

UC San Diego

UC San Diego Electronic Theses and Dissertations

Title

The role of children, families, and acculturation on Latina mothers' dietary intake and behaviors

Permalink

<https://escholarship.org/uc/item/9sw3x6vz>

Author

Soto, Sandra Hyatt

Publication Date

2017

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA, SAN DIEGO
SAN DIEGO STATE UNIVERSITY

The role of children, families, and acculturation on Latina mothers' dietary intake and
behaviors

A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy

in

Public Health (Health Behavior)

by

Sandra Hyatt Soto

Committee in Charge:

San Diego State University

Professor Elva M. Arredondo, Chair

Professor Guadalupe X. Ayala

Professor Scott Roesch

University of California, San Diego

Professor Bess Marcus

Professor Holly B. Shakya

2017

Copyright
Sandra Hyatt Soto, 2017
All rights reserved.

The Dissertation of Sandra Hyatt Soto is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

University of California, San Diego
San Diego State University
2017

DEDICATION

This dissertation is dedicated to my mom and dad who taught me that the one thing that can never be taken away is my knowledge. Also, to my husband, Patrick who has always believed in me, supported me, shared my burdens to lighten the load, and continues to be the light in my heart. This is for you.

EPIGRAPH

Behavior is what you do, culture is how you do it.

-Dr. Shane Gero, Behavioral Ecologist

TABLE OF CONTENTS

SIGNATURE PAGE	iii
DEDICATION	iv
EPIGRAPH	v
TABLE OF CONTENTS	vi
LIST OF FIGURES AND TABLES	ix
Figures	ix
Tables	ix
ACKNOWLEDGMENTS	xi
VITA AND PUBLICATIONS	xiv
ABSTRACT OF THE DISSERTATION	xx
INTRODUCTION	1
Conceptual framework	13
Aims and hypotheses	14
References	16
CHAPTER 1 . Effects of Latino children on their mothers' dietary intake and behaviors: The role of children's acculturation and the mother-child acculturation gap .	23
Abstract	23
Introduction	25
Methods	28
Study design and procedures	28
Measures	29
Data analyses	34
Results	36
Demographic characteristics and mothers' dietary intake and behaviors	36
Acculturation and acculturation gap variables	36
Association between child's acculturation and mother's diet	37
Association between mother-child acculturation gap and mother's diet	37
Discussion	38

Limitations	41
Conclusions.....	42
Acknowledgments.....	42
References.....	49
CHAPTER 2 . Family environment, children’s acculturation and Latina mothers’ dietary intake and behaviors: An autoregressive cross-lagged study	54
Abstract.....	54
Introduction.....	56
Methods.....	59
Study design and participant characteristics	59
Measures	60
Data analyses	63
Results.....	65
Descriptive characteristics	65
The role of the family environment on mothers’ diet.....	65
Differences in the role of the family environment on mothers’ diet by children’s acculturation.....	67
Discussion.....	67
Limitations	70
Conclusions.....	71
Acknowledgments.....	71
References.....	84
CHAPTER 3 . Exploring how children influence their Latina mothers’ diet: Qualitative interviews with mothers of bicultural and assimilated children.....	88
Abstract.....	88
Introduction.....	90
Methods.....	92
Participants and sampling	93
Procedure for data collection	94
Data analyses	97
Results.....	98
Sample characteristics.....	98
Mothers’ dietary intake and behaviors.....	99

Themes found in qualitative interviews with mothers and children	99
Discussion	115
Limitations	118
Conclusions	119
Acknowledgments	119
References	123
DISCUSSION	128
Overview	128
Strengths and limitations	133
Future directions	136
Conclusions	138
References	139

LIST OF FIGURES AND TABLES

FIGURES

Figure i-1. Conceptual overview of associations examined in this dissertation	13
Figure 2-1. Theoretical models.	73
Figure 2-2. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' away-from-home eating.....	74
Figure 2-3. Auto-regressive lagged analysis results of family expressiveness and interactions around food with the percent of grocery dollars spent on fruits and vegetables.....	75
Figure 2-4. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' away-from-home eating among mothers with (a) assimilated and (b) bicultural children.....	76
Figure 2-5. Auto-regressive lagged analysis results of family expressiveness and interactions around food with the percent of grocery dollars spent on fruits and vegetables among mothers with (a) assimilated and (b) bicultural children.	77
Supplement Figure 2-1. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily vegetable servings.....	78
Supplement Figure 2-2. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily fruit servings.	79
Supplement Figure 2-3. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' calories from fat.....	80
Supplement Figure 2-4. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily sugary beverage servings.....	81
Figure 3-1: Narrative themes from interviews with mothers and children.....	121

TABLES

Table 1-1: Demographic characteristics of mothers and children and mothers' dietary variables (N=314)	44
---	----

Table 1-2: Separate regression model associations between having an assimilated child (versus bicultural) and mothers' dietary variables.....	45
Table 1-3: Separate regression model associations between the difference in children's acculturation dimension scores and mothers' dietary variables	46
Table 1-4: Separate regression model associations between acculturation gap typologies and mothers' dietary variables	47
Supplement Table 1-1: Correlations between dietary variables	48
Table 2-1: Correlations and descriptive statistics among family environmental variables and mothers' dietary intake and behaviors (N = 162; Continued).....	82
Table 2-2: Means and standard deviations of mothers' dietary and family environment variables stratified by children's acculturation group.....	83
Table 3-1: Participant demographic characteristics (N=21 mother-child dyads).....	122

ACKNOWLEDGMENTS

I would like to extend my gratitude to my chair, Dr. Elva Arredondo for giving me equal parts support and freedom to explore my research interests. Your flexibility and guidance allowed me to cultivate my own corner of research that I am excited to call my niche. I would also like to extend my gratitude to Dr. Guadalupe X. Ayala for your openness and willingness to let me explore your data. Your energy, motivation, and dedication to rigorous research practices have inspired me continue in the example you have set. To Dr. Holly Shakya who has provided mentorship that I value immensely, thank you for showing me how to look at the “big picture” in manuscripts we have co-authored or in the scope of my career. Thank you Dr. Scott Roesch for your kind patience and cheerful attitude in the face of difficult statistics. And to Dr. Bess Marcus for your guidance, expertise, and time.

To the other professors and research staff that have guided me along the way: Dr. Kathleen Merchant, I thank you for being a delightful combination of mentorship and friendship that I look forward to in every interaction we share. Dr. Elder, you were the first person I spoke to when I inquired about coming to the JDP program. I came out of that conversation both excited and convinced that this was the perfect program for achieving my career goals. I would especially like to thank Jessica Haughton for always having an open door and being a source of never-ending guidance in project management. Above all, you have also been a special friend who shaped my experience at IBACH in the most positive way. To Lucy Horton who has always been a pleasure to work with and shown me limitless patience with my endless inquiries. To Elena Concha,

Eileen Allen, Jen Caffrey, Stephanie Sanz, Jordana Breton, and the rest of the staff and students at IBACH for lending me your support on my projects and your friendship along the way. I could not have done this without each of you.

The journey of earning a PhD was only possible with the support from my cohort and fellow students who shared in my struggles and achievements. To Jen Sanchez-Flack, Jessa Engleberg, Michelle Takemoto, Angelica Barrera, Kate Machiato, Lilian Perez, and the rest of my JDP family, thank you for your support these past five years. Thank you for your feedback on my papers and grants, for your suggestions on how to handle difficult circumstances, for our study sessions in each other's homes, coffee shops, and work spaces, and for the many decompression (happy) hours we shared.

