UNIVERSITY OF CALIFORNIA,
IRVINE

Illness Burden in Hispanic Women: Understanding the Role of Social Networks

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Epidemiology

by

Maribel Cervantes-Ortega

Dissertation Committee:
Professor Dara H. Sorkin, Co-Chair
Professor Karen L. Edwards, Co-Chair
Associate Professor Luohua Jiang, Member

2022

TABLE OF CONTENTS

Page

LIST OF FIGURES iv

LIST OF TABLES v

ACKNOWLEDGEMENTS vi

CURRICULUM VITAE vii

ABSTRACT OF THE DISSERTATION x

INTRODUCTION 1
References 5

CHAPTER 1: Participatory decision-making for cancer care in a high-risk sample of low income Mexican-American breast cancer survivors: The role of acculturation 9
Abstract 9
Introduction 10
Methods 13
Study design and participants 13
Measures 13
Outcome measures 13
Provider-patient relationship measures 14
Acculturation status 14
Covariates 15
Statistical Analysis 15
Results 16
Sample description 16
Patient-perceived quality of care and satisfaction with care 18
Discussion 20
Acknowledgements 26
References 27

CHAPTER 2: Health-related social control and perceived stress among high-risk Latina mothers with Type 2 Diabetes and their at-risk adult daughters 31
Abstract 31
Introduction 32
Family influence as leverage for behavioral change 33
Potential effectiveness of health-related social control 34
The current study 35

Method 36
Participants 36
Dyadic intervention 38
Usual care 38
Measures 39
Statistical analysis 40
Results 41
Demographic characteristics 41
Direct and indirect dyadic effects on perceived stress 42
Discussion 44
Declarations 49
Acknowledgements 49
References 50

CHAPTER 3: Understanding the Impact of Family on Stress and Health Outcomes in a Cross-Section of Diabetic Hispanic Mothers and their Adult Daughters 55
Abstract 55
Introduction 56
Methods 58
Participants and Data Collection 58
Recruitment and Collection 58
Measures 60
Analysis 61
Results 62
Discussion 65
New Contributions to the Literature 68
Acknowledgements 69
References 70

LIST OF FIGURES

		Page
Figure 1.1	Crude Linear Association of PDM and Quality of Care by Low and High Acculturation	19
Figure 2.1	Unstandardized (beta) coefficients from the SEM analysis testing for actor-partner effects on the direct and indirect relation of intervention to T2 perceived stress	43
Figure 3.1	Mothers' and daughters' reports of received versus provided levels of relationship characteristics and their influence on mother's perceived stress and general health. MR=Mothers' Reports; DR=Daughters' Reports	65

LIST OF TABLES

		Page
Table 1.1	Socio-demographic Characteristics by Acculturation, (N-63)	17
Table 1.2	Means and correlations for components of the patient-provider relationship and the outcome, quality of care (N = 68)	18
Table 1.3	Association between Provider-Patient Relationship and Patient-Reported Quality of Care for High versus Low Acculturated Patients (N=68)	19
Table 2.1	Direct effects of the intervention and components of health-related social control on follow-up (T2) perceived stress	42
Table 2.2	Mediating effects for the actor-partner interdependence mediation model with intervention as the independent variable, T2 mothers' and daughters' persuasion and pressure as mediators, and T2 mothers' and daughters' perceived stress as dependent variables	44
Table 3.1	Means and correlations for relationship components of mother-daughter dyads. MR=Mothers' Reports; DR=Daughters' Reports	63
Table 3.2	SEM model results estimating the impact of mother and daughter reported relationship characteristic on mothers' perceived stress and general health	64

ACKNOWLEDGEMENTS

I thank the University of California, Irvine for providing me the space to learn and develop as a scientist. During my undergraduate and graduate degrees at UC Irvine, I have come across remarkable mentors and peers who pushed me to become the best researcher I could be. I am tremendously grateful for the resources the University of California invested in me and am humbled by the opportunities I continue to receive as an alumna of one of the greatest public institutions for higher education.

I would like to express the deepest appreciation to my committee members, especially Professor Dara H. Sorkin, who always supported my goals and encouraged my work to transcend academia in hopes of creating meaningful change in our communities. Without her guidance and persistent help this dissertation would not have been possible.

Thank you to all the Department of Epidemiology faculty, staff, and collogues who have been instrumental in the success of my degree. My committee members, Prof. Karen L. Edwards and Asst. Prof. Luohua Jiang, for helping me grow as an Epidemiologist. Also, a huge thank you to Dr. Thomas H. Taylor for the years of patience of guidance along the way. You have all played major roles in my success at UC Irvine.

I am tremendously grateful for the support and recognition I have received from internal UC Irvine grants and awards. Thank you to the Institute for Clinical and Translational Sciences for awarding me an NIH Predoctoral Trainee Fellowship. To the Rose Hills Foundation Science and Engineering Fellowship, for recognizing my research during two consecutive years. Also, to the School of Medicine and Department of Epidemiology & Biostatistics for always providing the means to pursue my research.

Thank you to the *International Journal of Healthcare* for publishing Chapter One and allowing its inclusion as part of my dissertation.

Forever thanks to my parents and family members for always supporting me. You have always believed in me and remained steadfast even when I doubted myself. This is for all of us.

CURRICULUM VITAE

Maribel Cervantes-Ortega

Education

2022 Ph.D. in Epidemiology, University of California, Irvine

2016 M.S. in Demographic and Social Analysis, University of California, Irvine

2014 B.S. in Public Health Sciences, University of California, Irvine

Honors and Awards

2020, 2021 Rose Hills Foundation Fellow

2017-2020 Institute for Clinical and Translational Sciences Pre-Doctorial Fellow

2019 School of Medicine, Latino Excellence and Achievement Award Recipient

2018 Agency for Healthcare Research and Quality Summer Intramural Fellow

2016 Pathways Intern Recipient

Experience

2021-present Supervising Epidemiologist, Los Angeles County Department of Public Health

2021-2022 Teaching Assistant, Department of Public Health, UC Irvine

2020 Research Assistant, Department of Epidemiology and Biostatistics, UC Irvine

2017-2020 Research Assistant, Department of Medicine, UC Irvine

2016-2018 Research Assistant, Department of Social Sciences, UC Irvine

2016 Statistician Intern, United States Census Bureau

Publication

Cervantes-Ortega, M., Du, S., Biegler, K. A., Al-Majid, S., Davis, K. C., Chen, Y., ... & Sorkin, D. H. (2020). Participatory decision-making for cancer care in a high-risk sample of low income Mexican-American breast cancer survivors: The role of acculturation. International Journal of Healthcare. 6(2). DOI: https://doi.org/10.5430/ijh.v6n2p35.

Conference Presentations

Cervantes-Ortega M, Beltran R, Ramirez Salinas G, Sorkin DH. (2020, October 28-31). Exploring Latinx disease burden and fatalism in the context of social exchanges. Virtual presentation given at the 100th Western Psychological Association annual meeting.

Cervantes-Ortega M, Sorkin DH. (2020, October 24-28). Disease burden and stress: Assessing the influence of families in the Latinx community. Virtual presentation given at the 147th American Public Health Association annual meeting.

Cervantes-Ortega M, Biegler KA, Rook KS, Kilgore DB, Dow E, Sorkin DH. (2019, November 6). Health related social support as important mechanism for driving stress reduction in sample of high risk Latina mother-adult daughter dyads. Oral presentation given at the 146th American Public Health Association annual meeting, Philadelphia, PA.

Cervantes-Ortega M. & Sorkin DH. (2019, November 3). More Similar or More Different? A Look into Mental and Physical Health Differences across Subgroups of the Latinx Community. Poster presented at the 146th American Public Health Association annual meeting, Philadelphia, PA.

Cervantes-Ortega M, Nuñez R, Muñiz MD, Porrón J, Juarez J, Macias DH, Sorkin DH. (2019, April 25-28). Understanding the Impact of Family on Health Behaviors and Health Outcomes in the Latinx Community. Poster presented at the 99th Western Psychology Association annual meeting, Pasadena, CA.

Cervantes-Ortega M, Campos B, Biegler K, Rook KS, Kilgore DB, Dow E, Sorkin DH. (2018, November 10-14). Influence of Familism and the Interpersonal Context on Perceived Stress Among Latina Mother-Adult Daughter Dyads. Poster presented at the 146th American Public Health Association annual meeting, San Diego, CA.

Guerra N R, Cervantes-Ortega M, Juarez J, Lei C, Patel J, Prieto-Arias L, Rook KS, Biegler K, Sorkin DH. (2018, April 26- 29). Familism, Social Ties, and Health Behaviors in a High-risk Sample of Latina Mothers and Adult Daughters. Poster presented at the 98th Western Psychology Association annual meeting, Portland, OR.

Frisch E, Cervantes-Ortega M, Lonappan H, Biegler K, Mukamel D, Sorkin DH. (2018, May 4). Health Care Disparities among a Racially/Ethnically Diverse Group of People with Type 2 Diabetes: A California Population Based Study. Poster presented at the University of California at Irvine's Institute for Clinical and Translational Science Research Day, Irvine, CA.

Biegler K, Cervantes-Ortega M, Rook KS, Dow E, Kilgore D, Sorkin DH. (2018, April 11-14). Unidas por la Vida: Examining diabetes management and weight loss in an intervention designed for Latinas with type 2 diabetes. Poster presented at the Society for Behavioral Medicine Annual Research Meeting, New Orleans, Louisiana.

Kane, JB & Cervantes-Ortega M. (2017, June). Neighborhood Deprivation and Prenatal Smoking: Assessing Effect Modification by Residential Stability. Poster session presented at the annual meeting of the Society for Pediatric and Perinatal Epidemiologic Research, Seattle, Washington.

Cervantes-Ortega M. (2017, April). Alzheimer's Disease: A Nationwide Increase in Cause Specific Morality. Poster presented at the annual meeting of the Population Association of America, Chicago, Illinois.

Mentorship

2020 UC Irvine Summer Undergraduate Research Program - $1,500
The Role of Fatalism and Familism in the Acculturation of Undocumented Latinx Families
Mentors: Dara H. Sorkin, Maribel Cervantes-Ortega
Student: Gladys Ramirez Salinas

2020 UC Irvine Undergraduate Research Opportunities Program - $500
Characterizing Fatalism in the Context of High Disease Burden and Social Networks within the Latinx Community
Mentors: Dara H. Sorkin, Maribel Cervantes-Ortega
Students: Ruth E. Beltran, Gladys Ramirez Salinas

2019 UC Irvine Summer Undergraduate Research Program - $1,000
The Influence of Physical Activity on the Quality of Sleep and Sleep Patterns within the Latinx Community: Assessing Information from a Multi-Family Member Health and Health Behavior Study
Mentors: Dara H. Sorkin, Maribel Cervantes-Ortega
Student: Sofia Groba

2019 UC Irvine Undergraduate Research Opportunities Program - $600
A Multi-Family Member Health and Health Behavior Study: Expanding Unidas por La Vida to Understand the Impact of the Family on Health Behaviors and Health Outcomes
Mentors: Dara H. Sorkin, Maribel Cervantes-Ortega
Students: Joceline Porron, Ruby Nuñez, Jazmin N. Juarez, Maria D. Muñiz

2018 UC Irvine Summer Undergraduate Research Program - $1,000
Unidas por la Vida: An Assessment of Compounded Stress in Related Adverse Health Outcomes Across Vulnerable Latino Families
Mentors: Dara H. Sorkin, Maribel Cervantes-Ortega
Student: Ruby Nuñez

ABSTRACT OF THE DISSERTATION

Illness Burden in Hispanic Women:
Understanding the Role of Social Networks

by
Maribel Cervantes-Ortega
Doctor of Philosophy in Social Ecology
University of California, Irvine, 2022
Professor Dara H. Sorkin, Co-Chair
Professor Karen L. Edwards, Co-Chair

The constant influx of Latino immigrants throughout the decades has transformed the demographic composition of the United States, such that the Hispanic population has experienced a 592% growth since 1970. Given that chronic conditions affect minority groups earlier and at much higher rates than other populations, it is especially important to investigate health in the growing Latino community. Despite declining cancer incidence and mortality rates, Latina patients continue to have lower 5-year survival rates compared to their non-Hispanic white counterparts. Moreover, Hispanic adults are 1.7 times more likely to have been diagnosed with diabetes, 2.6 times more likely to be hospitalized for diabetes related end-stage renal disease, and 1.4 times more likely to die from diabetes compared to non-Hispanic white adults.

Given the central role of family in the Latino culture, social relationships may help attenuate adverse health outcomes by promoting overall health and wellness for those involved. Dominant paradigms examining the impact of close relationships on focus on the individual, often a patient, or dyadic perspective, frequently spousal or parent-child

relationships. However, these models fail to consider the unique cultural influences of other members that are present in Hispanic families. Given that familism, a cultural value that emphasizes family over self, is one of the most prominent values in the Hispanic community, it is especially important to consider the role that social network members play in disease management.

To address these needs, a series of analyses examined the role of meaningful others, including medical providers and family members, on health behavior and health outcomes. Results from three separate datasets buttress the importance of such connections indicating that relationships matter for the overall health and wellness of Hispanic women. Research findings may have significant implications for the design of healthcare interventions that elicit change at the individual and social network levels with the goal of producing health equity for all.

INTRODUCTION

Hispanics or Latinos are currently the largest racial/ethnic minority population in the US. Nearly 1 in 6 people living in the United States are Hispanic, with this number expected to grow to 1 in 4 by 2035. Given that chronic conditions affect minority groups earlier and at much higher rates than other populations,[1] it is especially important to investigate health in the growing Latino community. When it comes to breast cancer, an estimated 28,100 cases and 3,100 deaths are expected to occur among Hispanic women in 2021.[2] Considerations for breast cancer are especially important given that five-year breast cancer survival in Hispanic women is lower than that in non-Hispanic White women, partly reflecting the higher proportion of Hispanic women diagnosed with later-staged disease. During 2014-2018, 59% of breast cancers among Hispanic women were diagnosed at a localized stage, compared to 67% among non-Hispanic White women.[2] Lower rates of mammography screening and delayed follow-up of abnormal results or self-discovered breast abnormalities among Hispanic women likely contribute to this difference. Additionally, Hispanics, particularly Mexican Americans,[3] have higher overall diabetes prevalence and are about 50% more likely to die from diabetes compared to non-Hispanic whites.[4,5] While a high burden of diabetes is common among Latinos, the lack of diabetic control in this population[6,7] contributes to higher rates of diabetes-related complications and worse overall outcomes among Latinos compared to non-Latino whites.[8-13]

Vast attempts have been made to document the biomedical burden of disease in this population.[10,13,14-17] More recently, however, efforts to understand illness burden have expanded beyond measures of mortality and morbidity to focus on the burden of disease for families, households, and social networks. Moreover, illness burden is, by definition, a

negative term—it focuses on the hardships and losses associated with a disease, but a full understanding of the burden of disease involves an appreciation of factors that are health protective and promote health, such as social cohesion, healthy and supportive family environments. Positive qualities in social relationships, including relationship closeness, satisfaction, and social support, have been shown to influence overall health and wellness for those involved.[18,19] Interestingly, research has also found that individuals with unsupportive social relationships are likely to experience an increase in psychological and somatic problems.[20]

Beyond family and friends, doctor-patient relationships also have the power to influence health and wellness in Hispanic individuals. In the area of breast cancer, studies have shown that patients who have a higher quality provider-patient relationship and are concurrently guided through the treatment process, are more satisfied with their care. [21,22] In turn, satisfaction with care has been associated with better illness-management and health behaviors, including improved adherence to recommended therapy,[23] leading to improved health outcomes and quality of life.[24-26] While leveraging these relationships can have a positive influence on breast cancer patients, for Hispanic women in particular, growing evidence indicates that first generation immigrants have higher levels of satisfaction with care than second or later generation Hispanic patients.[27] Given the evidence that satisfaction with care can have downstream effects on health outcomes, it is important to disentangle the influence that acculturation may have on this association.

Hispanic cultural values have become an area of interest due to the suggested protective factors that they may serve.[28,29] One of the most studied core Hispanic cultural values is familism, which refers to the idea that one's family is expected to provide

necessary emotional and instrumental social support when needed.[29,30] Familism creates a sense of obligation to take care of one's family and to take one's family into consideration when making decisions. Evidence to date indicates that familism is correlated with positive psychological health and is likely facilitated by familial closeness and social support. More recent studies, however, have moved beyond psychological benefits and begun to explore the association between familism and physical health.[31,32]

A key pathway through which familism may be linked to better health is by moderating the potentially health-harming effects of stress. Stress, defined as emotional strain or physiological responses to adverse circumstances, can lead to poor physical health if experienced repeatedly or for a prolonged period of time.[33] This is especially important for Latinos given that they report higher levels of perceived stress compared to non-Hispanic whites.[34] Emerging work, however, suggests that familism may have a buffering effect of perceived stress on health.[31] Although Latinos experience elevated stress levels that leave their health at risk, findings suggest that cultural values within this population may serve as protective factors for long-term health.

