lower diabetes self-management. Adolescent reports of adolescent responsibility were correlated with lower mother and adolescent reported self-management behaviors before controlling for demographic variables (but not after), while mothers who reported more mother responsibility reported lower adolescent-reported self-management behaviors after controlling for demographic and illness variables (but not before). These results mirror previous studies finding that individual responsibility was associated with poorer adolescent health (Helgeson et al., 2008), and that Latinx adolescents who have more responsibility for diabetes management reported lower self-management behaviors (Hsin et al., 2009). The finding that mother responsibility was associated with lower adolescent self-management behaviors underscores that more parental involvement is not always better, and the difference in findings between mother versus shared responsibility underscores the idea that the quality of parental involvement is important. Specifically, shared responsibility may facilitate collaboration, which has been found to be a developmentally appropriate and autonomy supportive form of involvement across adolescence (e.g., Wiebe et al., 2005).

Findings were largely consistent across ethic groups, with some small differences observed. There was a significant interaction between ethnicity and shared responsibility predicting mother-reported self-management behaviors, such that the positive association between mother-reported shared responsibility and mother-reported self-management behaviors was stronger for Latinx families than non-Latinx White families. One possible explanation for these differences is that differences in cultural values may translate to differences in how diabetes responsibility is shared within the family. Familism has been identified as a value for Latinx individuals, while independence/self-reliance has been identified as a cultural value for non-Latinx White individuals (e.g., Knight et al., 2010). It is possible that these differences in cultural values may mean that shared responsibility is qualitatively different in Latinx families, such that shared responsibility may involve more collaboration in Latinx families, rather than parents and adolescents alternating who completes a given task. It is important to note that another study from the current dataset found that diabetes-related conflicts between mothers and adolescents were less strongly associated with diabetes outcomes in Latinx families compared with non-Latinx White families (Main et al., 2014). However, negative family processes such as conflict may function differently than positive processes such as shared responsibility, highlighting the

importance of understanding the nuances of family dynamics within cultural groups.

This work replicates prior findings related to shared responsibility and self-management, but we did not replicate Helgeson et al.'s findings that shared responsibility was also associated with lower HbA1c and depressive symptoms. Much like the present study, Marker et al. (2018) did not find an association between diabetes responsibility and HbA1c, and they noted that previous studies have found that paternal but not maternal monitoring is linked to HaA1c (Young et al., 2014). The current study only included mothers, which may be why an association was not detected. Helgeson et al. (2008) found a small but significant association between more shared responsibility and fewer depressive symptoms, while the present study found no association. The small effect size of this association in the context of our more diverse sample (93% white versus 53% White) may account for the lack of replication in the present study. Even though associations with depressive symptoms and HbA1c specifically were not found, the present study extends the finding that diabetes responsibility is associated with diabetes self-management behaviors among Latinx adolescents with type 1 diabetes, a rapidly growing demographic in the United States (Mayer-Davis et al., 2017). The pattern of results indicates that self-management may be the most proximal outcome predicted by diabetes responsibility sharing, and that this variable in particular may be important to include in future studies examining diabetes responsibility sharing.

Though this study has numerous strengths, including the focus on an understudied but at-risk population and inclusion of data from multiple reporters, there are some limitations that warrant discussion. First, the measures in this study were self-report, which may be subject to bias. To complement self-report measures, future studies could use other methodologies, such as interviews or observed conversations between parents and adolescents about diabetes-related tasks, and objective health measures in addition to HbA1c (e.g., downloaded data from pumps to assess self-management). Although data about insulin pump usage were available in this dataset, continuous glucose monitoring (CGM) data were not available. According to one estimate, CGM use for individuals aged 13–18 in the US increased from 4% in 2010–2012 to 22% in 2016–2018 (Foster et al., 2019). Given increasing CGM utilization, our data collected 2009–2011 should be interpreted with caution when applied to present day adolescents who may be more likely to use CGM. There is evidence that CGM adoption may alter the parent-adolescent relationship when it comes to diabetes management, such that shared responsibility may be particularly important for diabetes management when using CGM (Rashotte et al., 2014). Future studies can explore this in Latinx samples. Although CGM use is an important issue to consider in future studies, it is also important to note that CGM use is less common among English-Speaking Latinx individuals than non-Latinx or Spanish-Speaking Latinx individuals, so CGM use may be a less salient issue for some English speaking Latinx individuals (Tsai et al., 2021).

The inclusion of multiple reporters was a strength, but this design also added to the number of models conducted, and given the number of tests, results need to be interpreted with caution. In addition, using two reporters made it clear that mothers and adolescents did not always agree on the distribution of diabetes-related tasks. Although it is not uncommon for parent and adolescent reports to differ (Anderson et al., 1990), this discrepancy makes these results more difficult to interpret. A previous investigation using this dataset found that Latina mothers had less agreement with their adolescents regarding diabetes stressors, and it is possible that Latinx families have more divergent perspectives due to acculturation gaps (Mello et al., 2017). Future investigations can explore the ethnic differences in agreement regarding specific items on the DFRQ to better understand the nuances of differences between how Latinx and non-Latinx White families divide diabetes responsibility. Only mother reports of diabetes responsibility were available, and although mothers have been shown to be more responsible for their child's chronic illness management than fathers, other studies from this dataset have found fathers may play a unique role in diabetes management (Tucker et al., 2018), and family processes are different across mothers and fathers in the context of diabetes management in Latinx families (Main et al., 2014). Future investigations can test if the associations between shared responsibility and adolescent health observed in this study extend to father-adolescent and other family relationships.

The cross-sectional design precluded determining causal associations among division of diabetes responsibility and adolescent health outcomes. It is possible that associations between diabetes responsibility and diabetes management are bidirectional, because it may be easier for mothers and adolescents to share responsibility when management is going well, or mothers may step in and take more independent responsibility when management is not going well. Nonetheless, there is evidence from longitudinal research with primarily non-Latinx White participants that changes in responsibility precede changes in diabetes health outcomes (Helgeson et al., 2008). Longitudinal studies including Latinx families are needed to determine if changes in responsibility precede changes in self-management behaviors in Latinx families.

Findings indicate that shared responsibility is associated with higher self-management behaviors in Latinx youth, while individual responsibility (parent and adolescent) is

unrelated or related to lower self-management behaviors. Furthermore, there were mostly universal patterns of associations across ethnic groups, but the association between mother-reported shared responsibility and mother-reported self-management behaviors was only statistically significant for Latinx families. To our knowledge, this is the first quantitative study to examine shared versus individual responsibility in Latinx families managing type 1 diabetes, and results underscore the importance of shared responsibility in this population. These findings may have implications for interventions. Specifically, interventions encouraging collaboration between parents and adolescents for diabetes management have been successful, but these interventions have been conducted primarily with non-Latinx White families and have not focused on responsibility sharing specifically (Hilliard et al., 2017). The current investigation found that shared responsibility was important for Latinx families, and therefore interventions encouraging responsibility sharing and culture-specific values that might facilitate shared responsibility (e.g., familism) could be implemented tested. The present findings indicate the relevance of family processes for adolescent diabetes management, particularly self-management behaviors, in Latinx and non-Latinx White families.

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