And to my dear family. My dissertation focuses on family and differences in acculturation. Throughout my dissertation, I have thought back to when we moved to the US from Colombia and the years that followed. Even though we were living here you both tried very hard to keep our traditions alive. I see examples of how difficult that must have been in my participants and am so thankful you tried so hard. Not only because it was good for our health but also because it was good for our relationship. I am grateful for the sometimes painful, but ultimately valuable experience of growing up between two cultures. To my dear brother, Angel who is so very different from me in so many ways. My curiosity in these differences is what has inspired my career in researching families. To my other brother, Ricardo, I know you would be beaming with pride if you were here to see this. Last but certainly not least, to my husband, Patrick for being my sounding

board, my grief counsellor, and my biggest fan. You have made this possible. I love you and I thank you from the bottom of my heart.

I would like to thank the National Institute for Nursing Research (NINR) of the National Institutes of Health (NIH) for funding my dissertation (1F31NR015965-01A1).

Chapter 1 in full, is a reprint of the materials submitted to Social Science & Medicine. The dissertation author was the primary investigator and author of this material. Co-authors include Dr. Elva M. Arredondo, Dr. Bess Marcus, Dr. Holly Shakya, Dr. Scott Roesch, and Dr. Guadalupe X. Ayala.

Chapter 2 in full, is a reprint of the materials submitted to Annals of Behavioral Medicine. The dissertation author was the primary investigator and author of this material. Co-authors include Dr. Elva M. Arredondo, Dr. Holly Shakya, Dr. Scott Roesch, Dr. Bess Marcus, and Dr. Guadalupe X. Ayala.

Chapter 3 is currently being prepared for submission to Appetite. The dissertation author was the primary investigator and author of this material. Co-authors include, Dr. Elva M. Arredondo Dr. Guadalupe X. Ayala, Dr. Bess Marcus, Dr. and Dr. Holly Shakya.

VITA AND PUBLICATIONS

EDUCATION

San Diego State University & University of California, San Diego, CA

Joint Doctoral Program in Public Health, San Diego, CA | 2012 – present

Health Behavior Track

George Washington University – Washington, DC | 2007 – 2009

Master of Public Health with a Specialization in Health Promotion

University of South Florida – Tampa, FL | 2000 – 2004

Bachelor of Science in Nursing

PUBLICATIONS

Soto, S. H., Shakya, H., Haughton, J., Arredondo, E.M., (in press). Leisure-time physical activity and characteristics of social network support for exercise among Latinas. *American Journal of Health Promotion*.

Soto, S. C., Chavez, A., Haughton, J., Arredondo, E. M. (2017). Development of culturally appropriate strategies for promoting physical activity. Bopp, M. (Ed.), *Physical Activity and diverse populations: evidence and practice*.

Kowitt, S., Ayala, G. X., Cherrington, A., Horton, L. A., Safford, M. M., **Soto, S. C.**, Tang, T. S., Fisher, F., B. (2017). Social support and diabetes: an investigation of nondirective and directive support. *Annals of Behavioral Medicine*.

Perez L.G., Chavez A., Marquez D.X., **Soto S. C.**, Haughton J., & Arredondo E.M. (2016). Associations of acculturation with self-report and objective physical activity and sedentary behaviors among Latinas. *Health Education & Behavior*. DOI: 10.1177/10901981166669802.

Soto, S. C., Arredondo, E. M., Villodas, M. T, Elder, J. P., Quintanar, E., Madanat, H. (2016). Depression and chronic health conditions among Latinos: the role of social networks. *Journal of Immigrant and Minority Health*, 18(6), 1292-1300. DOI: 10.1007/s10903-016-0378-2.

Soto, S.C., Arredondo, E.M., Horton, L. A., Ayala, G. X. (2016). Validation of the Modified Parenting Strategies for Eating and Physical Activity Scale-Diet (PEAS-Diet) in Latino Children. *Appetite*, 98, 55-62. DOI: 10.1016/j.appet.2015.12.003.

Soto, S. C., Louie, S., Cherrington, A., Parada, H., Horton, L. A., Ayala, G. X. (2015). An ecological perspective on diabetes self-care support, self-management

behaviors, and hemoglobin A1C among Latinos. *The Diabetes Educator*, 0145721715569078.

Bronheim, S. M., **Soto, S. C.**, Anthony, B. J. (2014) Addressing disparities in access to information for Hispanic families of children with special health care needs. *Journal of Health Disparities and Practice*: 8(2), 3.

Soto, S. C., Linas, K., Malloy, M., Jacobstein, D. M., Biel, M. G., Migdal, T., Anthony, B. (2014). A review of cultural adaptations of screening tools for autism spectrum disorders. *Autism*, 19(6), 646-6611362361314541012.

SUBMITTED MANUSCRIPTS

Soto, S.H., Sanz, S., Merchant, K. M., Nichols, J. M., Arredondo, E.M. (submitted). Lessons from a feasibility study of physical activity promotion among pregnant Latina WIC participants. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*

Soto, S.H., Arredondo, E.M; Marcus, B. Shakya, H., Roesch, S., Ayala, G. X. (submitted). Effects of Latino children on their mothers' dietary intake and dietary behaviors: the role of children's acculturation and the mother-child acculturation gap. *Social Science & Medicine*.

Soto, S.H., Arredondo, E.M; Shakya, H., Roesch, S., Marcus, B. Ayala, G. X. (submitted). Family environment, children's acculturation and Latina mothers' dietary intake and behaviors: An autoregressive cross-lagged study. *Annals of Behavioral Medicine*.

MANUSCRIPTS IN PROGRESS

Soto, S.H., Arredondo, E.M., Ayala, G. X., Marcus, B., Shakya, H. (in preparation). Exploring how children influence their Latina mothers' dietary behaviors: qualitative interviews with mothers of bicultural and assimilated children. *Appetite*.

SCIENTIFIC PRESENTATIONS

Soto, S.H., Arredondo, E.M; Roesch, S., Marcus, B. Shakya, H., Ayala, G. X. (2017, June). *Family-level factors and dietary intake among Latinas: An autoregressive cross-lagged analysis*. Poster presentation at the International Society for Behavioral Nutrition and Physical Activity's Annual Meeting, Victoria, BC.

Soto, S. H., Arredondo, E. M., Marcus, B., Shakya, H., Roesch, S., Ayala, G. X. (2017, March). *The role of Latino children's acculturation on their mothers' dietary*

- intake and dietary behaviors*. Poster presentation at the 38th Annual Society of Behavioral Medicine Meeting, San Diego, CA-24.
- Breton, J., **Soto, S.H.**, (2017, March). *Exploring why some traditional Latina mothers are more permissive with their children's dietary intake*. Poster presentation at the 4th Annual Conference for Research in the Arts, Social Sciences, and Humanities, San Diego.
- Soto, S. C.**, Shakya, H., Haughton, J., Arredondo, E. M. (2016, March). *Leisure-time physical activity and social network support among Latinas*. Poster presentation at the 37th Annual Society of Behavioral Medicine Meeting, Washington, DC.
- Soto, S. C.**, Shakya, H., Haughton, J., Arredondo, E. M. (2016, January). *Leisure time moderate-to-physical activity and the role of social network support for physical activity among adult Latinas*. Poster presentation at the Active Living Research Conference, Clearwater, FL.
- Soto, S. C.**, Arredondo, E. A., Elder, J., Quintanar, E., Madanat, H. (2015, October). *Depression and chronic health conditions among Latinos: the role of social networks*. Poster presentation at the American Public Health Association's Annual Meeting, Chicago, IL.
- Soto, S. C.**, Sanz, S., Montanez, J., Merchant, K., Nichols, J., Arredondo, E. A. (2015, June). *A pilot study to promote physical activity among pregnant women enrolled in the Women, Infants, and Children (WIC) program*. Poster presentation at the Hispanic-Serving Health Professions Schools' Professional Development Workshop, Bethesda, MD.
- Soto, S. C.**, Arredondo, E. M., Horton, L., Strong, D., Ayala, G.X. (2014, May). *Factor Analysis of a modified Parenting Strategies for Eating and Physical Activity Scale (PEAS) in Latino Children*. Short oral presentation at the International Society for Behavioral Nutrition and Physical Activity's Annual Meeting, San Diego, CA.
- Soto, S. C.**, Louie, L., Cherrington, A., Ayala, G. X. (2014, April). *An ecological perspective on perceived social support and diabetes self-care behaviors*. Poster presentation at the Society of Behavioral Medicine's Annual Meeting, Philadelphia, PA.
- Soto, S. C.**, Arredondo, E., Horton, L., Strong, D., Ayala, G.X. (2014, March). *Validation of a modified Parenting Strategies for Eating and Physical Activity Questionnaire in*

Latino Children. Poster presentation at the San Diego State University 2013 Student Research Symposium, San Diego, CA., San Diego, CA.