Existing models assessing stress transmission typically focus on the individual and fail to consider the unique cultural influences of other members that are present in Latino families. The current research plan will address this gap in knowledge by transitioning to a multi-perspective assessment of the family context examining how cultural values influence stress levels that can have downstream effects on the onset and management of physical health conditions. This study further advances literature by addressing the transmission processes in the presence of diabetes, an area where the social context of disease management plays a pronounced role.

Based on growing evidence that shows the deep impact that social networks have on health and wellness in Hispanic women, a series of datasets were used to address the following areas:

Chapter 1: Participatory decision-making for cancer care in a high-risk sample of low income Mexican-American breast cancer survivors: The role of acculturation.

Chapter 2: Health-related social control and perceived stress among high-risk Latina mothers with Type 2 Diabetes and their at-risk adult daughters.

Chapter 3: Understanding Stress and Health Outcomes in the Context of Social Networks: An Assessment of Hispanic Families.

Insight to the above aims will provide novel information about the effect of social networks cancer care and stress to better our understanding of the complex mechanisms behind these multifaceted outcomes. These efforts have the prospect of improving targeted intervention methods to better assist vulnerable populations and illuminate mechanisms to best involve practitioners, friends, and family to leverage health and wellness.

REFERENCES

1. University of California San Francisco. (2010). San Francisco General Hospital and Trauma Center Annual Report Fiscal Year 2009-2010. Retrieved January 4, 2020, from https://www.sfdph.org/dph/hc/HCAgen/HCAgen2010/12072010/Dec%207%20SFGH%20Annual%20Repo rt.pdf.

2. Kposowa, A. J. (2013). Mortality from diabetes by Hispanic groups: evidence from the US National Longitudinal Mortality Study. International Journal of Population Research, 2013.

3. Centers for Disease Control and Prevention. (2015). Hispanic Health. Retrieved March 16, 2020, from https://www.cdc.gov/vitalsigns/hispanic-health/index.html

4. López, L., & Golden, S. H. (2014). A New Era in Understanding Diabetes Disparities Among U.S. Latinos— All Are Not Equal. Diabetes Care, 37(8), 2081-2083. doi:10.2337/dc14-0923

5. National Institute of Diabetes and Digestive and Kidney Diseases. (2005). National diabetes statistics fact sheet: general information and national estimates on diabetes in the United States, 2005. Department of Health and Human Services, National Institutes of Health, Bethesda, MD.

6. Centers for Disease Control and Prevention. (2020). National diabetes statistics report, 2020. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services.

7. Diamant, A. L., Babey, S. H., Brown, E. R., & Chawla, N. (2003). Diabetes in California: nearly 1.5 million diagnosed and 2 million more at risk.

8. United States. Public Health Service. Office of the Surgeon General, United States. Office of Disease Prevention, Health Promotion, Centers for Disease Control, & Prevention (US). (2001). The Surgeon General's call to action to prevent and decrease overweight and obesity. US Government Printing Office.

9. Lavery, L. A., Ashry, H. R., Armstrong, D. G., & Pugh, J. A. (1999). Diabetes-related lower-extremity amputations disproportionately affect Blacks and Mexican Americans. Southern medical journal, 92(6), 593-599.

10. Evans, G. W., & Kantrowitz, E. (2001). Strategies for reducing morbidity and mortality from diabetes through health-care system interventions and diabetes self-management education in community settings. A report on recommendations of the Task Force on Community Preventive Services. Morbidity and Mortality Weekly Report Recommendations and Reports, 50, 1-15.

11. Brown, E. R., Ojeda, V. D., Wyn, R., & Levan, R. (2000). Racial and ethnic disparities in access to health insurance and health care.

12. Pugh, J. A., Medina, R. A., Cornell, J. C., & Basu, S. (1995). NIDDM is the major cause of diabetic endstage renal disease: more evidence from a tri-ethnic community. Diabetes, 44(12), 1375-1380.

13. American Cancer Society. Cancer Facts & Figures for Hispanic/Latino People 2021-2023. Atlanta: American Cancer Society, Inc. 2021.

14. Dominguez, K., Penman-Aguilar, A., Chang, M. H., Moonesinghe, R., Castellanos, T., Rodriguez-Lainz, A., & Schieber, R. (2015). Vital signs: leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States—2009–2013. MMWR. Morbidity and mortality weekly report, 64(17), 469.

15. American Diabetes Association. (2019). 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. Diabetes Care, 42(Supplement 1), S13-S28.

16. Harris, M. I. (2001). Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. Diabetes care, 24(3), 454-459.

17. Haffner, S. M., Mitchell, B. D., Moss, S. E., Stern, M. P., Hazuda, H. P., Patterson, J., ... & Klein, R. (1993). Is there an ethnic difference in the effect of risk factors for diabetic retinopathy?. Annals of epidemiology, 3(1), 2-8.

18. Towler, A. J., & Stuhlmacher, A. F. (2013). Attachment styles, relationship satisfaction, and well-being in working women. The Journal of social psychology, 153(3), 279-298.

19. Kok, B. E., & Fredrickson, B. L. (2014). Wellbeing Begins with "We" The Physical and Mental Health Benefits of Interventions that Increase Social Closeness. Wellbeing: A Complete Reference Guide, 1-29.

20. DeLongis, A., Folkman, S., & Lazarus, R. S. (1988). The impact of daily stress on health and mood: psychological and social resources as mediators. Journal of personality and social psychology, 54(3), 486.

21. Ong LM, de Haes JC, Hoos AM, et al. Doctor-patient communication: a review of the literature. *Soc Sci Med* 1995;40(7):903–918.

22. Thind A, Hoq L, Diamant A, Maly RC. Satisfaction with care among low-income women with breast cancer. *J Womens Health (Larchmt)* 2010;19(1):77–86.

23. Piette JD, Heisler M, Krein S, et al. The Role of Patient-Physician Trust in Moderating Medication Nonadherence Due to Cost Pressures. *Arch Intern Med* 2005;165(15):1749–1755.

24. Ashraf AA, Colakoglu S, Nguyen JT, et al. Patient involvement in the decision-making process improves satisfaction and quality of life in postmastectomy breast reconstruction. *J Surg Res* 2013;184(1):665–670.

25. Vogel BA, Leonhart R, Helmes AW. Communication matters: the impact of communication and participation in decision making on breast cancer patients' depression and quality of life. *Patient Educ Couns* 2009;77(3):391–397.

26. Wildes KA, Miller AR, de Majors SS, et al. The satisfaction of Latina breast cancer survivors with their healthcare and health-related quality of life. *J Womens Health (Larchmt)* 2011;20(7):1065–1074.

27. Schutt RK, Cruz ER, Woodford ML. Client satisfaction in a breast and cervical cancer early detection program: the influence of ethnicity and language, health, resources, and barriers. *Women Health* 2008;48(3):283–302.

28. Smokowski P. R., Bacallao M., Buchanan R. L. (2009). Interpersonal mediators linking acculturation stressors to subsequent internalizing symptoms and self-esteem in Latino adolescents. J. Community Psychol. 37, 1024–1045. 10.1002/jcop.20346.

29. Calzada E. J., Tamis-LeMonda C. S., Yoshikawa H. (2012). Familismo in mexican and dominican families from low-income, Urban communities. J. Fam. Issues 34, 1696–1724. 10.1177/0192513X12460218.

30. Sabogal F., Marin G., Otero-Sabogal R., Marin B. V., Perez-Stable E. J. (1987). Hispanic familism and acculturation: what changes and what doesn't? Hisp. J. Behav. Sci. 9, 397–412. 10.1177/07399863870094003.

31. Corona, K., Campos, B., Rook, K. S., Biegler, K., & Sorkin, D. H. (2019). Do cultural values have a role in health equity? A study of Latina mothers and daughters. Cultural Diversity and Ethnic Minority Psychology, 25(1), 65.

32. Katiria Perez, G., & Cruess, D. (2014). The impact of familism on physical and mental health among Hispanics in the United States. Health psychology review, 8(1), 95-127.

33. Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. Psychological bulletin, 98(2), 310.

34. American Psychological Association. (2006). Stress and Mind/Body Health Hispanics [Press release]. Retrieved March 19, 2020, from http://www.apa.org/news/press/releases/2006/10/hispanic-stress.aspx.

CHAPTER 1

Participatory decision-making for cancer care in a high-risk sample of low income Mexican-American breast cancer survivors: The role of acculturation

ABSTRACT

Background: Despite declining cancer incidence and mortality rates, Latina patients continue to have lower 5-year survival rates compared to their non-Hispanic white counterparts. Much of this difference has been attributed to lack of healthcare access and poorer quality of care. Research, however, has not considered the unique healthcare experiences of Latina patients.

Methods: Latina women with prior diagnoses of stage 0-III breast cancer were asked to complete a cross-sectional survey assessing several socio-demographic factors along with their experiences as cancer patients. Using a series of linear regression models in a sample of 68 Mexican-American breast cancer survivors, we examined the extent to which patients' ratings of provider interpersonal quality of care were associated with patients' overall healthcare quality, and how these associations varied by acculturation status.

Results: Findings for Latina women indicated that both participatory decision-making (PDM) ($\beta = 0.62$, $p < .0001$) and trust ($\beta = 0.53$, $p = .02$) were significantly associated with patients' ratings of healthcare quality. The interaction between acculturation and PDM further suggested that participating in the decision-making process mattered more for less acculturated than for more acculturated patients ($\beta = -0.51$, $p \leq .01$).

Conclusions: The variation across low and high acculturated Latinas in their decision-making process introduces a unique challenge to health care providers. Further understanding the relationship between provider-patient experiences and ratings of overall healthcare quality is critical for ultimately improving health outcomes.

1. INTRODUCTION

In the United States alone, approximately 276,480 new cases of invasive breast cancer are expected to be diagnosed in 2020 along with 48,530 new cases of non-invasive (in situ) breast cancer.[1] Furthermore, a projected total of 42,170 U.S. women are expected to die from breast cancer in the same year, reflecting the highest cancer death rate after lung cancer. [1] As of January 2020, there are more than 3.5 million women with a history of breast cancer living in the United States. [1] Although breast cancer continues to be major source of disease, early detection and advances in treatment have resulted in higher survival rates. It is, therefore, crucial to consider the experiences of breast cancer survivors during their treatment process.

Within the past few decades, patients have become increasingly active in their own medical care. Recently diagnosed cancer patients are faced with the complexities of not only coping with the emotional stress of their diagnosis but also comprehending extensive information about treatment procedures immediately after diagnosis in order to participate in the decision-making process with their providers. Although the initial diagnosis may be challenging, many patients tend to seek additional information and later return to their healthcare providers as informed patients rather than as passive recipients of advice and treatment.[2]

As the availability and complexity of treatment options has increased, studies have shown that patients who have a higher quality provider-patient relationship and are concurrently guided through the treatment process, are more satisfied with their care.[3,4] The model in which providers actively engage patients with their own medical care has been termed “shared” or “participatory decision-making” (PDM).[5,6] Ideally, a PDM style

approach involves a provider-patient relationship in which patients are presented with the best available information. Patients' values, goals, capabilities and care preferences are also assessed, and together with their healthcare team, providers and patients arrive at mutually agreed-upon treatment plans. The perception that the provider involves them in the treatment decision-making process has been associated with improved health outcomes, better self-management, and higher levels of patient satisfaction.[7,8] In turn, satisfaction with care in the area of breast cancer has been associated with better illness-management and health behaviors, including improved adherence to recommended therapy,[9] leading to improved health outcomes and quality of life.[10-12]

Recent studies, however, have reported a disparity in PDM among Latina patient populations, as they have the lowest rates of PDM and poorest provider-patient communication compared to their non-Hispanic white counterparts.[13] Latinas with breast cancer, and in particular low acculturated Latinas, are less likely to report high clinical communication quality for both surgeons and medical oncologists,[13] less informed about their diagnoses and less likely to seek or receive information about their treatment options compared to other racially/ethnically diverse women.[14] Surprisingly, a large population-based cohort study examining satisfaction with care that included low-income Latina women suggested that most women (nearly 75%) reported being extremely satisfied with the breast cancer care they had received, and that less acculturated Latinas had nearly five times the odds of being extremely satisfied compared to non-Hispanic white women.[15] However, these studies have been descriptive in nature and have not taken further steps toward understanding how patient-ratings of their provider experiences contribute to ratings of their healthcare quality.

The noted paradoxical finding may arise, in part, from the limited consideration of acculturation factors, which may influence expectations around not only provider-patient communication and confidence in participating throughout the treatment decision-making process, but also expectations of received care from the medical system.[15,16] Studies examining racial/ethnic differences in patient perspectives when it comes to their cancer treatment experiences have found that lower acculturated Latinas are less likely to report high communication quality with their clinicians and that Spanish-speaking Latinas had the highest odds of low satisfaction with their surgical treatment decisions.[13,17,18] However, there is growing evidence that first generation Hispanic immigrants have higher levels of satisfaction with care than second or later generation Hispanic patients.[19] Given the evidence that lower health literacy and language barriers are often associated with lower ratings of participatory decision making, lower satisfaction with the treatment decision making process,[20,21] and more treatment regret,[21] it is difficult to disentangle the potentially opposing influence of factors related to acculturation and immigration-related barriers to care.

This raises the question as to whether the strong association between participatory decision-making and satisfaction with care generalizes to Latina women or is limited to those of a certain acculturation level, and more importantly whether there are other components of the provider-patient relationship that warrant examination. Therefore, this study was designed to examine (1) associations between patient ratings of the interpersonal qualities of the provider-patient relationship and their overall healthcare quality, and (2) the extent to which patient acculturation levels affected these associations, in a sample of Mexican-American breast cancer survivors.

2. METHODS

2.1. Study design and participants

Latina breast cancer survivors were recruited through an academic medical center and asked to complete a survey assessing several socio-demographic factors along with their experiences as cancer patients. Inclusion criteria comprised the following: 1) identifying as Mexican-American, 2) at least 18 years of age, 3) prior diagnosis of stage 0-III breast cancer, 4) have completed active treatment 6 months prior to recruitment, 5) have a body mass index > 25 kg/m2 and < 43, and 6) English or Spanish speaking. Reasons for exclusion included the following: 1) Stage IV (e.g., metastatic disease), 2) recurrent cancer, 3) contraindications for moderate physical activity (i.e., walking), 4) visual or hearing impairment, or 5) any major psychiatric and/or life-threatening illness that impeded the ability to consent to or complete the study. Approximately 77 women were approached, and 70 consented to complete a survey in their preferred language (either English or Spanish) containing measures that assessed their level of acculturation and other socio-demographic characteristics, patient-perceived quality of care, and satisfaction with care. In order to accommodate language preferences within this sample, all study materials were made available in either Spanish or English to avoid any inclusion bias based on language. Study procedures were approved by the University of California, Irvine Institutional Review Board.

2.2. Measures

2.2.1. Outcome measures

Evaluation of overall quality of care was assessed using a single item that asked patients to rate the quality of care they received over the course of their cancer treatment.

The item used a 5-point Likert scale, in which a higher score indicated better quality of care (1 = Poor, 5 = Excellent).

2.2.2. Provider-patient relationship measures

Level of patient involvement in decision-making related to their breast cancer treatment was assessed using a 4-item measure of participatory decision making (PDM-4).[22,23] Participatory decision making scales have consistently been used across all racial/ethnic groups, with some studies specifically focusing on minority groups.[22,24,25] A sample item included "How often did the doctors that took care of you during your cancer treatment offer you choices in your medical care?" Ratings were made on a 5-point Likert scale (1 = never/none of the time, 5 = very often/all of the time). Items were averaged to create a composite variable (Cronbach's alpha was adequate = 0.89). To assess patient perceptions of being treated as an equal partner, we used a single item question rated on a 5-point scale (1 = definitely yes, 5 = definitely no). A total of five questions were used to assess patients' trust in their provider.[26] A sample item included "How often do you feel that you trust your doctor's judgments about your medical care?" Ratings were made on a 5-point scale (1 = never, 5 = always). Items were averaged to form a composite measure (Cronbach's alpha = 0.84).

2.2.3. Acculturation status

Acculturation status was assessed using a combination of information from three content areas: 1) whether or not the participant was born in the U.S. (0 = no, 1 = yes); 2) length of time in the U.S. (those who had lived in the U.S. for less than 10 years, between 10 and 20 years, and 20 or more years); and 3) primary language spoken (1 = English-

speaking only or English better than Spanish, 2 = equal proficiency in both English and Spanish, and 3 = Spanish-speaking only or Spanish better than English).