Bronheim, S., **Soto, S. C.**, Thomas, J., Anthony, B. (2013, November). *Addressing disparities in access to information for Hispanic families of children with special health care needs: Increasing use of family-to-family centers*. Poster presented at the 141st American Public Health Association Annual Meeting, Boston, MA.

Linas, K., Lorenzo-Hubert, I., Dos Santos, S., Mendez, R., **Soto, S. C.**, Anthony, B. (2013, April). *Exploring the disparities in rates of diagnosis of autism in young Latino children*. Poster presented at the 2013 Society for Research in Child Development Biennial Meeting, Seattle, WA.

Soto, S. C., Arredondo, E., Holub, C., Ayala, G.X., Elder, J., Chanson, D., Burke, K., Haughton, J. (2013, March). *Social support for physical activity among Latinas living in San Diego County*. Poster presented at the 34th Annual Meeting and Scientific Sessions of the Society of Behavioral Medicine, San Francisco, CA.

Soto, S. C., Arredondo, E. M. (2013, Feb). *Motivational interviews in a physical activity intervention among Latinas*. Oral presentation at the San Diego State University Student Research Symposium, San DIEGO, CA.

Soto, S. C., Thomas, M., Anthony, B. (2012, Mar). *Increasing access to information and support for families of children with special needs*. Oral presentation at the 25th Annual Children's Mental Health Research and Policy Conference, Tampa, Fl.

Anthony, B., **Soto, S. C.**, Holland, C. (2012, Mar). *Using a Delphi study process to refine a model of technical assistance*. Oral presentation at the 25th Annual Children's Mental Health Research and Policy Conference, Tampa, Fl.

TEACHING ACTIVITIES

Session leader, Community Engagement and Advocacy (PubH 6054; graduate-level online course). George Washington University, Milken Institute School of Public Health | Spring 2016

Guest lecturer, *Interpersonal Relationships in Health Behaviors & Interventions*. Motivating Health Behavior (PH 662; graduate-level public health course). San Diego State University, Division of Health Promotion and Behavioral Sciences. Evaluation score: 4.6/5.0 | Spring 2016

Guest lecturer, *Faith in Action RCT*. Public Health Program Evaluation (PH 490C; undergraduate-level health science (public health) course). San Diego State University, College of Health and Human Services | Spring 2016

Guest lecturer, *Assessing Needs and Setting Priorities & Problem Statements, Goals, and Objectives*. Behavioral and Social Science in Public Health (PH 603; graduate-level public health course). San Diego State University, Division of Health Promotion and Behavioral Sciences. Evaluation score: 4.8/5 | Fall 2015

Teaching assistant, Health, Society and Human Behavior (PH 664; graduate-level public health course). San Diego State University, Division of Health Promotion and Behavioral Sciences | Spring 2015

Guest lecturer, *HIV and African American Women*. Seminar in Women's Health (PH 700F; graduate-level public health course). San Diego State University, Division of Health Promotion and Behavioral Sciences | Spring 2013

Session leader, Management Approaches to Public Health (PubH 6006; graduate-level public health course). George Washington University, School of Public Health and Health Services | Spring 2010, Fall 2010, Spring 2011, Fall 2011, Spring 2012

PROFESSIONAL SERVICE

Annual Meeting Coordinator – Society of Behavioral Medicine (SBM) Student Special Interest Group | 4/16 – 4/17)

Journal Referee/Reviewer – Appetite; International Journal of Mental Health Systems; Journal of Depression & Anxiety; Preventing Chronic Disease; World Journal of Diabetes

Conference Referee/Reviewer – National Council for Family Relations: Family and Health Section | 2017; American Public Health Association: Food and Nutrition program | 2016, Latino Caucus | 2015

Grant reviewer – Office of the State Superintendent of Education, District of Columbia (OSSE) | 2013; Children and Youth Investment Trust Corporation Children and Youth Investment Trust Corporation | 2010; DC Department of Health, Community Health Administration | 2011

Annual Program Committee member – Metropolitan Washington Public Health Association (MWPCHA) | 10/10 – 9/11

Secretary – Delta Omega, Honorary Public Health Society | 4/11 – 9/12

AWARDS AND RECOGNITION

NIH National Institute of Nursing Research (NINR) T32 Postdoctoral Training Fellowship recipient, School of Nursing, University of North Carolina, Chapel Hill (2T32NR007091) | 2017

NIH National Institute of Nursing Research (NINR) F31 Predoctoral Fellowship, Ruth L. Kirschstein National Research Service Award (NRSA), Individual Predoctoral Fellowship to Promote Diversity in Health-Related Research (1F31NR015965-01A1): *Parent/child acculturation and family dynamics: Impact on Latina mothers' diet* | 2016

Research Mini-Grant Award, Undergraduate Research Program, Division of Undergraduate Studies, San Diego State University: *Children's influence on their Latino mothers' dietary behaviors: A qualitative analysis* | 2016

GMaP Travel Award, Geographical Management of Cancer Health Disparities | 2016

Underrepresented Student Workshop Travel Award, The Society of Multivariate Experimental Psychology | 2016

Meritorious Student Abstract Award, Society of Behavioral Medicine's (SBM) Annual Conference: *Leisure-time physical activity and social network support among Latinas* | 2016

Transdisciplinary Research in Energetics and Cancer (TREC) scholar, Moores Cancer Center, University of California San Diego | 2015

Student Travel Fund Award, San Diego State University Division of Research Affairs | 2014

Meritorious Student Abstract Award, Society of Behavioral Medicine's (SBM) Annual Conference: *Social support for physical activity among Latinas living in San Diego County* | 2013

Annual Conference Scholarship, Society for Public Health Education, San Diego Chapter | 2012

PROFESSIONAL AFFILIATIONS

National Council on Family Relations (NCFR)

Society of Behavioral Medicine (SBM)

International Society of Behavioral Nutrition and Physical Activity (ISBNPA)

ABSTRACT OF THE DISSERTATION

The role of children, families, and acculturation on Latina mothers' dietary intake and behaviors

by

Sandra Hyatt Soto

Doctor of Philosophy in Public Health (Health Behavior)

University of California, San Diego, 2017

San Diego State University, 2017

Professor Elva M. Arredondo, Chair

Background: Many adult Latinos are not meeting guidelines for healthy eating. Theory posits the important role of family and family members on individual's health behaviors (e.g., diet). However, few studies examine how children impact their parents' diet. Furthermore, empirical evidence shows that acculturation is an important predictor of diet among Latino adults. The purpose of this dissertation was to examine the role of children, families, and acculturation on mothers' dietary intake and related behaviors.

Methods: Chapters 1 and 2 used secondary data from mother-child dyads enrolled in a randomized controlled trial (RCT) and Chapter 3 used primary data collected from mother-child dyads. Chapter 1 used baseline survey data from 314 Latino mother-child dyads to test how children's acculturation and the mother-child acculturation gap was associated with mothers' dietary intake and related behaviors. Building on the results from Chapter 1, in Chapter 2, longitudinal data from 162 dyads enrolled in delayed treatment group of the RCT were used to test the temporal relations of the family environment on traditional mothers' dietary intake and behaviors, and whether these relations differed between mothers of assimilated versus bicultural children. Finally, Chapter 3 used qualitative interview data from mothers and their bicultural (n=11) or assimilated (n=10) children and quantitative data from mothers to explore how children influenced their mothers' dietary intake and behaviors.

Results: Chapter 1 provided evidence that accounting for mothers' acculturation, having an assimilated versus a bicultural child was negatively associated with mothers' vegetable intake and positively associated with mothers' sugary beverage intake, percent of calories from fat, and frequency of away-from-home eating. The most at-risk dyads for lower quality diet among mothers were traditional mothers of assimilated children. Chapter 2 found that less positive family interactions around food at baseline predicted more frequent away-from-home eating four months later among mothers of assimilated children. Additionally, more family expressiveness at four months predicted more dollars spent on fruits and vegetables at ten months among mothers of bicultural children. In Chapter 3, participants described how mothers' feeding styles shaped children's food

preferences and in return, children's food preferences influenced mothers' dietary intake and behaviors.

Discussion: This dissertation found evidence for the important role of children and families on mothers' dietary intake and related behaviors. The findings presented here support the theoretical notion that individuals' health behaviors are directly and indirectly influenced by family-level factors. Further, this dissertation extends previous research on the important role of mothers on their children's dietary outcomes by building evidence for the reciprocating influence of children on their mothers' dietary intake and behaviors.

INTRODUCTION

DIETARY INTAKE AND DIETARY BEHAVIORS

The 2015 Dietary Guidelines for Americans recommend that individuals over two years of age adopt eating patterns that include foods that are rich in nutrients and low in calories.¹ Specifically, the Guidelines recommend that individuals increase their consumption of fruits and vegetables and decrease their consumption of foods and beverages that contain fats and added sugars to promote weight loss, weight maintenance, and a reduction in the risk of diet-related health conditions. For example, among individuals who should consume 2,000 calories per day, the Guidelines suggest a daily intake of at least 2 cups of fruit and 2 ½ cups of vegetables. Also, because calories consumed from fat and added sugars tend to displace calories consumed from more nutritious sources, it is recommended that their consumption be limited to less than 10% of total calories.¹

Individuals across the lifespan in the U.S. are not meeting the recommended daily dietary intake of fruits and vegetables and are exceeding the recommended allowance for fats and sugar.^{2,3} In a nationally representative study, 14% and 8% of adults met the recommendations for fruit and vegetable intake, respectively.⁴ Furthermore, there are substantial disparities in the quality of dietary intake between non-Latino whites and Latinos.⁵ For example, national data show that total calories consumed from sugary beverages among Latinos are 8.2% compared to 5.3% among non-Latino whites.⁶ Moreover, only 1.1% of Mexican-Americans versus 6.4% of non-Latino whites exceeded the recommended intake for dark green vegetables.³ On the other hand, diet quality is

better among Latinos than non-Latino whites in some cases. For example, research shows that Mexican-American adults consume more daily fiber than non-Latino whites,⁷ and compared to non-Latino whites, a higher percentage of Mexican Americans exceed the recommended intake of beans/peas (2.2% versus 20.0%, respectively) and fruits (17.4% versus 22.8%, respectively).³

Several dietary behaviors contribute to the quality of foods individuals consume, including away-from-home eating and purchasing foods at grocery stores.⁸ Away-from-home eating includes consuming foods purchased at fast food and full-service restaurants, pre-prepared foods from grocery stores, and foods obtained from friends or relatives.⁸ Compared to other countries, the U.S. leads in caloric intake from away-from-home eating.⁹ Among U.S. adults, there is a positive relationship between frequency of eating at fast food and full-service restaurants with calorie, total fat, and sugar intake.^{10,11} For example, for each meal consumed from a restaurant of any kind, an extra 130 calories are consumed and dietary quality, measured by the Healthy Eating Index,¹² worsens by 2 points (on a scale of 0-100).¹³ Although Latinos tend to engage in less frequent away-from-home eating than non-Latino whites,^{11,14,15} the quality of away-from-home foods and beverages Latinos consume, in particular from fast food restaurants, tends to be worse than foods non-Latino whites consume.^{10,16} For example, a study using the National Health and Nutrition Examination Survey (NHANES) from 2001-2010 found that Latinos consumed more calories (174.6 versus 169.9), total fat (11.2 versus 9.3 grams), sodium (374.2 versus 248.1 milligrams), sugar (6.2 versus 3.7 grams), and less fiber (-0.7 versus 0.5) than non-Latino whites obtained from fast food restaurants.¹⁰

In addition to away-from-home eating, other dietary behaviors including purchasing foods at grocery stores are also relevant to dietary intake. Between 2003-2010, Mexican-Americans consumed fewer added sugars (12.5 tsp.) from foods purchased at stores than non-Latino whites (13.7 tsp).¹⁷ Furthermore, in a racially/ethnically diverse sample of food shoppers, fruit and vegetable (including legumes) purchases were greater among Latinos (7.2% and 11.6%, respectively) than among non-Latino whites (4.6% versus 6.9%, respectively).¹⁸ Grocery shopping is also an important indicator of cooking at home, which is associated with lower consumption of daily caloric, fat, and sugar.¹⁹ Evidence from NHANES showed that the prevalence of cooking most nights of the week (6-7 nights) was higher among Latinos (65%) than non-Latino whites (47%) and blacks (38%).¹⁵

Latinos tend to exhibit an array of protective and harmful dietary behaviors that contribute to the quality of foods consumed. The contributing factors to these behaviors range from household income²⁰ to food marketing,²¹ with numerous factors in between. One area of potential influence on adult's dietary intake and behaviors that has received little attention is children,²² even though theory suggests that family members play an important role in the diet of all individuals.²³⁻²⁵ It is imperative that researchers examine child factors because, among traditional Latinos, the family is an essential, central element of daily life,²⁶ which may have direct and indirect influences on dietary intake and behaviors.²⁶ Furthermore, food choices and eating behaviors are largely social activities that occur in the presence of others;²⁷ thus, foods are likely purchased and prepared with children's food preferences in mind,²⁸ impacting what parents consume. Finally, another relevant source of influence on eating is culture, which includes the

norms and values that determine the foods and dietary behaviors that individuals perceive as acceptable and preferable.²⁹ With social and cultural concepts in mind, the remainder of this literature review examines the role of children and children's acculturation as contributing factors in the dietary intake and behaviors observed among U.S. Latinos. Lastly, because Latina women tend to be the predominant food purchasers and meal preparers in Latino families, this dissertation focuses on Latina mothers.^{30,31}

HISPANIC PARADOX

Over one-third of all Latinos residing in the U.S. are foreign-born.³² Recent immigrants to the U.S. tend to experience better health outcomes than non-Latino blacks and non-Latino whites, even though many are of lower socioeconomic status, have less access to care, and engage in lower levels of physical activity.³³ This phenomenon has been termed the Hispanic Paradox because, despite these risk factors, recent immigrants tend to have a lower cardiovascular disease, cancer, and all-cause mortality than other Latinos and non-Latinos of similar socioeconomic status.^{34,35} One explanation for the Hispanic Paradox is that the health-promoting behaviors of traditional Latino culture tend to erode over time and/or Latino immigrants tend to adopt harmful behaviors with prolonged contact with U.S. culture.^{33,35-38} This explanation implies that health behaviors and health outcomes are not solely due to ethnicity or nativity, but may also be influenced by cultural changes that occur among Latinos who immigrate to the U.S.^{39,40}

CULTURE AND ACCULTURATION

Culture includes the learned behaviors, beliefs, values, norms, and customs (e.g., traditions, foods, language) of groups of individuals.⁴¹ As a phenomenon, culture develops within multiple contexts including societies, localized economic, political, and

demographic situations, and micro-systems such as families.⁴² Culture is also highly dependent on time and context (e.g., location, situation); thus, some elements of culture evolve over time and after immigration to societies with different cultures (i.e., acculturation).