Data was combined to create a point scale from 0 to 3 (0 = born outside the U.S. and lived in the U.S. for less than 10 years, 1 = born outside the U.S. and lived in the U.S. for 10–20 years, 2 = born outside the U.S. and lived in the U.S. for 20 or more years, 3 = born in the U.S.). The categories applied to language spoken were assigned a point scale from 0 to 2 (0 = Spanish-speaking, 1 = both equally, 2 = English-speaking).

Scores were then added together to create a composite acculturation score, which ranged from 0 (least acculturated) to 5 (most acculturated). Participants were dichotomized into a less acculturated group (scores = 0–2) and a more acculturated group (scores = 3–5). This scoring system was modeled after a study on Hispanic and Chinese populations, reflecting a more accurate representation of acculturation compared to separate analyses of each variable, as these variables tend to cluster within individuals.[27]

2.2.4. Covariates

Covariates in the analysis included standard demographic characteristics, such as age and years of education. Participants also reported their date of diagnosis, as well as the time passed since their last chemotherapy or radiation treatment. Participants were asked about the length of relationship with their doctor (1 = less than one month, 2 = more than 1 month but less than a year, 3 = 1–2 years, 4 = more than two but less than five years, 5 = 5 or more years). Health insurance status was reported (0 = no insurance, 1 = insurance), as well as insurance type (1 = insurance provided by job or employer, 2 = MediCal, 3 = CalOptima, 4 = MSI, 5 = Medicare, etc.).

2.3. Statistical analysis

All data were analyzed using SPSS release 17.0 (SPSS Inc., Chicago) and SAS/STAT software version 9.4 (SAS Institute Inc., Cary, NC, USA.). All derived multi-item measures were tested for reliability using Cronbach's alpha. We first describe the sociodemographic and health characteristics of the patient sample. A linear regression model using full information maximum likelihood (FIML) was created to examine the effect of acculturation on the association between components of the interpersonal quality of the provider-patient relationship and overall patient ratings of quality of care. Interactions of acculturation were made with each interpersonal component of the provider-patient relationship to test whether quality of care was moderated by acculturation. To allow for ease of interpretation and to help account for the small sample size, acculturation was dichotomized into low acculturation (score of ≤2) and high acculturation (scores of ≥3).

3. RESULTS

3.1. Sample description

A total of 70 Latina breast cancer survivors responded to the survey with 68 respondents having a non-missing quality of care value. Of the 68 respondents, Table 1 describes the 63 participants that had complete data from which level of acculturation could be calculated; of these, 42 were categorized as having lower acculturation, and 21 were categorized as having higher acculturation. Overall, the sample generally consisted of women with low socioeconomic status, as the majority of the sample is on government-sponsored insurance (e.g., MediCal/CalOptima) and 64.5% of the sample had a total annual household income less than $14,999. Few significant differences were found when assessing sociodemographic characteristics in lower versus higher acculturated respondents in this sample. Respondents of lower acculturation were older (Means = 57.1

years old vs. 52.2 years old, p = .12) and in the U.S. for less time than their higher acculturated counterparts (Means = 28.2 years in U.S. vs. 34.3 years in US, p = .05). Furthermore, respondents of lower acculturation were also less likely to have graduated from high school (Percents = 31.0% high school graduate or more vs. 57.1% high school graduate or more, p = .05) compared to higher acculturated respondents.

Table 1. Socio-demographic Characteristics by Acculturation, (N-63)

	Acculturation		
	Low (n=42)	High (n=21)	
	%	%	p-value
Preferred Language, % Spanish	100	0.0	<0.0001
Education, % high school graduate or more	31.0	57.1	0.05
Born outside of the U.S., % Yes	100	61.9	
Married or living with partner, % Yes	47.6	39.1	0.47
Income, % $14,999 or less	59.5	57.1	0.86
Insurance–Government Sponsored (e.g., MediCal), %	85.7	76.2	0.35
Medical provider speaks Spanish, % Yes	9.5	9.5	1.0
Time since last treatment, % 5 or more years	38.1	28.6	0.45
	Mean (SD)	Mean (SD)	p-value
Average age, years	57.1 (10.1)	52.2 (12.0)	0.12
Time since diagnosis, years	5.8 (3.8)	5.7 (4.0)	0.94
Time in the US, years [only born outside US]	28.2 (9.9)	34.3 (8.6)	0.05
Components of Provider-Patient Relationship			
Participatory Decision-Making (PDM)	4.5 (0.7)	4.1 (1.0)	0.12
Trust	4.8 (0.4)	4.7 (0.5)	0.44
Treated as an Equal Partner	4.8 (0.5)	5.0 (0.2)	0.15
Dependent Variable			
Quality of Care	4.7 (0.7)	5.0 (0.2)	0.14

3.2. Patient-perceived quality of care and satisfaction with care

Means and standard deviations for all patient-centered care variables as well as their bivariate correlation analysis are displayed in Table 2. All three components of patient-provider interpersonal qualities (PDM style, being treated as an equal partner, and feelings of trust) were associated with patients' ratings of overall healthcare quality.

Table 2. Means and correlations for components of the patient-provider relationship and the outcome, quality of care (N = 68)

	Mean (SD)	1	2	3	4
1. Participatory Decision-Making (PDM)	4.3 (0.9)	--			
2. Trust in Provider	4.7 (0.5)	0.38*	--		
3. Treated as an Equal Partner	4.8 (0.5)	0.51**	0.49**	--	
4. Quality of Care	4.7 (0.8)	0.53**	0.55**	0.41*	--

*p<0.002 **p<0.0001

The results of the linear regression model testing the interaction of acculturation by each interpersonal component of the provider–patient relationship on patient-reported quality of care are shown in Table 3. Significant main effects were observed for PDM (β=0.62, p<0.0001) and trust in provider (β=0.53, p=0.02) with an alpha < 0.05. When assessing the moderating effect of acculturation, the only significant interaction was observed between PDM style and acculturation level (β=−0.51, p<0.01).

Table 3. Association between Provider-Patient Relationship and Patient-Reported Quality of Care for High versus Low Acculturated Patients (N=68)

	Quality of Care		
Variables:	**β (SE)**	**t**	**p-value**
Main Effects:			
Acculturation	-0.57 (3.49)	-0.16	0.87
Participatory decision making (PDM)	0.62 (0.14)	4.36	<0.0001
Trust in provider	0.53 (0.22)	2.43	0.02
Treated as an equal partner	-0.27 (0.22)	-1.26	0.21
Interactions:			
PDM x Acculturation	-0.51 (0.20)	-2.60	<0.01
Trust in provider x Acculturation	0.18 (0.34)	0.54	0.59

As shown in Figure 1, the association between PDM ratings' and ratings of overall quality of care were less strong among higher acculturated patients and more strong among lower acculturated patients.

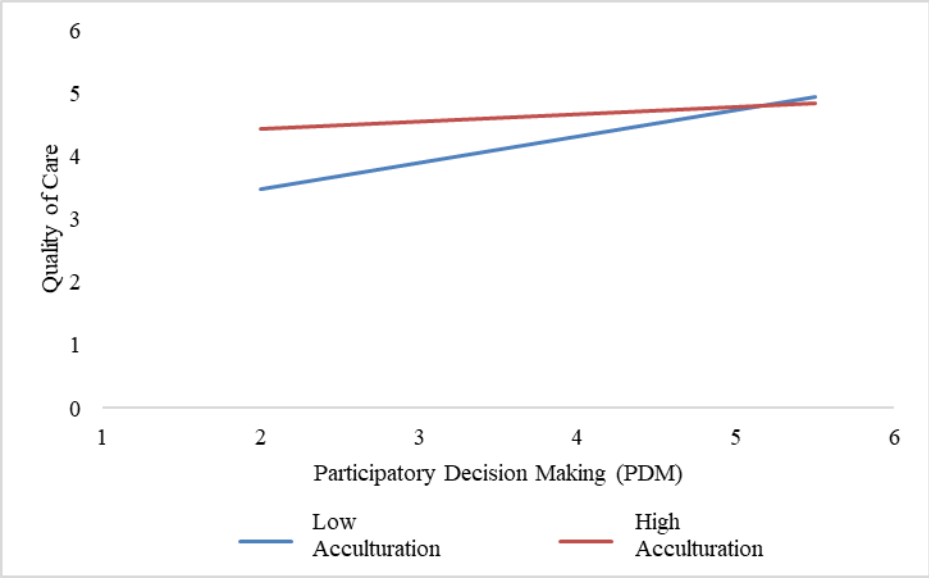

Figure 1. Crude Linear Association of PDM and Quality of Care by Low and High Acculturation

4. DISCUSSION

The field of healthcare is becoming increasingly sensitive to the importance of high-quality provider-patient relationships and its role in improving patient satisfaction with care and health outcomes. The growing literature has shown that patient ratings of overall quality of care, as well as the importance of the various components of the provider-patient relationship, vary between individuals from different racial/ethnic groups.[13,15,28-31] This study specifically set out to examine the extent to which each of three provider-patient relationship components were associated with patients' rating of their satisfaction with care. Additionally, our study investigated whether the importance of each component varied by acculturation level.

Although all components of the patient-provider relationship were correlated with one another, not all were significantly associated to ratings of quality of care in the regression analysis. Specifically, our study found that PDM was significantly associated with quality of care, such that increased levels of PDM were independently associated with higher patient ratings in quality of care. Similarly, a study reported that interventions designed to increase participatory/shared decision making within a group of Hispanic and other racially diverse individuals by encouraging patients to express their concerns were associated with increased perceptions in quality of care.[32] Study results buttress these patterns suggesting that, for minority women in particular, it is uniquely important to engage patients in opportunities to voice their concerns and ask questions during their treatment process. By doing so, both patients and providers are given the opportunity to address cultural differences around expectations for participating in treatment decisions and provider-patient communication deficiencies prominent among some Latinas. In the

context of receiving medical care, strong trust in health care providers has consistently been shown to guide patients' follow-up care experiences,[33] such that increased trust has been associated with higher satisfaction with treatment and quality of care.[34] These findings hold true in non-Hispanic[35-37] and Hispanic[38] populations alike. Our findings are consistent with the literature[36] in that those who had high trust in their providers reported significantly better quality of care ratings than those who had low trust in their providers, irrespective of acculturation status. Here, patient-provider relationships high in trust may facilitate communication and decrease patient fear, resulting in higher ratings of quality of care.[33,37] Additionally, this association may be explained, in part, by patients' needs to feel trust, that their provider is doing everything possible in order to obtain the best treatment outcome, especially after being confronted with a serious diagnosis.[33]

Furthermore, results reflected a significant interaction for participatory decision-making and acculturation level, indicating that the association between PDM ratings' and ratings of overall quality of care was weaker among higher acculturated patients and stronger among lower acculturated patients. Our findings add to the literature by showing that variations exist in the provider-patient relationship within a single ethnic group, and that a patient's acculturation level may differentially impact the association of participatory decision-making with patient ratings of satisfaction with care.

Paradoxical findings in previous studies showing that low income and low acculturated Latinas are more likely to report higher satisfaction with care[15] – even though Latina patient populations report the lowest rates of PDM and poorest provider-patient communication compared to their non-Hispanic white counterparts[14]– highlights the importance of disentangling the role of acculturation. Growing literature continues to

demonstrate that higher acculturated Latina patients are generally less satisfied with care than their lower acculturated counterparts.[8,15] Our study similarly shows that, when it comes to the modifying effect of acculturation, associations between PDM and overall quality of care are strong among lower acculturated patients and weaker among higher acculturated patients. An explanation may be that individuals of different acculturation levels may have different perceptions of what PDM means in the context of their care. A study assessing doctor-patient relationships in the public and private health care contexts within the Mexican health care system bring attention to existing differences in expectations for these relationships. Study findings indicated that the type of medical care subsystem, public versus private, shaped different relationships between patients and doctors.[39] Encounters between patients and physicians within public medical settings, which typically care for lower-income patients, appear to be more doctor-centered, while these encounters become more complex in the private sector, which typically care for more affluent patients, shifting to a model where a patient-centered approach coexists with the traditional physician-centered approach.[39] Within Mexican culture, access to public versus private health care shapes patient experiences and may play a role in expectations upon transition to the US health care system. The patients included in this study were all recruited from a medical clinic that provides care to the underserved, and thus our low-acculturated patients seen in this setting may have lower expectations for engagement with their providers in comparison to what they could expect in their country of origin. Thus, upon immigration to the US, it is likely that as women have the opportunity to become increasingly involved in the decision-making process, these experiences have a stronger impact on their ratings of quality of care.

On the other hand, it is also possible that Latina women who are less acculturated may be more grateful for any type of care they receive, resulting in higher ratings in quality of care as they become increasingly involved with their medical care. This conceptual framework, emphasizing deference toward providers among lower acculturated individuals,[38] likely explains the impact of acculturation seen across our results. The idea that individuals who have not had an opportunity to extensively acculturate into the US and its health care system, especially with its emphasis on patient autonomy, are more likely to regard providers with greater respect and esteem than those who have had more opportunity to acculturate.[38] Perhaps individuals with lower acculturation scores have not always had the same access to care and are appreciative of these providers for providing necessary care after their cancer diagnosis while higher acculturated individuals maintain high expectations for the amount of care and quality of care they receive.

This study finds strength in its ability to add to a small but growing literature suggesting that patient preferences may be contingent on expectations driven by cultural and sociodemographic factors.[13] Nonetheless, this study also has a few limitations. First, our sample size was relatively small and predominately comprised of low-income Mexican-American women, which may not be generalizable to other breast cancer survivor populations, Latina or otherwise. Nonetheless, this study offers a unique and interesting perspective given that recruited participants were predominantly low income, held lower education levels, and the majority were born outside the US. Second, the descriptive nature of this study prevents any assumptions of causality between the variables. Although the relationship between the provider and patient has been shown to influence patients' satisfaction with care ratings, there may be other factors, such as their impression of other

health care staff and their ability to work together, receptionists, ease of navigating the healthcare system, etc., that are unaccounted for in our study and also likely influence reports of quality of care.[40,41] It is also important to note that respondents were not asked about language or ethnic concordance with their providers, factors likely to improve communication and influence feelings of participation and trust.

Final limitations concern the measurement of quality of care and acculturation.[42,43] Quality of care was measured using a single question and may have resulted in a crude assessment. Acculturation, on the other hand, was assessed using a combination of information from three content areas. Whereas language and nativity are commonly used as proxy measures,[44] in recent years a more comprehensive understanding of acculturation has evolved that has called for greater attention to the socio-cultural context that affect the experience of migration – including the environments from which people emigrate and to which they immigrate.[45] For example, Allen and colleagues highlight how immigration can be accompanied by a disruption in social ties, increased stress, and experiences of discrimination.[46] Our goal was to evaluate the extent to which acculturation influences the association between ratings of provider-patient interpersonal quality on and ratings of healthcare quality, as opposed to understanding the indirect influence of these other socio-contextual factors.

Based on the findings from our study, we demonstrated the importance of the provider-patient relationship in Mexican-American breast cancer survivors' satisfaction with care and aimed to bring attention to the acculturation differences in various components of these relationships. In order to improve satisfaction in health care among ethnic minority patients, there may be a need for a more tailored relationship between the

provider and patient. Our findings indicate that providers should, to the best of their ability, prioritize participatory decision-making in their interactions with patients in order to improve ratings in quality of care which could have beneficial downstream and longer-term effects for patient health. Future research should continue to focus on larger populations and include additional minority groups in order to investigate whether these finding are generalizable. Furthermore, future studies should also investigate additional factors involved in the provider-patient relationship that may also be affected by acculturation levels. Ultimately, this study provides results that would inform the creation of an intervention to establish a causal relationship between the provider-patient interactions and satisfaction with care.

ACKNOWLEDGEMENTS

This work was co-authored with: Senxi Du, Kelly A. Biegler, Sadeeka Al-Majid, Katelyn C. Davis, Yunan Chen, Alfred Kobsa, Dana B. Mukamel, and Dara H. Sorkin. This work was supported by the National Cancer Institute of the National Institutes of Health under award numbers P20 CA174292 and P20 CA174188. This work was also supported by the National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institute of Health, through Grant UL1 TR000153 and KL2 TR000147.

REFERENCES

1. Breastcancer.org. *U.S. Breast Cancer Statistics* Available: http://www.breastcancer.org/symptoms/understand_bc/statistics.

2. Diefenbach M, Turner G, Carpenter KM, et al. Cancer and patient-physician communication. *J Health Commun* 2009;14 Suppl 1:57–65.

3. Ong LM, de Haes JC, Hoos AM, et al. Doctor-patient communication: a review of the literature. *Soc Sci Med* 1995;40(7):903–918.