Acculturation is an evolving construct with a rich history of conceptualizations and assessment methods.⁴³ Historically, acculturation has been described as a phenomenon that occurs among different cultural groups when they come into continuous, first-hand contact with one another, resulting in changes to either or both cultures.⁴⁴ More recently, the term has predominantly been used to describe the changes that occur at the individual level when individuals come into contact with a dominant culture that differs from their own, resulting in cultural changes.⁴⁵

Operationalization and assessment of acculturation

There are several ways in which individual-level acculturation is conceptualized. The linear or unidimensional model of acculturation suggests that as immigrant Latinos come into prolonged contact with the dominant, U.S. culture, they adopt cultural aspects of the U.S. and shed aspects of their traditional culture.^{46,47} This linear exchange, characterized as moving from low acculturation to high acculturation was often observed in first generation and subsequent generation Latinos.⁴⁶ This model is limited, however, because it does not consider individuals who strongly identify with both cultures, or those who do not identify with either culture.

The unidimensional model is a somewhat simplistic approach to what is now understood to be a complex and multifaceted phenomenon.⁴⁸ A more realistic conceptualization of individual-level acculturation is the bidimensional model, which

posits that ethnic/racial minorities (e.g., foreign and U.S.-born Latinos) can simultaneously adopt elements from the dominant culture while maintaining elements from their traditional culture.⁴⁹⁻⁵¹ According to this model, rather than having either low or high acculturation to U.S. culture, Latinos may become bicultural, retaining cultural elements from their traditional culture and adopting new ones from the U.S., or they may reject elements from one or both cultures. In accordance with the bidimensional approach, researchers have developed an orthogonal assessment method, assessing acculturation with two separate scales: acculturation to the traditional, Hispanic culture and acculturation to the dominant, non-Hispanic culture. An extension of the orthogonal method, as suggested by Berry,⁴⁹ is a four-fold paradigm that arises from the maintenance or rejection of the traditional culture and adoption or rejection of the new dominant culture. The four possible cultural groups are: (a) *bicultural*, or maintaining elements of the traditional culture while simultaneously adopting elements of the dominant culture (e.g., integrated); (b) *assimilated*, or shedding of the traditional culture and adoption of the dominant culture; (c) *traditional*, or maintenance of the traditional culture and rejection of the dominant culture; and (d) *marginalized*, or rejection of both cultures. Examples of bidimensional measures of acculturation are the Bidimensional Acculturation Scale for Hispanics (BAS), which assesses adherence to two cultural dimensions: Hispanic and non-Hispanic,⁵² and the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II), which assesses adherence to Mexican Orientation and Anglo Orientation dimensions.⁵³

Common alternatives to using scales for assessing acculturation are proxy measures. These include primary language, language of the interview, place of birth,

having one or more foreign-born parent or grandparent (e.g., generation status), length of residence in the U.S., and age at immigration to the U.S.⁴⁰ A review conducted by Thomson and Hoffman-Goetz⁴⁰ found that over one-third of acculturation studies in public health use proxy measures because they are simple to use and because they often correlate with acculturation scales. For example, the unidimensional scale, Short Acculturation Scale for Hispanics (SASH), is positively correlated with generation status and length of residence in the U.S.,⁵⁴ and the non-Hispanic dimension of the bidimensional scale, BAS, is positively correlated with generation status, length of residence in the U.S., and age at immigration to the U.S.⁵² However, proxy measures are limited by their inability to assess acculturation to both traditional and dominant cultures. This information can provide better insight into the cultural mechanisms driving health behaviors than a simplified assessment obtained by proxy measures.^{40,55}

ACCULTURATION AND DIETARY INTAKE AND BEHAVIORS

Dietary behaviors and the quality of foods and beverages Latinos consume differ as a function of acculturation.⁵⁶⁻⁵⁹ For example, in his systematic review, Perez-Escamilla found that in comparison with other Latinos, those who were born in the U.S., spoke predominantly English, and/or had adopted the dominant, U.S. culture (based on acculturation measures) consumed fewer fruits and vegetables and more added sugar, salt, and calories from fat, and engaged in more frequent away-from-home eating.⁵⁸ In another systematic review on the role of acculturation on dietary intake and behaviors among Latino adults, foreign-born Latinos and those who maintained their traditional culture, based on acculturation measures, consumed more fruits than other Latinos.⁵⁶ On the other hand, findings regarding vegetable consumption were inconsistent and varied by

how acculturation was assessed. The authors also concluded that there was no consistent relationship between acculturation (irrespective of how it was measured) and dietary fat intake or percentage of energy intake from fat. However, Latinos who rejected the dominant U.S. culture consumed more fried foods and prepared more food using added fat, whereas Latinos who adopted the dominant U.S. culture, who spoke English predominantly, were born in the U.S., or had spent more years in the U.S. consumed more fast food and snacks containing added fats than their Latino counterparts.⁵⁶

ACCULTURATION GAPS BETWEEN FAMILY MEMBERS

The acculturation process is often described as an individual-level phenomenon; however, it occurs within the family context where other family members are going through their own acculturation process.⁶⁰⁻⁶² Research has shown that family members tend to acculturate at different rates. For example, immigrant Latino men tend to adopt the English language faster than immigrant Latino women⁶³ and immigrant Latino children usually adopt the dominant culture faster than their parents.⁶⁴ Different rates of acculturation between family members results in an “acculturation gap,” first documented between Latino parents and children by Szapocznik et al.⁶⁴ Children adopt elements of the dominant culture faster than their parents because they have greater exposure to mainstream media, are educated in the U.S., more readily learn and adopt English in school, and are more susceptible to this influence than their parents.⁶⁵ Stemming from Szapocznik et al.,⁶⁴ most research on the acculturation gap has tested his theory on the harmful effects of the gap on family functioning and children’s maladaptive behaviors (e.g., alcohol use).⁶⁶⁻⁶⁹ Research examining the acculturation gap has maintained a

primary interest in child outcomes, while parent outcomes have remained secondary or unexplored.²²

CHILDREN'S ACCULTURATION AND MOTHERS' DIETARY INTAKE AND BEHAVIORS

Given that children tend to acculturate at a faster rate than their parents,⁶⁵ children may also undergo changes in diet preferences more rapidly than their parents because of their exposure to American-type foods at school, from peers, and through the media. Developmentally, these external influences on dietary acculturation begin to impact children around six years of age when they become more influenced by peers and media than family.⁷⁰ Because acculturation happens within a family context where individual family members influence each other's acculturation process,⁶⁰⁻⁶² it follows that changes in children's diet preferences can affect their parents' dietary intake and behaviors.

One possible mechanism for how children's acculturation impacts mothers' dietary intake and behaviors is that as children adopt aspects of the dominant culture, they introduce new foods to their mothers, acting as cultural food brokers. Qualitative research has suggested that changes in children's food preferences may cause their mothers to adopt new dietary behaviors. For example, Colby and colleagues⁷¹ used photographic guides of traditional foods and dietary behaviors of a family in Mazatlán, Mexico to guide in-depth interviews with four Mexican immigrant families in North Carolina. Families were living in the U.S. for less than 3 years with children 11 years of age. Both parents and children said that children's dietary changes after immigrating to the U.S. had occurred primarily because of the foods they ate at school and that children preferred the types of foods provided at school over the foods mothers prepared at home.