4. Thind A, Hoq L, Diamant A, Maly RC. Satisfaction with care among low-income women with breast cancer. *J Womens Health (Larchmt)* 2010;19(1):77–86.

5. Brundage MD, Feldman-Stewart D, Tishelman C. (2010) How do interventions designed to improve provider-patient communication work? Illustrative applications of a framework for communication, *Acta Oncologica* 2010;49(2), 136–143.

6. Heisler M, Bouknight RR, Hayward RA, et al. The relative importance of physician communication, participatory decision making, and patient understanding in diabetes self-management. *J Gen Intern Med* 2002;17(4):243–252.

7. Katz SJ, Lantz PM, Janz NK, et al. Patient involvement in surgery treatment decisions for breast cancer. *J Clin Oncol* 2005;23(24):5526–5533.

8. Liang W, Burnett CB, Rowland JH, et al. Communication between physicians and older women with localized breast cancer: implications for treatment and patient satisfaction. *J Clin Oncol* 2002;20(4):1008–1016.

9. Piette JD, Heisler M, Krein S, et al. The Role of Patient-Physician Trust in Moderating Medication Nonadherence Due to Cost Pressures. *Arch Intern Med* 2005;165(15):1749–1755.

10. Ashraf AA, Colakoglu S, Nguyen JT, et al. Patient involvement in the decision-making process improves satisfaction and quality of life in postmastectomy breast reconstruction. *J Surg Res* 2013;184(1):665–670.

11. Vogel BA, Leonhart R, Helmes AW. Communication matters: the impact of communication and participation in decision making on breast cancer patients' depression and quality of life. *Patient Educ Couns* 2009;77(3):391–397.

12. Wildes KA, Miller AR, de Majors SS, et al. The satisfaction of Latina breast cancer survivors with their healthcare and health-related quality of life. *J Womens Health (Larchmt)* 2011;20(7):1065–1074.

13. Katz SJ, Wallner LP, Abrahamse PH, et al. Treatment experiences of Latinas after diagnosis of breast cancer. *Cancer* 2017;123(16):3022–3030.

14. Napoles-Springer AM, Livaudais JC, Bloom J, et al. Information exchange and decision making in the treatment of Latina and white women with ductal carcinoma in situ. *J Psychosoc Oncol* 2007;25(4):19–36.

15. Thind A, Hoq L, Diamant A, et al. Satisfaction with care among low-income women with breast cancer. *J Womens Health (Larchmt)* 2010;19(1):77–86.

16. Yanez B, Stanton AL, Maly RC. Breast cancer treatment decision making among Latinas and non-Latina Whites: a communication model predicting decisional outcomes and quality of life. *Health Psychol* 2012;31(5):552–561.

17. Katz SJ, Lantz PM, Paredes Y, at al. Breast cancer treatment experiences of Latinas in Los Angeles County. *American Journal of Public Health* 2005;95(12):2225–2230.

18. Hawley ST, Janz NK, Hamilton A, et al. Latina patient perspectives about informed treatment decision making for breast cancer. *Patient education and counseling* 2008;73(2):363–370.

19. Schutt RK, Cruz ER, Woodford ML. Client satisfaction in a breast and cervical cancer early detection program: the influence of ethnicity and language, health, resources, and barriers. *Women Health* 2008;48(3):283–302.

20. Hawley ST, Janz NK, Lillie SE, et al. Perceptions of care coordination in a population-based sample of diverse breast cancer patients. *Patient Educ Couns* 2010;81 Suppl: S34–40.

21. Lopez ME, Kaplan CP, Napoles AM, et al. Satisfaction with treatment decision-making and treatment regret among Latinas and non-Latina whites with DCIS. *Patient Educ Couns* 2014;94(1):83–89.

22. Kaplan SH, Greenfield S, Gandek B, et al. Characteristics of physicians with participatory decision-making styles. *Ann Intern Med* 1996;124(5):497–504.

23. Kaplan SH, Gandek B, Greenfield S, et al. Patient and visit characteristics related to physicians' participatory decision-making style. *Results from the Medical Outcomes Study. Med Care* 1995;33(12):1176–1187.

24. Heisler M, Tierney E, Ackermann RT, et al. Physicians' participatory decision-making and quality of diabetes care processes and outcomes: results from the triad study. *Chronic Illn* 2009;5:165–76.

25. Parchman ML, Zeber JE, Palmer RF. Participatory decision making, patient activation, medication adherence, and intermediate clinical outcomes in type 2 diabetes: a STARNet study. *Ann Fam Med* 2010;8:410–7.

26. Thom DH, Bloch DA, Segal ES. An intervention to increase patients' trust in their physicians. *Stanford Trust Study Physician Group. Acad Med* 1999;74(2):195–198.

27. Kandula NR, Lauderdale DS. Leisure time, non-leisure time, and occupational physical activity in Asian Americans. *Ann Epidemiol* 2005;15(4):257–265.

28. Choi SE, Ngo-Metzger Q, Billimek J, et al. Contributors to Patients' Ratings of Quality of Care Among Ethnically Diverse Patients with Type 2 Diabetes. *J Immigr Minor Health* 2016;18(2):382–389.

29. Sisk BA, Kang TI, Mack JW. Racial and Ethnic Differences in Parental Decision-Making Roles in Pediatric Oncology. *Journal of palliative medicine* 2019.

30. Murray-Garcia JL, Selby JV, Schmittdiel J, et al. Racial and ethnic differences in a patient survey: patients' values, ratings, and reports regarding physician primary care performance in a large health maintenance organization. *Med Care* 2000; 38:300–310.

31. Saha S, Arbelaez JJ, Cooper LA. Patient-physician relationships and racial disparities in the quality of health care. *Am J Public Health* 2003; 93:1713–1719.

32. Alegria M, Nakash O, Johnson K, et al. Effectiveness of the DECIDE Interventions on Shared Decision Making and Perceived Quality of Care in Behavioral Health With Multicultural Patients: A Randomized Clinical Trial. *JAMA Psychiatry* 2018;75(4):325–335.

33. Ernstmann N, Wirtz M, Nitzsche A, et al. Patients' Trust in Physician, Patient Enablement, and Health-Related Quality of Life During Colon Cancer Treatment. *J Canc Educ* 2017; 32:571–9.

34. Birkhäuer J, Gaab J, Kossowsky J, at al. Trust in the health care professional and health outcome: a meta-analysis. *PLoS ONE* 2017; 12:1–13.

35. Mechanic D, Meyer S. Concepts of trust among patients with serious illness. *Soc Sci Med* 2000; 51(5):657–668.

36. Sterba KR, Zapka J, LaPelle N, at al. A formative study of colon cancer surveillance care: implications for survivor-centered interventions. *J Cancer Educ* 2015; 30:719–727.

37. Hillen MA, de Haes, Hanneke CJM, Smets EM (2011) Cancer patients' trust in their physician—a review. *Psychooncology* 2011;20(3):227–241.

38. Hasnain M, Schwartz A, Girotti J, et al. Differences in Patient-Reported Experiences of Care by Race and Acculturation Status. *J Immigr Minor Health* 2013;15(3):517–524.

39. Colmenares-Roa T, Huerta-Sil G, Infante-Castañeda C, et al. Doctor–Patient Relationship Between Individuals with Fibromyalgia and Rheumatologists in Public and Private Health Care in Mexico. *Qualitative Health Research*, 2016;26(12):1674–1688.

40. Mistry H, Levack WM, & Johnson S. Enabling people, not completing tasks: patient perspectives on relationships and staff morale in mental health wards in England. *BMC psychiatry* 2015;15: 307.

41. MacLeod S, Musich S, Gulyas S, et al. The impact of inadequate health literacy on patient satisfaction, healthcare utilization, and expenditures among older adults. *Geriatric Nursing* 2017; 38:334–41.

42. Abraído-Lanza AF, Armbrister AN, Flórez KR, et al.. Toward a theory-driven model of acculturation in public health research. *American journal of public health* 2006;96(8):1342–1346.

43. Pérez-Escamilla R, Putnik P, The Role of Acculturation in Nutrition, Lifestyle, and Incidence of Type 2 Diabetes among Latinos. *The Journal of Nutrition* 2007;137(4):860–870.

44. Lopez-Class M, Gonzalez Castro F, Ramirez AG. Conceptions of acculturation: A review and statement of critical issues. *Soc Sci Med* 2011;72(9):1555–1562.

45. Acevedo-Garcia D, Sanchez-Vaznaugh EV, Viruell-Fuentes EA, et al. Integrating social epidemiology into immigrant health research: A cross-national framework. *Soc Sci Med* 2012;75(12):2060–2068.

46. Allen JD, Caspi C, Yang M, et al. Pathways between acculturation and health behaviors among residents of low-income housing: the mediating role of social and contextual factors. *Social science & medicine* 2014; 123:26–36.

CHAPTER 2

Health-related social control and perceived stress among high-risk Latina mothers with Type 2 Diabetes and their at-risk adult daughters

ABSTRACT

Background

Diabetes-related multi-morbidity, cultural factors, and life circumstances place Latinas with diabetes at increased risk for stress, which can further threaten illness management. Given the central role of family in the Latino culture, families provide an ideal focus for interventions targeting behavioral change. The goals of this study were to examine the extent to which participating in a dyadic-behavioral intervention was associated with reduced perceived stress and, furthermore, to examine the extent to which persuasion and pressure, two forms of health-related social control, mediated this relationship.

Methods

Unidas por la Vida, a dyadic-behavioral intervention for Latina mothers and their adult daughters, consisted of education on healthy behavior and promotion of collaborative partnerships between the dyad (intervention) or educational material mailed to their home (control). Using Actor-Partner Independence Model (APIM) analysis, we estimated the dyadic effect of each individual and their partner.

Results

Results revealed that participating in the intervention was associated with significantly reduced perceived stress for daughters, but not for mothers (β=-3.00, p=0.02; β=-0.57, p=0.67, respectively). Furthermore, analyses also indicated that the relationship between the intervention and perceived stress was mediated by persuasion, such that mothers' persuasion significantly reduced her own post-intervention perceived stress (indirect effect=-1.52, 95% CI=[-3.12, - 0.39]). Pressure, however, did not evidence a mediating mechanism for either mothers or daughters.

Conclusions

These findings buttress existing research by suggesting that persuasion, the method by which members attempt to increase participants' health behaviors in a nonjudgmental way, may be the driving force in reducing perceived stress levels.

INTRODUCTION

Approximately 40% of US adults are expected to develop type 2 diabetes over their lifetime, and that number is even higher for Hispanic men and women—more than 50%. Risk factors for diabetes such as obesity, poor diet, and physical inactivity are particularly high in the Latino population.[1-4] Furthermore, individuals of Hispanic descent are 50% more likely to die from diabetes compared to non-Hispanic whites.[5] Mexican-American women, in particular, are at an elevated risk of contracting diabetes given that approximately half of this population reports living a sedentary lifestyle along with higher rates of obesity or overweight status, relative to non-Hispanic white women.[6]

Managing the day-to-day demands of a chronic disease like diabetes has been shown to be a source of stress.[7] Data from a national sample of adults with diabetes suggests that people from diverse racial/ethnic backgrounds endorse higher diabetes-related distress than their non-Hispanic White counterparts despite exhibiting no significant differences in overall levels of distress.[8] Moreover, negative psychosocial factors, such as perceived stress and diabetes-related distress, are associated with worse diabetes outcomes including excess body weight,[9] poorer glycemic control, long-term complications, and premature mortality.[10] These associations may operate through various biological and behavioral mechanisms, including via elevations in stress hormones including cortisol[11,12] or ineffective diabetes self-care behaviors.[13]

In addition, Latinos are more likely to experience stressful life events (e.g. financial stressors) and daily hassles (e.g., difficulty paying for medications, poor access to high quality foods, lack of safe places in which to exercise),[14,15] which can further increase overall perceived stress and deplete self-regulatory resources that are critical to the self-

management of diabetes.[16] Thus, diabetes-related multi-morbidity, cultural factors, and life circumstances combine to place Latinas with diabetes at increased risk for perceived stress that can jeopardize their illness management.

Family influence as leverage for behavioral change

Many of the serious complications of type 2 diabetes can be prevented or delayed by engaging in healthy lifestyle behaviors, particularly eating an appropriate diet and controlling one's weight; thus, healthy behavior interventions may be effective in preventing diabetes and/or minimizing its downstream outcomes. Most behavior change programs among obese adults have focused on changing an individual's behavior.[17] However, newer intervention models recognize that behavioral changes often occur in a social context[18] and are impacted by the relationships with and involvement of social network members.[19,20]

As the family plays a central role in Hispanic culture, family members often share beliefs and opinions around health-related issues, thereby mutually influencing each other's attitudes towards health behaviors and, among those with type 2 diabetes, disease management.[16,21] In fact, family dynamics and expectations are among the strongest influences on the management and treatment of diabetes in Hispanics.[22] Additionally, daughters often learn about the preparation of traditional foods from their mothers and, as a result, may acquire beliefs and practices relevant to the development of obesity.[23,24] Interventions that leverage existing relationships between mother-daughter dyads have the potential to yield substantial and long-lasting lifestyle that may lead to the reduction of obesity and diabetes. In view of the fact that Mexican-American mothers and their adult

daughters are likely to be mutually influential, they provide an ideal focus for a dyadic behavior change approach.

One such study sought to evaluate the feasibility of a lifestyle intervention, Unidas por la Vida (United for Life), in which Mexican-American mothers who have type 2 diabetes and their overweight/obese adult daughters collaborated in an effort to change shared health behaviors.[25] Results revealed that mother-daughter dyads who participated in the intervention lost significantly more weight than did control dyads who received usual care alone. Furthermore, intervention dyads were also more likely to be eating foods with lower glycemic load and less saturated fat by the end of the 16-week intervention period.[25]

Potential Effectiveness of Health-Related Social Control

Research has begun to examine the specific mechanisms that link engagement in meaningful relationships to improved health behaviors and health outcomes. A key pathway through which social relationships can affect health is by serving as sources of influence and regulation, often termed health-related social control.[26,27] For example, meals are often consumed with social network members who are in a position to monitor and comment on a person's dietary intake and/or weight-loss efforts.[28-30] Its intent is typically to influence recipients to positively change their behavior by encouraging health promoting behaviors and discouraging health-compromising behaviors.[31]

Whether or not social control attempts are effective may depend, in part, on the types of strategies used by social network members. Efforts to prompt or persuade another person to improve his or her health behaviors, termed persuasive social-control, have been found to elicit positive health behavior change with positive emotional outcomes in some studies[32-35] but not others.[36,37] In the context of chronic illness for example, family

members who engage in social control efforts may be perceived as allies in the challenge of managing illnesses.[38,39] Having an ally, particularly someone who needs to make similar health-behavior changes, might make the task of managing an illness less daunting, thereby reducing perceived stress.

Alternatively, such forms of influence, however well-intentioned, can sometimes amplify rather than reduce stress.[40] Emerging literature has shown that while social control efforts on the part of network members are intended to promote positive health behavior change, the recipient may not always welcome such recommendations.[40] Social control strategies that involve pressure, such as criticizing or expressing doubts about the recipient's health behaviors, have often been found to be ineffective or even counterproductive in changing behavior and have been associated with negative affect.[31,36,37]

The Current Study

Unidas por la Vida is a behavioral intervention that specifically targets the dyadic relationship between mothers and daughters in the Latina community. In addition to being an evidence-based weight loss intervention,[25] Unidas por la Vida also aimed to reduce stress in women's lives by encouraging positive interpersonal exchanges that promote health behavior change while discouraging criticism thought to undermine health behavior change. Thus, the goals of the current study were (1) to examine the extent to which participating in the Unidas intervention reduced perceived stress over the 16-week study period, (2) to examine the extent to which persuasion and pressure, two forms of health-related social control, mediated this association, and (3) to assess whether effects of health-related social controls were driven by the individual of their dyad partner. To test the

latter, we employed the actor-partner interdependence model (APIM), which unpacks the mutual influence of dyadic partners by modeling the mother and her adult daughter as nested within the dyad.[41] APIM allows the simultaneous estimation of the effect, within the dyad, that each individual has on herself (actor effect) and on the other person (partner effect). Taking both the mother and her adult daughter into account can inform the enhancement of complex, behavioral health interventions by enriching our understanding of the intra-family influence on perceived stress as an outcome. To our knowledge, this study is among the first to assess the mediating effects of persuasion and pressure in a dyadic weight-loss intervention with perceived stress as the primary outcome. We hypothesized that mothers' and daughters' reports of persuasion would be associated with both their own and their partners' reduction in stress, and that network members' efforts to persuade their family member to improve her health behaviors might mediate the effect of the dyadic intervention on perceived stress. In contrast, we hypothesize that mothers and daughters' reports of pressure would be associated with an increase in perceived stress, and given the mixed findings in the literature for pressure, we did not anticipate any mediation.

Method

Participants

Women identified through patient registries from two Federally Qualified Health Centers (FQHCs; clinics that receive federal funding to provide health care to low income, underinsured, and underserved populations) as being Hispanic, having a diagnosis of type 2 diabetes, and having a body mass index (BMI) of > 25 were contacted by phone to assess initial study interest and eligibility. Women who showed interest in participating

completed an informed consent form and a Health Insurance Portability and Accountability Act (HIPAA) waiver form, allowing the study team access to the participant's medical record. Subsequently, with the participant's permission, study personnel contacted the participant's daughter, and if interested, obtained her informed consent and HIPAA waiver authorization access. All forms were available in both English and Spanish. All study conducts and procedures were approved by (removed for review).

Of the 882 dyads who were assessed for eligibility, 323 dyads met the eligibility criteria to participate in the study. Women were recruited based on the following criteria: 1) self-identified as Latina, 2) had a daughter over the age of 18, 3) BMI at or over 25, 4) ICD-9 diagnosis of type 2 diabetes (mothers only), 5) mothers and daughters independently consented to participate, and 6) lived within 25 miles of each other.[42] Women were excluded if they were pregnant, or became pregnant during the course of the study, were unable to provide informed consent, or had contraindications for engaging in moderate physical activity. Of the 323 eligible dyads, 218 had one member who declined to participate, 10 had contraindications to engage in a weight loss intervention upon physician assessment, and 6 declined to participate following physician clearance. Thus, the final study sample for this randomized control trial consisted of 89 dyads (178 women).[25,42] Mother-daughter dyads were randomized to either the Unidas por la Vida Intervention group or the Usual Care Control group using a blocked design to account for the two recruitment sites. The attrition rate over the course of the study was low (3.9%), as only four women withdrew from the intervention group (1 mother-daughter dyad and 2 individual daughters) and three women withdrew from the Usual Care Control group (1 mother-daughter dyad and 1 mother).

Dyadic Intervention

The Unidas por la Vida intervention was modeled after the Diabetes Prevention Program (DPP) Lifestyle change program.[43] Although the DPP has been effectively implemented in the Latino population, the Unidas por la Vida program was further adapted to capitalize on local, public, community-based resources (e.g. partnership with local community college to use outdoor physical activity spaces) in an effort to support sustained behavior change, and to promote a collaborative partnership between mother and daughter to achieve shared weight loss goals.[25]

The 16-week intervention consisted of four group classes, eight home visits, and four booster phone calls. The curriculum featured common strategies employed in weight loss programs, including 1) setting weight loss goals, 2) meal planning and preparation, 3) identifying obstacles and barriers, 4) problem solving, 5) getting back on track after experiencing setbacks, and 6) managing stress. In participating in the Unidas intervention together, mother/daughter dyads were particularly encouraged to engage in each of these weight loss strategies together, including meal planning and exercising, frequently checking in with each other to support meeting weekly weight loss and healthy lifestyle goals, working together to problem solve in order to overcome barriers and retain motivation, and providing coping support for dealing with stress.

Usual Care

Participants randomized to the Usual Care control group also completed baseline and 16- week assessments. In addition, mothers (with diagnosed diabetes) received National Diabetes Education Program materials that were mailed to their homes. Daughters also received mailed diabetes prevention materials that discussed diabetes risk

factors and lifestyle factors known to prevent diabetes, developed by the National Institute of Diabetes and Digestive and Kidney Diseases. All participants were advised to continue usual care with their primary care provider.

Measures

Demographic information, health status, perceived stress, and measures of health-related social control (persuasion and pressure) were assessed through self-reported questionnaires at baseline and 16 weeks post-intervention. All surveys were available to participants in both English and Spanish.

Perceived stress. Perceived stress was measured using the 10-item Perceived Stress Scale (PSS-10).[44] This measure assesses perceptions of ongoing life stress and is widely used in populations with chronic conditions. Items included questions such as: "How often have you felt you were unable to control the important things in your life?" and "How often have you felt difficulties were piling up so high that you could not overcome them?" Item responses ranged from 0=never to 4=very often, and the sum of ratings on all 10 items was computed as the total scale score. The scale showed good reliability in the current sample (Cronbach's α Baseline=0.82 and 16 weeks post-intervention=0.81).

Health-related social control. Persuasion was assessed using three items, such as: "Over the past month, how often did the important people in your life try to do something to get you to improve your food choices or exercise regimen?" and "Over the past month, how often did the important people in your life try to persuade you to do more to follow your diet or exercise regimen?" (0=Not at all to 6=Every day).[34,37] The composite measure, computed as a mean of the three items, demonstrated strong reliability in this sample (Cronbach's α Baseline=0.93 and 16 weeks post-intervention=0.92). Pressure was assessed

using four items, such as: “Over the past month, how often did the important people in your life criticize your poor food choices or lack of physical activity?” and “Over the past month, how often did the important people in your life question or express doubts about your poor food choices or physical inactivity?” (0=not at all to 6=every day).[18,37] The composite measure, computed as a mean of the four items, showed strong reliability in the current sample (Cronbach’s α baseline=0.89 and 16 weeks post-intervention=0.85).

Statistical Analysis

The goal of the present study was to test whether or not the intervention was associated with a reduction in perceived stress over a 16-week time period and whether social control mediated the effect of the intervention on perceived stress. To examine these associations, we fit a structural equation model (SEM) to estimate direct effects of the Unidas por la Vida intervention vs. Usual Care on perceived stress and indirect effects through persuasion and pressure estimated in parallel. Separate paths were created for mothers and daughters in the model, following the appropriate APIM design for distinguishable dyads to enable the assessment of each member’s individual influence on the other.[45] Analyses controlled for whether mothers and daughters lived together (no=0, yes=1), baseline perceived stress, and baseline social control.[25] Variances were estimated via bootstrapping and models were fit using full information maximum likelihood to account for missing data.[46] Mediation results were interpreted using the framework developed by Zhao and colleagues.[47] This innovative framework additionally removes the necessity of a significant direct effect when the mediator is not controlled for, as is standard for the 1986 Baron and Kenny approach.[48]

Results

Demographic Characteristics

We first examined demographic variables for mothers and daughters and conducted t-tests to assess whether there were significant changes in persuasion, pressure, and perceived stress from baseline (T1) to follow-up (T2). Of the 89 dyads in the study, 88 had completed baseline and post-intervention surveys and were included in the analysis. Of those 88 dyads, 37 were in the control group, and 51 were in the intervention group. A majority of the mothers (72.9%) lived with their adult daughters who were participating in the study. Overall, 97.7% of the mothers and 67.5% of the daughters were born outside of the United States, with 72.3% of the mothers and 10.8% of the daughters speaking Spanish only. Although 39.2% of mothers and 55.6% of daughters reported either full- or part-time work, many participants were low income, with 41.5% of mothers and 55.7% of daughters reporting a yearly income below $15,000.

Analyses showed that for both mothers and daughters, perceived stress decreased over the 16-week period ($\Delta Mean_{T2\text{-}T1}$: Mothers=-2.1, p=0.05; Daughters=-2.1, p=0.03). Both members of the dyad additionally reported increased levels of persuasion from baseline to post-intervention ($\Delta Mean_{T2\text{-}T1}$: Mothers=0.6, p=0.06; Daughters=0.7, p=0.004). Pressure, in contrast, did not change over the 16-week period for either mothers or daughters ($\Delta Mean_{T2\text{-}T1}$: Mothers=-0.1, p=0.66; Daughters=0.1, p=0.57). Additional details about the study population can be found elsewhere.[25,42,49]

TABLE 1: Direct effects of the intervention and components of health-related social control on follow-up (T2) perceived stress

	Mothers			Daughters		
Direct effects of:	β	SE	p-value	β	SE	p-value
Intervention on Persuasion	**0.69**	**0.27**	**0.01**	**0.94**	**0.28**	**0.002**
Intervention on Pressure	0.28	0.33	0.40	0.07	0.33	0.82
Intervention on Stress	-0.57	1.32	0.67	**-3.00**	**1.22**	**0.02**
Mothers' Persuasion on Stress	**-2.06**	**0.49**	**<.001**	0.11	0.48	0.83
Daughters' Persuasion on Stress	0.33	0.56	0.55	0.09	0.58	0.87
Mothers' Pressure on Stress	**0.98**	**0.41**	**0.02**	**0.84**	**0.38**	**0.03**
Daughters' Pressure on Stress	-0.06	0.47	0.89	-0.07	0.44	0.86

Direct and indirect dyadic effects on perceived stress

Results from direct paths in the structural equation model are shown in Table 1. Overall, the model had a goodness of fit (GFI) of 0.87, indicating a good fit, even though the RMSEA value was 0.15. The direct effect of the intervention on T2 perceived stress differed between mothers and daughters such that there was a significant decrease in stress for daughters (β=-3.00, p=0.02), but not for mothers (β=-0.57, p=0.67). Participating in the intervention was also associated with a significant increase in mothers' and daughters' reports of experiencing persuasion over the 16-week period (β=0.69, p=0.01; and β=0.94, p=0.002, respectively). The intervention, however, did not have a significant effect on T2 pressure. Higher levels of social persuasion reported by mothers across the 16-week period was associated with a significant decrease in their own T2 perceived stress (β=-2.06, p<0.001), but not daughters' stress. In contrast, higher levels of social pressure reported by mothers was associated with a significant increase in T2 stress for both mothers and daughters (β=0.98, p=0.02; and β=0.84, p=0.03, respectively). These findings suggest that mothers' reports of pressure impact both their own stress and their daughters'

stress, whereas reports of persuasion only impact their own stress. Daughters' reports of persuasion and pressure over the 16-week period, on the other hand, did not have any significant impact on themselves or their mothers' perceived stress. All significant paths in the SEM model are shown in Figure 1.

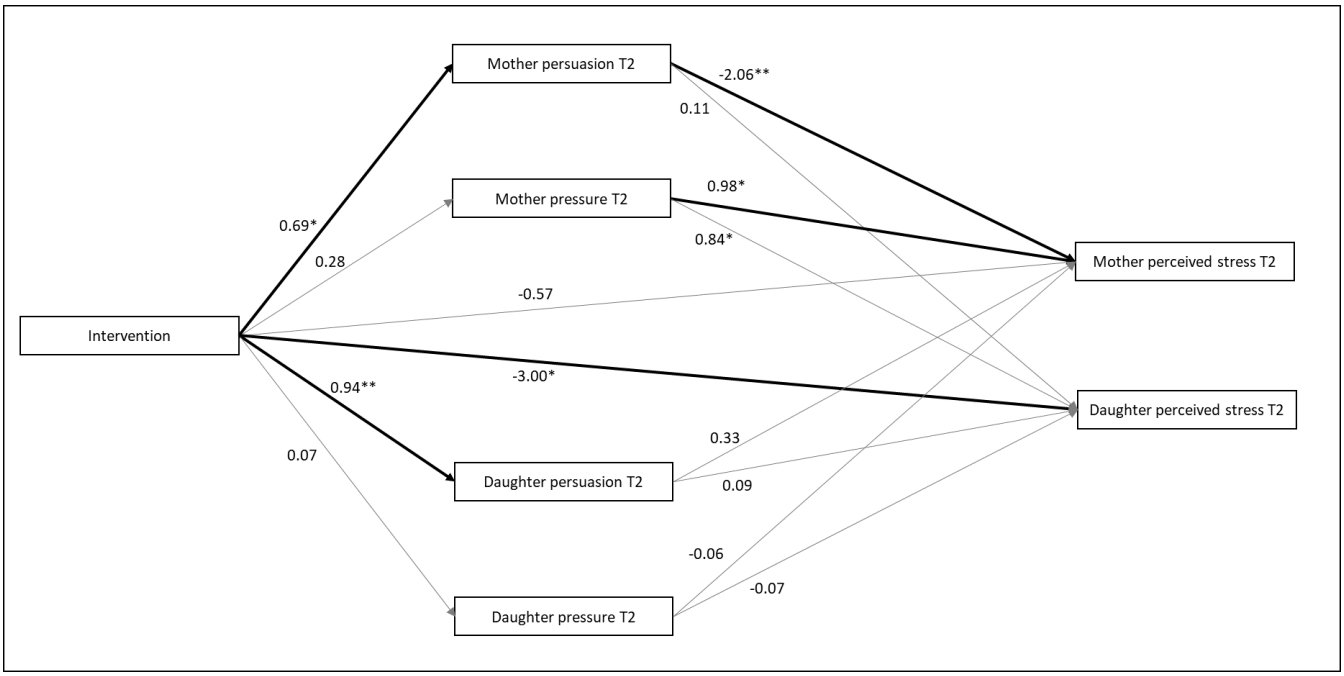

Figure 1: Unstandardized (beta) coefficients from the SEM analysis testing for actor-partner effects on the direct and indirect relation of intervention to T2 perceived stress.

The covariate-adjusted beta estimates and bootstrapped 95% confidence intervals for the direct and indirect effects of the intervention on T2 perceived stress for mothers and daughters are reported in Table 2. Total effect (TE) estimates indicate that the intervention was associated with an overall reduction in perceived stress from T1 to T2, although the reduction is larger in magnitude for daughters than it is for mothers (TE=-2.61, [-4.73, -0.59]; and TE=-1.41, [-3.57, 1.04], respectively). The direct effect (DE) of the intervention on T2 perceived stress similarly showed a significant decrease in stress for

daughters (DE=-3.00, [-5.04, -0.70]), but not for mothers (DE=-0.57, [-3.59, 2.72]). We did not observe significant total indirect effects (IE) for mothers or daughters, (IE=-0.84, [-2.52, 0.75] for mothers and IE=0.39 [- 1.18, 1.30] for daughters). However, we did observe significant indirect effects of the intervention through social persuasion reported by mothers on their own stress levels (IE=-1.42 [-2.63, -0.38]). Neither persuasion reported from daughters nor reported pressure from mothers or daughters showed significant mediating effects for either mothers' or daughters' stress on average. These collective findings indicate that mediation occurred for mothers, but not for daughters.

TABLE 2: Mediating effects for the actor-partner interdependence mediation model with intervention as the independent variable, T2 mothers' and daughters' persuasion and pressure as mediators, and T2 mothers' and daughters' perceived stress as dependent variables.

	Effect of Mothers' Stress			Effect on Daughters' Stress		
	Estimate	95% CI		Estimate	95% CI	
Total Effect	-1.41	-3.57	1.04	**-2.61**	**-4.73**	**-0.59**
Direct Effect	-0.57	-3.59	2.72	**-3.00**	**-5.04**	**-0.70**
Total Indirect Effect	-0.84	-2.52	0.75	0.39	-1.18	1.30
Indirect Effects through:						
Moms' Persuasion	**-1.42**	**-2.63**	**-0.38**	0.07	-0.43	0.67
Daughters' Persuasion	0.31	-0.86	1.32	0.09	-0.95	0.93
Moms' Pressure	0.27	-0.35	0.98	0.23	-0.33	0.81
Daughters' Pressure	0.00	-0.34	0.30	-0.01	-0.33	0.19

95% confidence intervals represent bootstrapped values after 5,000 iterations

Discussion

Health researchers have become increasingly aware that for people with type 2 diabetes, complications may develop as a result of increased stress and negative coping strategies.[50-54] To develop more effective programs for individuals with type 2 diabetes,

newer intervention models similar to Unidas por la Vida have begun to incorporate family members who share similar health risks.[18] Building upon the well-documented importance of the family in Hispanic culture, the Unidas program targeted dyadic relationships between mothers with type 2 diabetes and their obese/overweight daughters in order to help them work collaboratively to maintain healthy lifestyles and ultimately reduce stress. The current study examined whether participating in the Unidas intervention was associated with a reduction in perceived stress and to further examine the extent to which persuasion and pressure, two forms of health-related social control, mediated this association.

Our findings revealed that participating in the Unidas por la Vida weight loss intervention was associated with significantly reduced perceived stress for daughters, but not for mothers. Moreover, increased persuasion from T1 to T2 was associated with significantly less perceived stress among mothers but not daughters. This difference may arise, in part, from differences between the mothers' and daughters' overall health status. Upon recruitment, mothers were already diagnosed with type 2 diabetes whereas daughters were at risk of developing the disease. Mothers may have felt a greater sense of urgency about managing their illness and making needed health-behavior changes. Therefore, persuasion from others to manage their health may have helped the mothers feel relieved that others were monitoring their health behavior and encouraging them to stay on track. Daughters, on the other hand, may not have felt the same sense of urgency about their health status and, as a result, may not have experienced a sense of allegiance or relief when others suggested that they change their health behavior.[55]

In contrast, mothers' increased reports of pressure from T1 to T2 was associated with increased stress for both mothers and daughters. Although health-related pressure, like persuasion, is intended to protect a person's health by advocating sound health behaviors, pressure may come at an emotional cost.[56] Research has alluded to a dual effect, where social control may help reduce the occurrence of poor health behaviors while also arousing psychological distress and, in the current study, perceived stress.[32,40,57] In the context of a weight loss intervention, findings from the current study buttress existing research by suggesting that health-related pressure may invoke feelings of irritation or frustration in the recipient and may also convey that the recipient is doing a poor job of managing her illness.[56] Therefore, the inefficacy that social pressure may convey could add to, rather than decrease, perceived stress among individuals who are contending with a chronic illness.