In a separate qualitative study, 18 immigrant Latinas living in Mississippi who were primarily responsible for purchasing and preparing foods were interviewed on their barriers to healthy eating behaviors, influences on their food choices, and changes in traditional food habits related to immigration to the U.S.⁷² Results indicated that children increasingly preferred “American” foods (e.g., pizza, hamburgers) and influenced mother’s food purchasing of these types of foods. Sussner et al.⁷³ conducted 5 focus groups (N=31) followed by 20 interviews to further explore the themes uncovered in focus groups with Latina mothers who were primarily foreign-born (94%) from Central America (41%) and the Dominican Republic (33%), living in the U.S. for an average of 9 years. The study explored the role of immigrant status and acculturation on the development of overweight in Latino families. Themes developed around mothers attempting to maintain their traditional food culture at home by preparing traditional meals, though children were more likely to consume fast food rather than traditional foods. Finally, 5 focus groups explored the nutritional patterns of 23 Honduran women who immigrated to the U.S. within the past 10 years, and now lived in New Orleans.⁷⁴ Women said that children influenced their diet because they insisted on eating fast food, resulting in mothers consuming fast food with their child. These qualitative studies suggest that children adopt U.S. dietary behaviors before their mothers, which may influence mothers to adopt these behaviors as well. A significant limitation of this literature is that these studies have primarily focused on the influence of immigration to the U.S. on dietary changes, but not specifically on children’s influence on Latina mothers’ dietary intake and behaviors.

FAMILY ENVIRONMENT AND DIETARY INTAKE AND BEHAVIORS

Family systems theory suggests that families develop rules regarding if and whether “outside” material (e.g., “American” foods) is introduced into the family.⁷⁵ Mothers who are more culturally traditional may be less willing to introduce U.S. foods into the home than mothers who are more assimilated to U.S. culture. However, if mothers have assimilated children, the family may be more willing to permit children to introduce new foods and dietary behaviors into the family. For example, mothers may choose to purchase a pizza for the family as a reward for their child’s good behavior. Family systems theory also acknowledges individual’s “roles” in the family. Children’s roles may shift as they become more assimilated to the U.S. and their mothers rely on them for translation and other matters (e.g., health information).^{76,77} Mothers may experience a power differential when there are changes in dependency with their children and may defer to their children’s demands to purchase or prepare non-traditional foods.

The acculturation gap between mothers and children may also impact mothers’ dietary behaviors through the effects of weakened family ties and added family stress.⁷⁸⁻⁸⁰ Research has shown that the acculturation process in children is negatively correlated with the family environment (e.g., family cohesion, expression).⁸¹ Specifically, research has found that the family environment is negatively impacted when children adopt the behaviors, values, and norms of the dominant culture, which may differ from their parents’ expectations of what their child’s behaviors, values, and norms should be.⁸² Mothers may respond by preserving traditional norms and strictly maintaining aspects of their traditional culture (e.g., traditional foods/meals).⁷⁹ As seen with the qualitative studies exploring dietary acculturation among Latina immigrants described above, many

mothers attempted to preserve their traditional food patterns after immigrating to the U.S. These attempts may increase if children assimilate to the U.S culture in ways that mothers do not approve.

Alternatively, parents experiencing conflict with their children may try to appease their children by accommodating requests for the adoption of new, dominant culture customs. Qualitative research indicates that some Latino children prefer “American” foods and that in some cases mothers accommodate these preferences and engage in the consumption of these foods.⁷⁴ Mothers of families with a negative family environment may be more willing to appease children’s food preferences by purchasing and consuming “American” foods to improve family relations. To date, the influence of children’s acculturation on Latina mothers’ dietary intake and behaviors, and the role of the family environment in this relationship have yet to be examined.

It is possible that children play an important role as dietary cultural brokers by introducing their mothers to new foods and behaviors learned outside the home.⁷⁴ Although mothers may attempt to maintain traditional foods in the home, their children may respond by pressuring them to adopt more non-traditional foods. Given that the factors and mechanisms involved in the relationship between children’s acculturation and mothers’ dietary intake and behaviors are not well understood, this dissertation seeks to build an understanding of this under-studied area.

CONCEPTUAL FRAMEWORK

Theoretical models assert the role of family, children, and culture in the dietary intake and behaviors of Latina mothers.²³⁻²⁵ The conceptual framework for this dissertation is based on these assertions (**Figure i-1**).

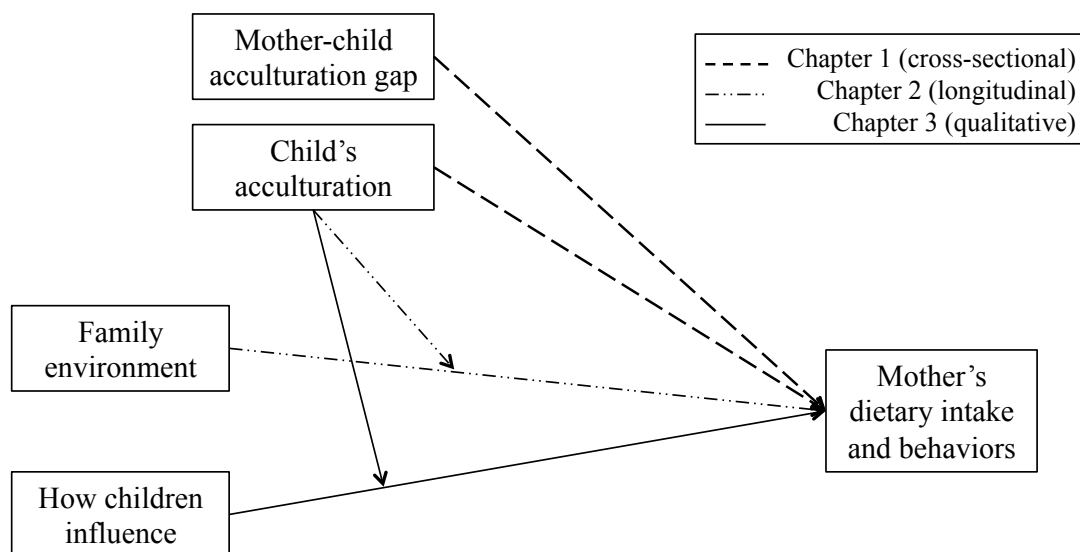


Figure i-1. Conceptual overview of associations examined in this dissertation

Most studies investigating adult's dietary intake have overlooked the social context (e.g., family) within which food-related behaviors occur.⁸³ Examining social context is especially important when studying dietary behaviors, which are largely a function of social (e.g., family) and cultural factors.⁸⁴ However, there is a dearth of literature on the intersection of families, acculturation, and mothers' dietary intake and behaviors. Until further research has examined these factors, our understanding of the social and cultural effects on the dietary intake and behaviors of Latinos will remain limited.⁵⁷

AIMS AND HYPOTHESES

As depicted in Figure 1, the three chapters that follow examine aspects of child, family, and cultural influences on Latina mothers' dietary intake and behaviors.