These patterns of reduced stress, according to Zhao and colleagues, indicate mediation for mothers but not for daughters.[47] Looking specifically at the indirect paths, a mediating effect on post-intervention perceived stress is evident through mother's health-related persuasion. No effect, however, remains for the paths through pressure. Perhaps, the lack of a direct effect of the intervention on mothers' perceived stress is indicative that the mediation is being driven through mothers who are high in persuasion. It may be that mothers who report increased levels of persuasion are the same women reporting a reduction in perceived stress levels while mothers who do not report increased persuasion are also not reporting any benefit to their perceived stress levels. Therefore, these collective paths lead to non-significant findings. These findings are consistent with the literature suggesting that persuasion is the driving force in eliciting change.[31,34,58,59]

Persuasion, the method by which members attempt to increase participants' health behaviors in a nonjudgmental way, may be interpreted as allies trying to encourage positive health behaviors which seem to have a stronger impact in generating change.[60] The results of the current study echo those of earlier studies in suggesting that persuasive and pressure strategies of social control have distinctive effects that warrant differentiation in studies of individuals who have or are at risk for chronic illness.[33,34,58,59]

Although this study is among the first to assess the mediating effects of health-related persuasion and pressure in a dyadic weight-loss intervention with perceived stress as the primary outcome, several study limitations exist. First, the data were collected at only two time points that spanned a 16-week period. Although two time points allow for the assessment of temporal changes, our study design did not allow us to capture additional fluctuations in feelings of perceived stress that may have occurred during or well after the intervention. Two time points, however, improve upon cross-sectional designs for mediation analyses because of their ability to reduce variations in direction and magnitude.[61,62] Additionally, having more than a single time point reduces the likelihood of finding support for mediation effects when there is no true mediation occurring.[62] A second limitation is that additional unknown mediators may have been omitted from the analysis. For example, coping strategies might have proven to mediate the effects of the intervention on daughters' stress, and future studies might benefit from including this and other mediators. Third, it is unclear whether these finding are generalizable to groups outside of the Hispanic culture, males, or those of a higher socio-economic status. Lastly, our model did not exhibit adequate goodness of fit on all fit indices. It is possible that this is driven mostly by small sample size, since RMSEA is known to be inflated in situations with few

observations. Care should be taken in drawing conclusions from the model's results, and our findings would need to be replicated in larger studies.

Our study highlights the importance of examining social network processes as they may affect health behaviors and perceived stress among individuals who have or are at risk for chronic illness. Findings highlight, for Hispanic women in particular, the importance of familial relationships where multiple members share similar health risks for the reduction of stress and the potential complications that may develop as a result. Increasing awareness of the potential benefits of persuasion through social networks is especially important among those who seek to aid individuals navigating important health behavior changes, including family members and health care providers alike. Encouraging persuasive exchanges across individuals has the potential to increase long term health and well-being, especially for those managing a chronic illness.

DECLARATIONS

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

ACKNOWLEDGEMENTS

This work was co-authored with: Anton Palma, Karen S. Rook, Kelly A. Biegler, Katelyn C. Davis, Emily A. Janio, David B. Kilgore, Emily Dow, Quyen Ngo-Metzger, and Dara H. Sorkin. This research was supported by the National Institute of Diabetes and Digestive and Kidney Diseases (1R01DK101623, R34 DK083500, K01DK078939). This work was partially supported by the grant UL1 TR0001414 and KL2 TR000147 from the National Center for Advancing Translational Sciences. The views expressed in this publication are solely the opinions of the authors and do not necessarily reflect the official policies of U.S. Department of Health and Human Services, the National Institutes of Health, or the Health Resources and Services Administration, nor does mention of the department or agency names imply endorsement by the U.S. government.

REFERENCES

1. Christine PJ, Auchincloss AH, Bertoni AG, et al. Longitudinal Associations Between Neighborhood Physical and Social Environments and Incident Type 2 Diabetes Mellitus: The Multi-Ethnic Study of Atherosclerosis (MESA). JAMA Intern Med. 2015;175(8):1311-1320.

2. Crespo CJ, Smit E, Andersen RE, et al. Race/ethnicity, social class and their relation to physical inactivity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988-1994. Am J Prev Med. 2000;18(1):46-53.

3. Mack KA, Anderson L, Galuska D, et al. Health and sociodemographic factors associated with body weight and weight objectives for women: 2000 Behavioral Risk Factor Surveillance System. J Women's Health. 2004;13(9):1019-1032.

4. Okosun IS, Annor F, Dawodu EA, et al. Clustering of cardiometabolic risk factors and risk of elevated HbA1c in non-Hispanic White, non-Hispanic Black and Mexican-American adults with type 2 diabetes. Diabetes Metab Syndr. 2014;8(2):75-81.

5. Hispanic Diabetes Prevention. (2017). Retrieved 23 August 2019, from https://www.cdc.gov/features/hispanichealth/index.html.

6. Obesity - The Office of Minority Health. Retrieved 15 August 2019, from https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=4&lvlid=70.

7. Fisher L, Polonsk, WH, & Hessler D. Addressing diabetes distress in clinical care: a practical guide. Diabetic Medicine. 2019;36(7), 803-812.

8. Peyrot M, Egede LE, Campos C, Cannon AJ, Funnell MM, Hsu WC., ... & Stuckey HL. Ethnic differences in psychological outcomes among people with diabetes: USA results from the second Diabetes Attitudes, Wishes, and Needs (DAWN2) study. Current Medical Research and Opinion. 2014;30(11), 2241-2254.

9. Alhalel N, Schueller S, & O'Brien M. Association of changes in mental health with weight loss during intensive lifestyle intervention: does the timing matter?. Obesity Science & Practice. 2018;4(2), 153-158.

10. Naranjo D, Hessler DM, Deol R, & Chesla CA. Health and psychosocial outcomes in US adult patients with diabetes from diverse ethnicities. Current diabetes reports. 2012;12(6), 729-738.

11. Carvalho LA, Urbanova L, Hamer M, et al. Blunted glucocorticoid and mineralocorticoid sensitivity to stress in people with diabetes. Psychoneuroendocrinology. 2015;51: 209-218.

12. Nowotny B, Cavka M, Herder C, et al. Effects of acute psychological stress on glucose metabolism and subclinical inflammation in patients with post-traumatic stress disorder. Horm Metab Res. 2010;42(10): 746-753.

13. Cox D, & Gonder-Frederick L. Major developments in behavioral diabetes research. Journal of Consulting and Clinical Psychology. 1992;60, 628–638.

14. Russell BE, Gurrola E, Ndumele CD, et al. Perspectives of non-Hispanic Black and Latino patients in Boston's urban community health centers on their experiences with diabetes and hypertension. J Gen Intern Med. 2010;25(6): 504-509.

15. Rodriguez N, Myers HF, Mira CB, et al. Development of the Multidimensional Acculturative Stress Inventory for adults of Mexican origin. Psychol Assess. 2002;14(4): 451-461.

16. Katiria Perez G, Cruess D. The impact of familism on physical and mental health among Hispanics in the United States. Health Psychol Rev. 2014;8(1):95-127.

17. García-Pérez L, Álvarez M, Dilla T, Gil-Guillén V, & Orozco-Beltrán D. Adherence to Therapies in Patients with Type 2 Diabetes. Diabetes Therapy. 2013;4(2), 175-194.

18. Greaves C, Sheppard K, Abraham C, Hardeman W, Roden M, Evans P, & Schwarz P. Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. BMC Public Health. 2011;11(1). doi: 10.1186/1471-2458-11-119.

19. Hogan B, Linden W, & Najarian B. Social support interventions: Do they work?. Clinical Psychology Review. 2002;22(3), 381-440.

20. Martire L, Lustig A, Schulz R, Miller G, & Helgeson V. Is It Beneficial to Involve a Family Member? A Meta-Analysis of Psychosocial Interventions for Chronic Illness. Health Psychology. 2004;23(6), 599-611.

21. Thornton PL, Kieffer EC, Salabarria-Pena Y, et al. Weight, diet, and physical activity-related beliefs and practices among pregnant and postpartum Latino women: the role of social support. Matern Child Health J. 2006;10(1):95-104.

22. Ramal E, Petersen AB, Ingram KM, et al. Factors that influence diabetes self-management in Hispanics living in low socioeconomic neighborhoods in San Bernardino, California. J Immigr Minor Health. 2012;14(6):1090-1096.

23. Matheson DM, Robinson TN, Varady A, et al. Do Mexican-American Mothers' FoodRelated Parenting Practices Influence Their Children's Weight and Dietary Intake? J Am Diet Assoc. 2006; 106(11):1861-1865.

24. Garcia-Maas LD. Intergenerational Analysis of Dietary Practices and Health Perceptions of Hispanic Women and their Adult Daughters. J Transcult Nurs. 1999; 10(3):213-219.

25. Sorkin DH, Mavandadi S, Rook KS, Biegler KA, Kilgore D, Dow E, & Ngo-Metzger Q. Dyadic collaboration in shared health behavior change: The effects of a randomized trial to test a lifestyle intervention for high-risk Latinas. Health Psychology. 2014;33(6), 566-575.

26. Berkman LF, Glass T, Brissette I, Seeman TE. From social integration to health: Durkheim in the new millennium. Soc Sci Med. 2000;51: 843–57.

27. Cohen S, Gottlieb BH, Underwood LG. Social relationships and health. Am Psychol. 2004;59: 676–84.

28. Berkman LF. Social support, social networks, social cohesion and health. Social Work in Health Care. 2000;31, 3–14. doi:10.1300/ J010v31n02_02.

29. Bishop J, Irby MB, Isom S, Blackwell CS, Vitolins MZ, & Skelton JA. Diabetes prevention, weight loss, and social support: Program participants' perceived influence on the health behaviors of their social support system. Family & Community Health: The Journal of Health Promotion & Maintenance. 2013;36, 158 –171. doi: 10.1097/FCH.0b013e318282b2d3.

30. Gallant MP. The influence of social support on chronic illness self-management: A review and directions for research. Health Education and Behavior. 2003;30, 170 –195. doi:10.1177/1090198102251030.

31. Lewis MA, & Rook KS. Social control in personal relationships: Impact on health behaviors and psychological distress. Health Psychology. 1999;18, 63–71.

32. Hughes M, & Gove WR. Living alone, social integration, and mental health. American Journal of Sociology. 1981;87, 48–74.

33. August KJ, & Sorkin, DH. Marital status and gender differences in managing a chronic illness: the function of health-related social control. Social science & medicine. 2010;71(10), 1831–1838.

34. Stephens MA, Fekete EM, Franks MM, et al. Spouses' use of pressure and persuasion to promote osteoarthritis patients' medical adherence after orthopedic surgery. Health Psychol. 2009;28(1): 48- 55.

35. Tucker JS, Orlando M, Elliott MN, & Klein DJ. Affective and behavioral responses to health-related social control. Health Psychology. 2006; 25:715–722.

36. Martire LM, Stephens MA, Mogle J, Schulz R, Brach J, Keefe FJ. Daily spousal influence on physical activity in knee osteoarthritis. Annals of Behavioral Medicine. 2013;45: 213–223.

37. Stephens MA, Franks MM, Rook KS, Iida M, Hemphill RC, Salem JK. Spouses' attempts to regulate day-to-day dietary adherence among patients with type 2 diabetes. Health Psychol. 2013;32: 1029–1037.

38. Badr H, Herbert K, Bonnen MD, Asper JA, Wagner T. Dyadic Coping in Patients Undergoing Radiotherapy for Head and Neck Cancer and Their Spouses. Front Psychol. 2018;9: 1780. doi:10.3389/fpsyg.2018.01780.

39. Badr H, Yeung C, Lewis MA, Milbury K, Redd WH. An observational study of social control, mood, and self-efficacy in couples during treatment for head and neck cancer. Psychol Health. 2015;30(7):783–802. doi:10.1080/08870446.2014.994633.

40. Rook KS, Thuras PD, & Lewis MA. Social control, health risk taking, and psychological distress among the elderly. Psychology and Aging. 1990;5, 327–334.

41. Kenny DA., Kashy DA, & Cook WL. Dyadic data analysis. Guilford press. 2020.

42. Sorkin DH, Biegler KA, Peyreda M, Kilgore D, Dow E, Ngo-Metzger Q. Unidas por la Vida (United for Life): implementing a culturally-tailored, community-based, family-oriented lifestyle intervention. J Health Care Poor Underserved. 2013;24: 116-138.

43. Centers for Disease Control and Prevention. National Diabetes Prevention Program 2016 Available from: https://www.cdc.gov/diabetes/prevention/lifestyleprogram/deliverers/index.html

44. Cohen S, Kamarck T, & Mermelstein R. A global measure of perceived stress. Journal of Health and Social Behavior. 1983;24, 385-396.

45. Ledermann T, Macho S, & Kenny D. Assessing Mediation in Dyadic Data Using the Actor-Partner Interdependence Model. Structural Equation Modeling: A Multidisciplinary Journal. 2011;18(4), 595-612.

46. Preacher KJ, & Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behav Res Methods Instrum Comput. 2004;36: 717–31.

47. Zhao X, Lynch J, & Chen Q. Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis. Journal of Consumer Research. 2010;37(2), 197-206.

48. Baron, Reuben M, & Kenny, DA. Moderator-Mediator Variables Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. Journal of Personality and Social Psychology. 1986;51 (6): 1173–82.

49. Sorkin DH, Rook KS, Campos B, Marquez B, Solares J, Mukamel DB, Marcus B, Kilgore D, Dow E, Ngo-Metzger Q, Nguyen DV, Biegler K. Rationale and study protocol for Unidas por la Vida (United for Life): A dyadic weight-loss intervention for high-risk Latina mothers and their adult daughters. Contemp Clin Trials. 2018;69: 10-20.

50. Gallo LC, Roesch SC, Fortmann AL, et al. Associations of chronic stress burden, perceived stress, and traumatic stress with cardiovascular disease prevalence and risk factors in the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. Psychosom Med. 2014;76(6): 468-475.

51. Gonzalez JS, Shreck E, Psaros C, et al. Distress and type 2 diabetes-treatment adherence: A mediating role for perceived control. Health Psychol. 2015;34(5): 505-513.

52. Silveira ML, Whitcomb BW, Pekow P, et al. Perceived psychosocial stress and glucose intolerance among pregnant Hispanic women. Diabetes Metab. 2014;40(6): 466-475.

53. Steptoe A, Hackett RA, Lazzarino AI, et al. Disruption of multisystem responses to stress in type 2 diabetes: investigating the dynamics of allostatic load. Proc Natl Acad Sci U S A. 2014;111(44):15693-15698.

54. Morris T, Moore M and Morris F. Stress and chronic illness: The case of diabetes. J Adult Dev. 2011;18: 1-11.

55. Mishra SR, Haldar S, Pollack AH, Kendall L, Miller AD, Khelifi M, Pratt W. 'Not just a receiver': understanding patient behavior in the hospital environment. Proc SIGCHI Conf Hum Factor Comput Syst. 2016;3103–14.

56. Rook KS, August KJ, Stephens M. AP, Franks MM. When does spousal social control provoke negative reactions in the context of chronic illness? The pivotal role of patients' expectations. Journal of social and personal relationships. 2011;28(6), 772-789.

57. Rook, KS. Social networks as a source of social control in older adults' lives. In H. Giles, N. Coupland, & J. Wiemann (Eds.), Communication, health, and the elderly. Manchester: University of Manchester Press. 1990;45-69.

58. Okun MA, Huff BP, August KJ, Rook KS. Testing hypotheses distilled from four models of the effects of health-related social control. Basic and Applied Social Psychology. 2007;29: 185–193.

59. Tucker JS. Health-related social control within older adults' relationships. Journal of Gerontology: Psychological Sciences. 2002;57: 387–395.

60. Tucker JS, & Anders SL. Social control of health behaviors in marriage. Journal of Applied Social Psychology. 2001;31: 467–485.

61. Fairchild AJ, & McDaniel HL. Best (but oft-forgotten) practices: mediation analysis. The American journal of clinical nutrition. 2017;105(6), 1259–1271.

62. Maxwell SE, Cole DA, Mitchell MA. Bias in cross-sectional analyses of longitudinal mediation: partial and complete mediation under an autoregressive model. Multivariate Behav Res 2011;4

CHAPTER 3

Understanding the Impact of Family on Stress and Health Outcomes in a Cross-Section of Diabetic Hispanic Mothers and their Adult Daughters

ABSTRACT

Background: Hispanic individuals are disproportionately faced with diabetes and diabetes-related outcomes. Building upon the well-documented importance of the family in Hispanic culture, the current study examined the extent to which (1) perceptions of received support and control by mothers and (2) levels of support and control that daughters reported providing to their mothers were associated with mother's general health and stress levels.

Methods: A total of 30 mother-daughter dyads were asked to complete a comprehensive survey assessing various demographic, health, interpersonal, and stress-related outcomes. In order to attain this multi-perspective view of the family context, we first approached Hispanic women who previously participated in a separate weight loss intervention study. Mothers from the original study then served as a point of contact to their family members.

Results: All participating mothers in the study were born outside of the Unites States compared to 40% of daughters with 93% of the mothers and less than 1% of daughters reporting that they speak English poorly or very poorly. Many participants were low income, with 63.3% of mothers and 58.6% of daughters reporting a yearly income below $30,000. While not significant, model results suggest that mothers who feel they are being persuaded upon tend to report higher stress levels, yet daughters who report being more likely to provide persuasion have mothers who are likely to report lower stress levels. Further, mothers' perspective seems to have a more profound impact on her own perceived stress while daughters' perspectives seem to matter more for general health.

Conclusion: Findings highlight, for Hispanic women in particular, the importance of familial relationships suggesting that differences across perceived levels of persuasion, whether they be received or provided to another individual, matters in the context of dyadic relationships.

INTRODUCTION

The burden of diabetes as an illness has been well-established in the Hispanic population.[1-6] Mexican Americans evidence increased prevalence rates of diabetes (133%) and are about 50% more likely to die from diabetes compared to their non-Hispanic white counterparts.[7,8] Moreover, the lack of diabetic control in this population[7,9] contributes to higher rates of diabetes-related complications and worse overall outcomes among Hispanics compared to non-Hispanic whites.[1,2,10-13] More recently, however, efforts to understand illness burden have expanded beyond typical measures of mortality or morbidity to focus on the burden of disease for families, households, and social networks.[14] Moreover, disease burden is, by definition, a negative term—it focuses on the hardships and losses associated with a disease, but a full understanding of burden of disease involves an appreciation of factors that are health protective and promote health, such as healthy and supportive family environments.[15] Although measuring social relationships and their impact on health may be challenging,[16] a deeper understanding of social networks and behavioral protective factors in Hispanic populations is necessary as these relationships are important in nearly all stages of life at both the individual and community level.[17]

Positive qualities in social relationships have been shown to influence overall health and wellness for those involved.[18,19] Overall, epidemiological studies have shown that people who have more supportive ties are less likely to become ill and more likely to live longer than people who have fewer supportive ties.[24-28] One such quality, health-related social support, is defined by attempts to aid and reinforce an individual's efforts to positively change health behaviors.[20] Not only have these supportive efforts been shown to

be associated with improved physical health outcomes,[21,22] they have also been associated with decreased depression and anxiety.[23]

In addition to serving as a source of support, close relationships also have been shown to serve as a source of behavioral regulation. Two forms of health-related social control, persuasion and pressure, are qualities present within social relationships and involve efforts to influence individuals' health behaviors.[49] Persuasive health-related social control strategies occur when network members put forth effort to prompt or persuade individuals to improve his or her health behaviors. These efforts have been found to positively impact health behavior as well as induce positive emotional outcomes.[29-32] Conversely, social control efforts that involve pressure are often defined by criticisms, restrictions of behavior, and other attempts that may, at times, elicit negative emotions by the recipient.[33] While both forms of social control are intended to improve health related behaviors, studies have found that pressure in particular is less likely to induce changes in health behavior.[30]

Attempts by social network members to both support and elicit positive behavioral change is especially important for Hispanic individuals diagnosed with type 2 diabetes given the difficulty surrounding its management. Diabetes, often referred to as a lifestyle disease, is a chronic and extremely demanding condition that requires daily management and strict adherence to medication, diet, and exercise. The literature shows that the quality of social relationships and the support and persuasion provided play an important role for patients with diabetes and can contribute to the successful management of disease.[34-37]

Given the well-documented importance of family in the Hispanic culture, intimate, or dyadic, relationships between mothers and daughters have shown to be a pivotal point

of intervention for improved health outcomes.[38] In these relationships, especially when mothers and daughter share similar health risks,[39] health related beliefs and practices are likely to be transmitted across the dyad.[38,40-42] Therefore, further research on mutually influential relationships between mothers and daughters is needed given that leveraging these relationships can yield substantial changes to health and wellness.[38]

METHODS

To investigate how social networks in the Latino community influence diabetic mothers' health and overall stress, we focus on a set of health-related social support and health-related social control strategies. A cross-sectional approach was taken to collect mother and family members survey responses exploring various demographic, health, interpersonal, and stress-related outcomes. In order to account for unique perspectives present within each household, a multi-member approach was taken such that multiple individuals from each recruited family had the opportunity to participate in the study and discuss their relationship with the mother. Given the importance of dyadic relationships between mothers and daughters in Hispanic families, the current study focuses on the perspectives reported by women identified as the mother and daughter in participating family units.

Participants and Data Collection

Recruitment and Collection

Family recruitment began by identifying Latina women with type 2 diabetes who had previously participated in a large, randomized control trial, Unidas por la Vida.[38] Participants were first recruited to the parent study from two large medical providers: AltaMed Health Services and University of California, Irvine (UCI) Health Centers. Each of

these providers were designated Federally Qualified Health Centers (FQHCs) providing healthcare services to low-income individuals drawing from the entire County of Orange, including cities distinguished for having the highest percentage (78.2%) of Latinos in the United States.[43]

After Latina women from the parent study were identified, a trained bilingual (English and Spanish) researcher contacted a random subset of participants to ask whether they would like to further participate in the proposed family study. If interested, women were then asked to provide a list of names that comprise their family network. Mothers along with all interested household and family members were invited to participate in the study and were recruited as a family unit. Overall, participants were included if they were 1) a mother who participated in a larger randomized control trial and consented to hear about additional research opportunities, or 2) individuals who live with or are first degree family members of mothers wanting to participate in the current study (i.e., parent, spouse, child). Exclusion criteria for the study included 1) mothers who reported having no family or household members willing to participate in the study with her, or 2) being under the age of 18. Following the criteria, a total of 42 families were recruited containing 130 unique participants. All measures were collected during a single visit, including physical health measurements as well as an interviewer-administered questionnaire.

All participants were asked to self-report demographic, health, interpersonal, and stress-related data. Mothers were additionally asked a set of unique questions addressing the extent to which they felt family members provided them with support, persuasion, and pressure. Conversely, all participating family members were asked the extent to which they performed supportive, persuasive, and pressuring strategies toward mothers. This

approach allows for a multi-perspective assessment of the family system. All study activities were reviewed and approved by the University of California, Irvine institutional review board (IRB) as an expansion of the existing parent study.

Measures

Relationship characteristics included:

Health-related social support was measured using three items asking participants to indicate the frequency of specific attempts by social networks members to provide support in the past month.[20] A sample item included: "Over the past month, to what extent did you so something to help (your mother) stick with (her) diet or exercise regimen?" Participants responded how frequently support was provided on a 6-point scale (0 = not at all, 5 = everyday), and a composite variable was created to represent health-related social support.

Health-related social control: Two kinds of health-related social control were assessed.

Persuasion was assessed using 3 items examining efforts to encourage positive changes in health behavior. Items for these strategies were adapted from Stephens et al. (2009).[31] A sample item for positive health-related social control includes: "Over the past month, how often did you try to do something to get (your mother) to improve her food choices or exercise regimen?" Participants responded how often these control attempts were made on a 6-point scale (1 = *everyday*, 6 = *not at all*). Responses were reverse coded (0 = *not at all*, 5 = *everyday*) and items were averaged to create a composite measure of positive control.

Pressure was assessed using 4 items examining more coercive strategies, or pressure, to encourage changes in health behavior.[31] A sample item for health-related social control includes: "During the past month, how often did you do something to try to restrict (your mother) from making poor food choices or being physically inactive?" Participants responded how often these control attempts were made on a 6-point scale (1 = *everyday*, 6 = *not at all*). Responses were reverse coded (0 = *not at all*, 5 = *everyday*) and items were averaged to create a composite measure of negative control.

Outcomes used to assess mothers' health and well-being included:

Perceived stress, the degree to which a person's demands exceed their ability to cope, was measured using the 10-item Perceived Stress Scale (PSS).[44] Participants were asked to rate how often they experience certain feelings or thoughts during the last month (1=*never*; 6= *always*). A sample item included: "How often have you felt that you were unable to control the important things in your life." Positive items were reverse-coded and summed to all other negative items such that higher values indicated higher levels of stress.

Health status was assessed using a single item asking participants to rate their general health.[45] Responses were on a 5-point likert scale and ranged from *poor* to *excellent*. Scores were reverse coded such that higher scores indicated worse health in order to better align with the perceived stress outcome.

Analysis

A structural equation model was created to investigate how social networks in the Latino community influence diabetic mothers' health and overall stress. This technique was chosen to allow for both reports of mothers' perceived and daughters' reported measures

of their relationship to be assessed simultaneously. The final model allows us to estimate the influence of social support, persuasion, and pressure on mother's stress and health status. Additional analysis calculating semi-partial correlations was conducted to better understand the impact that each member of the dyad had on mothers' stress and general health outcomes. This analysis allows us the ability to determine, within this sample, which perspective within the dyad mattered more and made a more profound impact on the outcomes of interest.

Three independent variables were collected from 2 separate perspectives, totaling 6 variables in the model. The first set of 3 independent variables included reports of social support, persuasion, and pressure as perceived by mothers within their familial relationships. Conversely, the second set of the independent variables focused on daughter's reports of how much social support, persuasion, and pressure she provided to her mother. This multi-perspective assessment of relationship characteristics allows us to better understand the influence of (1) the support and control that mothers report receiving versus (2) the support and control that daughters report providing to their mothers and how each of these two perspectives influence mother's stress and health status. All analyses were performed using SAS 9.4 and implemented the use of the PROC CALIS and the PROC CANCORR procedures to estimate the structural equation models and further assess the impact of each member on mothers' outcomes.

RESULTS

Of the 42 families in the study, 30 included a participating daughter. Thus, the current assessment was restricted to the 30 families where we had the ability to assess perceived reports of relationship characteristics from mothers and performed reports by

daughters. The model had a goodness of fit (GFI) of 0.98, indicating a good fit, even though the RMSEA value was 0.23. Overall, a majority of mothers (82.8%) lived with their daughters who were participating in the study. 100% of the mothers and 40% of the daughters were born outside of the United States, with 93% of the mothers and less than 1% of daughters speaking reporting that they speak English poorly or very poorly. Although 37% of mothers and 67% of daughters reported either full- or part-time work, many participants were low income, with 63.3% of mothers and 58.6% of daughters reporting a yearly income below $30,000.

Table 1. Means and correlations for relationship components of mother-daughter dyads. MR=Mothers' Reports; DR=Daughters' Reports.

	Mean (SD)	1	2	3	4	5	6	7
1. MR Support	4.33 (1.71)	-						
2. MR Persuasion	4.23 (1.84)	0.87***	-					
3. MR Pressure	2.77 (1.86)	0.47*	0.65***	-				
4. DR Support	3.63 (1.79)	0.50**	0.51**	0.36	-			
5. DR Persuasion	3.69 (1.84)	0.54**	0.57*	0.45*	0.95***	-		
6. DR Pressure	2.36 (1.34)	0.37*	0.46*	0.34	0.56*	0.60***	-	
7. MR Stress	15.07 (6.61)	-0.18	-0.14	-0.18	-0.08	-0.09	-0.2	-
8. MR General Health	3.87 (0.68)	0.21	0.15	-0.01	0.31	0.22	0.22	-0.01

*p<0.05 **p<0.01 ***p<0.001

Means and correlations for all independent variables are shown in Table 1. Overall, mothers' reports of support and persuasion are positively associated with each of the relationship characteristic variables included in the model, regardless of perspective. Similarly, daughters' reports of support and persuasion are also significantly associated with all other relationship characteristics except for the association between daughters' support and mothers' pressure. Table 2 outlines the results of the SEM model examining

the relationship characteristics that mothers report receiving from family members and that daughters report providing mothers. Generally there were very few significant findings. For mothers, neither her reports nor her daughter's reports of the relationship are significantly associated with her ratings of perceived stress or general health status. However, when it comes to the levels of relationship characteristics that daughters report providing mothers, results indicate that higher levels of social support from daughters are associated with higher perceived stress (β=1.74, p=0.45) and worsened general health status (β=0.46, p=0.03) as reported by mothers.

Table 2. SEM model results estimating the impact of mother and daughter reported relationship characteristic on mothers' perceived stress and general health.

	Mothers			Daughters		
	β	SE	p-value	β	SE	p-value
Mothers' Perceived Stress						
Social Support	-1.79	1.26	0.16	1.74	2.32	0.45
Persuasion	1.38	1.46	0.34	-0.87	2.60	0.73
Pressure	-0.34	0.87	0.69	-0.86	1.41	0.54
Mothers' General Health						
Social Support	0.12	0.13	0.33	**0.46**	**0.21**	**0.03**
Persuasion	-0.13	0.14	0.36	-0.36	0.24	0.13
Pressure	0.02	0.08	0.78	0.06	0.13	0.65

For ease of interpretation, final structural equation model results for both mothers and daughters are displayed in figure 2. In line with findings from the structural equation model presented, the semi-partial correlation analysis, not shown here, indicates that mothers' perspective of support and persuasion matter more for her own stress. However, when it comes to mother' general health status, daughters' reports on how much support,

persuasion, and pressure they provide to mothers makes a greater impact compared to mothers' perspectives.

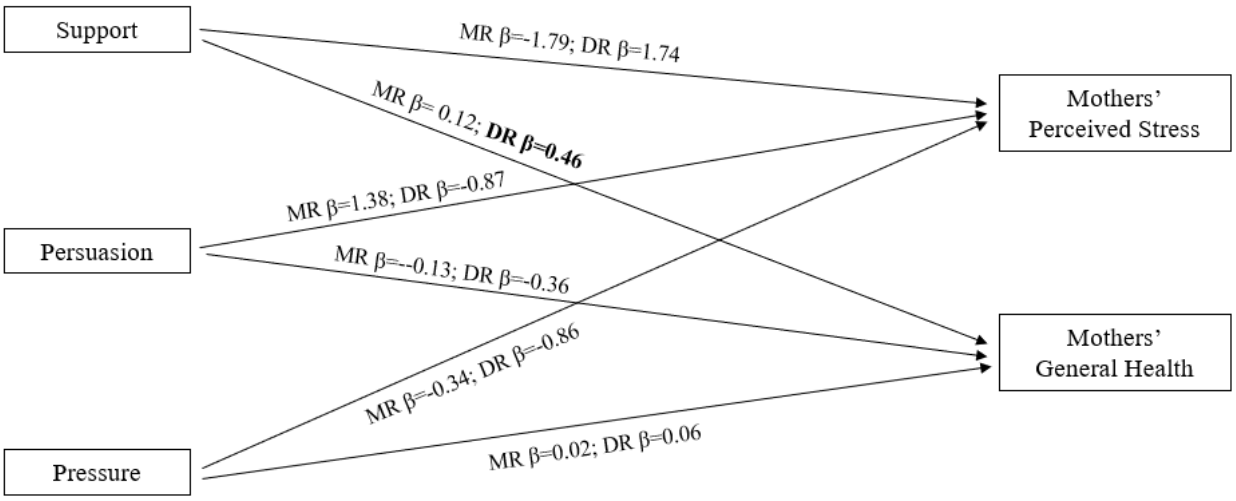

Figure 1. Mothers' and daughters' reports of received versus provided levels of relationship characteristics and their influence on mother's perceived stress and general health. MR=Mothers' Reports; DR=Daughters' Reports.