Chapter 1 contributes to the literature by providing the first (to my knowledge) published study of how children's acculturation and the mother-child acculturation gap are associated with mothers' dietary intake and behaviors. Aim 1: This study uses a cross-sectional design to examine the relationship between Latino children's acculturation and mothers' dietary intake and behaviors. Aim 2: Additionally, the study examines the mother-child acculturation gap to identify dyad characteristics associated with mothers' diet. Hypothesis 1: Mothers of assimilated versus not assimilated children will report lower quality dietary intake and behaviors (e.g., fewer intake of fruits and vegetables, more frequent away-from-home eating). Hypothesis 2: Mothers who came from dyads with larger gaps in acculturation and from dyad types that were more culturally assimilated than culturally traditional (e.g., bicultural mothers of assimilated children versus traditional mothers of bicultural children) will have a lower quality dietary intake and behaviors.

Chapter 2 builds on the findings from Chapter 1 by examining whether the aspects of the family environment (i.e., family expressiveness and interactions around food) explain the findings from the first chapter. Aim 1: This study uses a longitudinal design to test whether family interactions around food mediate the association between family expressiveness and mothers' dietary intake and behaviors. Aim 2: Test differences in these associations by mothers of assimilated versus bicultural children. Hypothesis 1:

The temporal association between family expressiveness and mothers' dietary intake and behaviors will be mediated by family interactions around food. Hypothesis 2: Mothers of bicultural children will have a more positive family environment and thus better diet quality than mothers of assimilated children.

Chapter 3 further explores the associations found in the first two chapters by using qualitative one-on-one interviews with mothers and children who are bicultural and assimilated. Aim: Using qualitative interviews with mothers and children, this study explores how bicultural and assimilated children influenced their Latina mothers' dietary intake and behaviors.

In sum, most Latino adults are not meeting recommended guidelines for dietary intake patterns that can prevent chronic diseases.³ Therefore, it is imperative to gain a better understanding of how social and cultural factors influence the dietary intake and behaviors of Latinas. Acculturation occurs within the family as family members each experience their own process of change including changes in dietary preferences. Thus, the acculturation of individual family members is expected to influence the dietary behaviors of others. To date, no studies have examined the influence of child acculturation on *mothers'* dietary behaviors among Latinos. This dissertation uses cross-sectional, longitudinal, and qualitative methods to provide an in-depth analysis of the role of children, their acculturation, and the family environment on Latina mothers' dietary intake and behaviors with the goal of addressing this important gap.

REFERENCES

1. United States Department of Agriculture (USDA). Scientific report of the 2015 dietary guidelines advisory committee. 2015.
2. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *J Nutr*. 2010;140(10):1832-1838.
3. Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):624-635. e6.
4. Moore LV, Dodd KW, Thompson FE, Grimm KA, Kim SA, Scanlon KS. Using behavioral risk factor surveillance system data to estimate the percentage of the population meeting US Department of Agriculture food patterns fruit and vegetable intake recommendations. *Am J Epidemiol*. 2015;181(12):979-988. doi: 10.1093/aje/kwu461 [doi].
5. Hiza HA, Casavale KO, Guenther PM, Davis CA. Diet quality of Americans differs by age, sex, race/ethnicity, income, and education level. *Journal of the Academy of Nutrition and Dietetics*. 2013;113(2):297-306.
6. Ogden CL, National Center for Health Statistics (US). *Consumption of sugar drinks in the united states, 2005-2008*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics; 2011.
7. King DE, Mainous AG, Lambourne CA. Trends in dietary fiber intake in the United States, 1999-2008. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):642-648.
8. Guthrie JF, Lin B, Frazao E. Role of food prepared away from home in the american diet, 1977-78 versus 1994-96: Changes and consequences. *Journal of nutrition education and behavior*. 2002;34(3):140-150.
9. Lachat C, Nago E, Verstraeten R, Roberfroid D, Van Camp J, Kolsteren P. Eating out of home and its association with dietary intake: A systematic review of the evidence. *Obesity Reviews*. 2012;13(4):329-346.
10. An R. Fast-food and full-service restaurant consumption and daily energy and nutrient intakes in US adults. *Eur J Clin Nutr*. 2015.

11. Paeratakul S, Ferdinand DP, Champagne CM, Ryan DH, Bray GA. Fast-food consumption among US adults and children: Dietary and nutrient intake profile. *J Am Diet Assoc.* 2003;103(10):1332-1338.
12. Guenther PM, Reedy J, Krebs-Smith SM, Reeve BB, Basiotis PP. Development and evaluation of the healthy eating index-2005: Technical report. . 2007.
13. Mancino L, Todd J, Lin B. Separating what we eat from where: Measuring the effect of food away from home on diet quality. *Food Policy.* 2009;34(6):557-562.
14. Kant AK, Graubard BI. Eating out in America, 1987–2000: Trends and nutritional correlates. *Prev Med.* 2004;38(2):243-249.
15. Virudachalam S, Long JA, Harhay MO, Polsky DE, Feudtner C. Prevalence and patterns of cooking dinner at home in the USA: National health and nutrition examination survey (NHANES) 2007–2008. *Public Health Nutr.* 2014;17(05):1022-1030.
16. Nguyen BT, Powell LM. The impact of restaurant consumption among US adults: Effects on energy and nutrient intakes. *Public Health Nutr.* 2014;17(11):2445-2452.
17. Drewnowski A, Rehm CD. Consumption of added sugars among US children and adults by food purchase location and food source. *Am J Clin Nutr.* 2014;100(3):901-907. doi: 10.3945/ajcn.114.089458 [doi].
18. Cullen K, Baranowski T, Watson K, et al. Food category purchases vary by household education and race/ethnicity: Results from grocery receipts. *J Am Diet Assoc.* 2007;107(10):1747-1752. doi: S0002-8223(07)01473-3 [pii].
19. Wolfson JA, Bleich SN. Is cooking at home associated with better diet quality or weight-loss intention? *Public Health Nutr.* 2015;18(08):1397-1406.
20. Wang DD, Leung CW, Li Y, et al. Trends in dietary quality among adults in the United States, 1999 through 2010. *JAMA Internal Medicine.* 2014;174(10):1587-1595.
21. Seiders K, Petty RD. Obesity and the role of food marketing: A policy analysis of issues and remedies. *Journal of Public Policy and Marketing.* 2004;23(2):153-169.
22. Fisher L. Research on the family and chronic disease among adults: Major trends and directions. *Families, Systems, & Health.* 2006;24(4):373.

23. Bandura A. Health promotion from the perspective of social cognitive theory. *Psychology and Health*. 1998;13(4):623-649.
24. Bronfenbrenner U. *The ecology of human development: Experiments by nature and design*. Harvard University press; 2009.
25. Bavelas JB, Segal L. Family systems theory: Background and implications. *J Commun*. 1982;32(3):99-107.
26. Galanti G. The Hispanic family and male-female relationships: An overview. *J Transcult Nurs*. 2003;14(3):180-185.
<http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2003103214&site=ehost-live>.
27. Brug J. Determinants of healthy eating: Motivation, abilities and environmental opportunities. *Fam Pract*. 2008;25 Suppl 1:i50-5. doi: 10.1093/fampra/cmn063 [doi].
28. Brown JL. Intra-family influences on food choice at mid-life. *Frontiers in Nutritional Science*. 2006;3:263.
29. Nestle M, Wing R, Birch L, et al. Behavioral and social influences on food choice. *Nutr Rev*. 1998;56(5):50-64.
30. Kittler PG, Sucher KP, Nahikian-Nelms M. *Food and culture*. Cengage Learning; 2011.
31. Sliwa SA, Must A, Peréa F, Economos CD. Maternal employment, acculturation, and time spent in food-related behaviors among Hispanic mothers in the United States. Evidence from the American time use survey. *Appetite*. 2015;87:10-19.
<http://search.proquest.com/docview/1664222030?accountid=14524>. doi:
<http://dx.doi.org/10.1016/j.appet.2014.10.015>.
32. U.S. Census Bureau. Facts for features: Hispanic heritage month 2014: Sept. 15–Oct. 15. 2014;CB14-FF.22.
33. Medina-Inojosa J, Jean N, Cortes-Bergoderi M, Lopez-Jimenez F. The Hispanic paradox in cardiovascular disease and total mortality. *Prog Cardiovasc Dis*. 2014;57(3):286-292. doi: 10.1016/j.pcad.2014.09.001 [doi].
34. Markides KS, Coreil J. The health of hispanics in the southwestern United States: An epidemiologic paradox. *Public Health Rep*. 1986;101(3):253-265.