DISCUSSION

Building upon the well-documented importance of the family in Hispanic culture, the current study examined the extent to which (1) the health-related support and control that mothers report receiving and (2) the health-related support and control that daughters report providing to their mothers are associated with mother's general health and stress levels. While findings are largely non-significant, results suggest that daughters' reports of providing higher levels of persuasion to elicit health behavior change are associated with less perceived stress in mothers. However, mothers' reports of receiving higher levels of persuasion from daughters are more likely to report increased levels of stress. Neither of these associations are significant, however, the distinction is an important one to note. Existing literature suggests that persuasive efforts on behalf of

network members are associated with improved physical outcomes and alleviates the emotional impacts of stress,[45] moreover, the current study further suggests that the differences across perceived levels of persuasion (whether they be reported by mothers or reported by daughters) matters in the context of dyadic relationships. This may in part be explained by the awareness of such strategies occurring across members of the dyad.[47-49] When persuasive efforts become visible, literature speculates that the awareness of such strategies occurring can create burden on the part of the recipient and can, therefore, have downstream effects on stress.[47-49]

Model results also indicate that daughters who report providing more pressure to influence health behaviors are associated with less stress in mothers. Moreover, mothers' own reports of the pressure she received are also associated with less stress even though it is a smaller effect. While the majority of literature on pressure suggests that it is ineffective or even associated with negative affect,[50-52] current study findings add to the smaller mixed literature suggesting that pressure can also lead to behavioral benefits.[31] Strategies using pressure on the part of network members are nonetheless intended to promote positive health behavior change regardless of the recipients perception of these efforts.[53] The benefit of reduced stress levels evidenced in the current study may, in part, be driven by appreciation and direct guidance from family members in what individuals should and should not be doing in order to sustain a healthy lifestyle.

Findings from the semi-partial correlations, not currently shown (available upon request), bolster results from the structural equation model indicating that differing perspectives across mother-daughter dyads have varying levels of impact on mothers' health and wellness. Mothers' reports of how much support and persuasion was received

from family members have a stronger impact on mothers' perceived stress and general health while daughters' reports have a lower impact. Given than perceived stress is a psychological process, results indicate that ones' own viewpoint may perhaps matter more in the context of social relationships.[54] Alternatively, daughters' reports of support, persuasion, and pressure have a stronger impact on general health than does mothers' reports of the same relationship characteristics. Perhaps fundamentally, where the social network plays a more pronounced role is in the idea of general health. Even though general health is self-reported, these ratings are nonetheless highly correlated and predictive of one's functional status and mortality underscoring the importance of daughters' perspectives in physical health outcomes for mothers.[55] The bifurcation in psychological outcomes depending more on an individuals' own reports while health outcomes depend more on outside reports highlights the importance of further understanding the role that daughters and other social network members play on mothers' overall well-being.

Although this study is among the first to assess how reports of relationship characteristics within the Hispanic culture might influence overall health and stress, several study limitations exist. First, the cross-sectional nature of the study limits the assessment of temporality. In our study, it would be difficult to understand the order in which the exposure and the outcome took place. While our conceptual framework posits changing health and stress levels as the result of social relationships, there may be a cyclical relationship linking these measures. Second, it is unclear whether these finding are generalizable to groups outside of the Hispanic culture, males, or those of a higher socio-economic status. Third, our model did not exhibit adequate goodness of fit on all fit indices. It is likely that this is mostly driven by small sample size given that RMSEA is known to be

inflated in situations with few observations. Lastly, the small sample size also had an impact on the current analysis and likely led to the largely non-significant findings. Given the low statistical power with a small sample size of 30, the study had limited ability to detect an effect, if there was one to be detected. Care should be taken in drawing conclusions from the model's results, and our findings would need to be replicated in larger studies with the appropriate power to detect effects.

New contribution to the literature

While a number of studies have shown supportive strategies may elicit positive well-being outcomes by alleviating the negative effects of stress,[56] the literature addressing the associations between perspectives of mothers' versus daughters' reports of such strategies in the Latino community is scant. The current study aims to close this gap in knowledge by transitioning to an intergenerational and multi-perspective assessment of the family context in order to assess how relationships within the Hispanic culture might influence stress levels that can have downstream effects on the onset and management of physical health conditions. This area of research is especially important in the context of diabetes, an area where the social context of disease management plays a pronounced role. While the impact of social networks on improved health outcomes is well-established,[20] the particular influence of supportive strategies provides a pivotal place for friends and family to encourage positive behavioral changes leading to improved health. Overall, these efforts have the potential to provide novel information about the effect of social networks on stress and general health to better our understanding of the complex mechanisms behind these multifaceted outcomes.

ACKNOWLEDGEMENTS

This research was supported by the National Institute of Diabetes and Digestive and Kidney Diseases (1R01DK101623, R34 DK083500, K01DK078939). This work was partially supported by the grant UL1 TR0001414 and KL2 TR000147 from the National Center for Advancing Translational Sciences. The views expressed in this publication are solely the opinions of the authors and do not necessarily reflect the official policies of U.S. Department of Health and Human Services, the National Institutes of Health, or the Health Resources and Services Administration, nor does mention of the department or agency names imply endorsement by the U.S. government.

REFERENCES

1. Lavery, L. A., Ashry, H. R., Armstrong, D. G., & Pugh, J. A. (1999). Diabetes-related lower-extremity amputations disproportionately affect Blacks and Mexican Americans. *Southern medical journal*, *92*(6), 593-599.

2. Pugh, J. A., Medina, R. A., Cornell, J. C., & Basu, S. (1995). NIDDM is the major cause of diabetic end-stage renal disease: more evidence from a tri-ethnic community. *Diabetes*, *44*(12), 1375-1380.

3. Dominguez, K., Penman-Aguilar, A., Chang, M. H., Moonesinghe, R., Castellanos, T., Rodriguez-Lainz, A., & Schieber, R. (2015). Vital signs: leading causes of death, prevalence of diseases and risk factors, and use of health services among Hispanics in the United States—2009–2013. *MMWR. Morbidity and mortality weekly report*, *64*(17), 469.

4. American Diabetes Association. (2019). 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2019. *Diabetes Care*, *42*(Supplement 1), S13-S28.

5. Harris, M. I. (2001). Racial and ethnic differences in health care access and health outcomes for adults with type 2 diabetes. *Diabetes care*, *24*(3), 454-459.

6. Haffner, S. M., Mitchell, B. D., Moss, S. E., Stern, M. P., Hazuda, H. P., Patterson, J., ... & Klein, R. (1993). Is there an ethnic difference in the effect of risk factors for diabetic retinopathy?. *Annals of epidemiology*, *3*(1), 2-8.

7. Centers for Disease Control and Prevention. (2015). Hispanic Health. Retrieved March 16, 2020, from https://www.cdc.gov/vitalsigns/hispanic-health/index.html

8. López, L., & Golden, S. H. (2014). A New Era in Understanding Diabetes Disparities Among U.S. Latinos—All Are Not Equal. *Diabetes Care, 37*(8), 2081-2083. doi:10.2337/dc14-0923

9. National Institute of Diabetes and Digestive and Kidney Diseases. (2005). National diabetes statistics fact sheet: general information and national estimates on diabetes in the United States, 2005. Department of Health and Human Services, National Institutes of Health, Bethesda, MD.

10. Diamant, A. L., Babey, S. H., Brown, E. R., & Chawla, N. (2003). Diabetes in California: nearly 1.5 million diagnosed and 2 million more at risk.

11. United States. Public Health Service. Office of the Surgeon General, United States. Office of Disease Prevention, Health Promotion, Centers for Disease Control, & Prevention (US). (2001). The Surgeon General's call to action to prevent and decrease overweight and obesity. US Government Printing Office.

12. Evans, G. W., & Kantrowitz, E. (2001). Strategies for reducing morbidity and mortality from diabetes through health-care system interventions and diabetes self-management education in community settings. A report on recommendations of the Task Force on Community Preventive Services. Morbidity and Mortality Weekly Report Recommendations and Reports, 50, 1-15.

13. Brown, E. R., Ojeda, V. D., Wyn, R., & Levan, R. (2000). Racial and ethnic disparities in access to health insurance and health care.

14. Bellato, R., Araújo, L. F. S. D., Dolina, J. V., Musquim, C. D. A., & Corrêa, G. H. D. L. S. T. (2016). The family experience of care in chronic situation. *Revista da Escola de Enfermagem da USP*, *50*, 81-88.

15. National Collaborating Centre for Infectious Diseases. (2016). More than Just Numbers: Exploring the Concept of 'Burden of Disease.' Retrieved April 20, 2020, from https://nccid.ca/publications/exploring-the-concept-of-burden-of-disease/.

16. Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. (2004). Toward national well-being accounts. *American Economic Review*, *94*(2), 429-434.

17. Thacker, S. B., Stroup, D. F., Carande-Kulis, V., Marks, J. S., Roy, K., & Gerberding, J. L. (2006). Measuring the public's health. *Public health reports*, *121*(1), 14-22.

18. Towler, A. J., & Stuhlmacher, A. F. (2013). Attachment styles, relationship satisfaction, and well-being in working women. *The Journal of social psychology*, 153(3), 279-298.

19. Kok, B. E., & Fredrickson, B. L. (2014). Wellbeing Begins with "We" The Physical and Mental Health Benefits of Interventions that Increase Social Closeness. Wellbeing: A Complete Reference Guide, 1-29.

20. Franks, M. M., Stephens, M. A. P., Rook, K. S., Franklin, B. A., Keteyian, S. J., & Artinian, N. T. (2006). Spouses' provision of health-related support and control to patients participating in cardiac rehabilitation. *Journal of Family Psychology*, *20*(2), 311.

21. Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social science & medicine*, *51*(6), 843-857.

22. Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS med*, *7*(7), e1000316.

23. Ozbay, F., Johnson, D. C., Dimoulas, E., Morgan, C. A., Charney, D., & Southwick, S. (2007). Social support and resilience to stress: from neurobiology to clinical practice. *Psychiatry (Edgmont (Pa. : Township))*, *4*(5), 35–40.

24. Helgeson, V. S., Novak, S. A., Lepore, S. J., & Eton, D. T. (2004). Spouse social control efforts: Relations to health behavior and well-being among men with prostate cancer. *Journal of social and Personal Relationships*, *21*(1), 53-68.

25. Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance and mortality: A nine-year follow-up study of Alameda County residents. *American Journal of Epidemiology*, 109, 186–204.

26. House, J. S., Umberson, D., & Landis, K. R. (1988). Structures and processes of social support. *American Review of Sociology*, 14, 293–318.

27. Orth-Gomér, K., Rosengren, A., & Wilhelmsen, L. (1993). Lack of social support and incidence of coronary heart disease in middle-aged Swedish men. *Psychosomatic Medicine*, 55, 37–43.

28. Reynolds, P., & Kaplan, G. A. (1990). Social connections and risk for cancer: Prospective evidence from the Alameda County study. *Behavioral Medicine*, 16, 101–110.

29. Hughes, M., & Gove, W.R. (1981). Living alone, social integration, and mental health. *American Journal of Sociology*, 87, 48–74.

30. August, K.J., & Sorkin, D.H. (2010). Marital status and gender differences in managing a chronic illness: the function of health-related social control. *Social science & medicine*, 71(10), 1831–1838.

31. Stephens, M. A. P., Fekete, E., Franks, M. M., Rook, K. S., Druley, J. A. & Greene, K. (2009). Spouses' use of persuasion and pressure to promote patients' medical adherence after orthopedic surgery. *Health Psychology*, 28, 48–55.

32. Tucker, J.S., Orlando, M., Elliott, M.N., & Klein, D.J. (2006). Affective and behavioral responses to health-related social control. *Health Psychology*, 25: 715–722.

33. August KJ, Dowell A, Sorkin DH. (2017). Disease factors associated with spousal influence on diabetic diet: An exploratory comparison of Vietnamese American and White older adults. *Health Psychol Open*, 4(2):2055102917738658. doi: 10.1177/2055102917738658. PMID: 29379626; PMCID: PMC5779944.

34. Ramkisson, S., Pillay, B. J., & Sibanda, W. (2017). Social support and coping in adults with type 2 diabetes. *African journal of primary health care & family medicine*, *9*(1), 1-8.

35. Tol, A., Baghbanian, A., Rahimi, A., Shojaeizadeh, D., Mohebbi, B., & Majlessi, F. (2011). The Relationship between perceived social support from family and diabetes control among patients with diabetes type 1 and type 2. *Journal of Diabetes and Metabolic Disorders*, *10*, 21.

36. Oftedal, B. (2014). Perceived support from family and friends among adults with type 2 diabetes. *European Diabetes Nursing*, *11*(2), 43-48.

37. Rintala, T. M., Jaatinen, P., Paavilainen, E., & Åstedt-Kurki, P. (2013). Interrelation between adult persons with diabetes and their family: a systematic review of the literature. *Journal of family nursing*, *19*(1), 3-28.

38. Sorkin DH, Rook KS, Campos B, et al. Rationale and study protocol for Unidas por la Vida (United for Life): A dyadic weight-loss intervention for high-risk Latina mothers and their adult daughters. *Contemp Clin Trials*. 2018;69:10-20. doi:10.1016/j.cct.2018.03.013

39. DeLongis, A., Folkman, S., & Lazarus, R. S. (1988). The impact of daily stress on health and mood: psychological and social resources as mediators. *Journal of personality and social psychology*, 54(3), 486.

40. Gordon SM. Hispanic Cultural Health Beliefs and Folk Remedies. *Journal of Holistic Nursing*. 1994;12(3):307-322. doi:10.1177/089801019401200308

41. Matheson DM, Robinson TN, Varady A, et al. Do Mexican-American Mothers' Food-Related Parenting Practices Influence Their Children's Weight and Dietary Intake? *J Am Diet Assoc*. 2006;106(11):1861–1865.

42. Garcia-Maas LD. Intergenerational Analysis of Dietary Practices and Health Perceptions of Hispanic Women and their Adult Daughters. J Transcult Nurs. 1999;10(3):213–219.

43. Ennis, S. R., Ríos-Vargas, M., & Albert, N. G. (2011). The Hispanic Population: 2010. 2010 Census briefs. May 2011. Retrieved May 28, 2020, from www.census.gov/prod/cen2010/briefs/c2010br-04.pdf.

44. Cohen, S., Kamarck, T., & Mermelstein, R. (1994). Perceived stress scale. Measuring stress: *A guide for health and social scientists*, 10, 1-2.

45. Ware, J. Jr., Kosinski, M., Keller, S.D. (1996). A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care*, 34(3):220-33. doi: 10.1097/00005650-199603000-00003. PMID: 8628042.

46. Thoits PA. Mechanisms linking social ties and support to physical and mental health. J Health Soc Behav. 2011 Jun;52(2):145-61. doi: 10.1177/0022146510395592. PMID: 21673143.

47. Lilleheie I, Debesay J, Bye A, & Bergland A. (2021) The tension between carrying a burden and feeling like a burden: a qualitative study of informal caregivers' and care recipients' experiences after patient discharge from hospital, *International Journal of Qualitative Studies on Health and Well-being*, 16:1, DOI: 10.1080/17482631.2020.1855751

48. Beck L. (2007) Social status, social support, and stress: a comparative review of the health consequences of social control factors, *Health Psychology Review*, 1:2, 186-207, DOI: 10.1080/17437190802217246

49. Newsom JT, Rook KS, Nishishiba M, Sorkin DH, Mahan TL. (2005). Understanding the relative importance of positive and negative social exchanges: examining specific domains and appraisals. *J Gerontol B Psychol Sci Soc Sci*, 60(6):P304-P312. doi: 10.1093/geronb/60.6.p304. PMID: 16260704; PMCID: PMC3833824.

50. Martire, L.M., Stephens, M.A., Mogle, J., Schulz, R., Brach, J., Keefe, F.J. (2013). Daily spousal influence on physical activity in knee osteoarthritis. Annals of Behavioral Medicine, 45: 213–223.

51. Stephens, M.A., Franks, M.M., Rook, K.S., Iida, M., Hemphill, R.C., Salem, J.K. (2013). Spouses' attempts to regulate day-to-day dietary adherence among patients with type 2 diabetes. Health Psychol, 32:1029–1037.

52. Lewis MA, & Rook KS. (1999). Social control in personal relationships: Impact on health behaviors and psychological distress. Health Psychology, 18, 63–71.

53. Rook, K.S., Thuras, P.D., & Lewis, M.A. (1990). Social control, health risk taking, and psychological distress among the elderly. *Psychology and Aging*, 5, 327–334.

54. Helgeson VS, Naqvi JB, Seltman H, Vaughn AK, Korytkowski M, Hausmann L, & Gary-Webb TL (2020). Links of communal coping to relationship and psychological health in type 2 diabetes: actor-partner interdependence models involving role, sex, and race. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*, *54*(5), 346–359. https://doi.org/10.1093/abm/kaz052

55. Lee Y. (2000). The predictive value of self assessed general, physical, and mental health on functional decline and mortality in older adults. *Journal of Epidemiology & Community Health*, 54:123-129.

56. Berkel, C., Knight, G. P., Zeiders, K. H., Tein, J. Y., Roosa, M. W., Gonzales, N. A., & Saenz, D. (2010). Discrimination and adjustment for Mexican American adolescents: A prospective examination of the benefits of culturally related values. *Journal of Research on Adolescence*, 20, 893-915. doi:10.1111/j.1532-7795.2010.00668.x.