35. Singh GK, Siahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: An analysis of two national data bases. *Human Biology*. 2002;83-109.
36. Vega WA, Amaro H. Latino outlook: Good health, uncertain prognosis. *Annu Rev Public Health*. 1994;15(1):39-67.
37. Morales LS, Lara M, Kington RS, Valdez RO, Escarce JJ. Socioeconomic, cultural, and behavioral factors affecting Hispanic health outcomes. *J Health Care Poor Underserved*. 2002;13(4):477-503.
38. Barcenas CH, Wilkinson AV, Strom SS, et al. Birthplace, years of residence in the United States, and obesity among Mexican-American adults. *Obesity*. 2007;15(4):1043-1052.
39. Alegria M, Shrout PE, Woo M, et al. Understanding differences in past year psychiatric disorders for Latinos living in the US. *Soc Sci Med*. 2007;65(2):214-230.
40. Thomson MD, Hoffman-Goetz L. Defining and measuring acculturation: A systematic review of public health studies with Hispanic populations in the united states. *Soc Sci Med*. 2009;69(7):983-991.
41. Berger BM. *An essay on culture: Symbolic structure and social structure*. Univ of California Press; 1995.
42. Page JB. The concept of culture: A core issue in health disparities. *Journal of Urban Health*. 2005;82(3):iii35-iii43.
43. Hwang WC, Wood JJ. Acculturative family distancing: Links with self-reported symptomatology among Asian Americans and Latinos. *Child Psychiatry Hum Dev*. 2009;40(1):123-138. doi: 10.1007/s10578-008-0115-8 [doi].
44. Redfield R, Linton R, Herskovits MJ. Memorandum for the study of acculturation. *American anthropologist*. 1936;38(1):149-152.
45. Berry JW. Conceptual approaches to acculturation. In: Chun KM, Balls Organista P, Marin G, eds. *Acculturation: Advances in theory, measurement, and applied research*. Washington, DC: American Psychological Association; 2003:17-37.
46. Cuellar I, Harris LC, Jasso R. An acculturation scale for Mexican American normal and clinical populations. *Hispanic Journal of Behavioral Sciences*. 1980.
47. Gordon MM. *Assimilation in American life: The role of race, religion and national origins*. Oxford University Press; 1964.

48. Berry JW. Acculturation: A conceptual overview. *Acculturation and parent-child relationships: Measurement and development*. 2006;2:13-30.
49. Berry JW. Immigration, acculturation, and adaptation. *Appl Psychol*. 1997;46(1):5-34.
50. Hutnik N. Patterns of ethnic minority identification and modes of social adaptation. *Ethnic and Racial Studies*. 1986;9(2):150-167.
51. Sánchez JI, Fernández DM. Acculturative stress among Hispanics: A bidimensional model of ethnic identification. *J Appl Soc Psychol*. 1993.
52. Marín G, Gamba RJ. A new measurement of acculturation for Hispanics: The bidimensional acculturation scale for Hispanics (BAS). *Hispanic Journal of Behavioral Sciences*. 1996;18(3):297-316.
53. Cuellar I, Arnold B, Maldonado R. Acculturation rating scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic journal of behavioral sciences*. 1995;17(3):275-304.
54. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences*. 1987;9(2):183-205.
55. Arends-Tóth J, van de Vijver, Fons JR. Issues in the conceptualization and assessment of acculturation. . 2006.
56. Ayala GX, Baquero B, Klinger S. A systematic review of the relationship between acculturation and diet among Latinos in the united states: Implications for future research. *J Am Diet Assoc*. 2008;108(8):1330-1344.
57. Arandia G, Nalty C, Sharkey JR, Dean WR. Diet and acculturation among hispanic/latino older adults in the united states: A review of literature and recommendations. *J Nutr Gerontol Geriatr*. 2012;31(1):16-37. doi: 10.1080/21551197.2012.647553 [doi].
58. Perez-Escamilla R. Acculturation, nutrition, and health disparities in Latinos. *Am J Clin Nutr*. 2011;93(5):1163S-7S. doi: 10.3945/ajcn.110.003467 [doi].
59. Gerchow L, Tagliaferro B, Squires A, et al. Latina food patterns in the united states: A qualitative metasynthesis. *Nurs Res*. 2014;63(3):182-193. doi: 10.1097/NNR.0000000000000030 [doi].
60. Nauck B. Intercultural contact and intergenerational transmission in immigrant families. *Journal of Cross-Cultural Psychology*. 2001;32(2):159-173.

61. Basáñez T, Dennis JM, Crano WD, Stacy AW, Unger JB. Measuring acculturation gap conflicts among Hispanics: Implications for psychosocial and academic adjustment. *J Fam Issues*. 2014;35(13):1727-1753.
62. Chun KM. Conceptual and measurement issues in family acculturation research. *Acculturation and parent-child relationships: Measurement and development*. 2006:63-78.
63. Akresh IR. Dietary assimilation and health among Hispanic immigrants to the United States. *J Health Soc Behav*. 2007;48(4):404-417.
64. Szapocznik J, Scopetta MA, Kurtines W, Aranalde MD. Theory and measurement of acculturation. *Revista Interamericana de Psicología*. 1978.
65. Hwang W. Acculturative family distancing: Theory, research, and clinical practice. *Psychotherapy: Theory, research, practice, training*. 2006;43(4):397.
66. Gil AG, Vega WA. Two different worlds: Acculturation stress and adaptation among Cuban and Nicaraguan families. *Journal of Social and Personal Relationships*. 1996;13(3):435-456.
67. Usita PM, Blieszner R. Immigrant family strengths meeting communication challenges. *J Fam Issues*. 2002;23(2):266-286.
68. Pasch LA, Deardorff J, Tschann JM, Flores E, Penilla C, Pantoja P. Acculturation, parent-adolescent conflict, and adolescent adjustment in Mexican American families. *Fam Process*. 2006;45(1):75-86.
69. Rios JM. *Understanding family acculturation processes and their role in Hispanic youth behavior problems*. ; 2005.
70. Rozin P. Food is fundamental, fun, frightening, and far-reaching. *Social Research*. 1999:9-30.
71. Colby SE, Morrison S, Haldeman L. What changes when we move? A transnational exploration of dietary acculturation. *Ecol Food Nutr*. 2009;48(4):327-343. doi: 10.1080/03670240903022379 [doi].
72. Gray VB, Cossman JS, Dodson WL, Byrd SH. Dietary acculturation of Hispanic immigrants in Mississippi. *Salud Publica Mex*. 2005;47(5):351-360.
73. Sussner KM, Lindsay AC, Greaney ML, Peterson KE. The influence of immigrant status and acculturation on the development of overweight in atino

- families: A qualitative study. *Journal of Immigrant and Minority Health*. 2008;10(6):497-505.
74. Edmonds VM. The nutritional patterns of recently immigrated Honduran women. *J Transcult Nurs*. 2005;16(3):226-235. doi: 16/3/226 [pii].
 75. Broderick CB. *Understanding family process: Basics of family systems theory*. Sage Publications, Inc; 1993.
 76. Weisskirch RS, Alva SA. Language brokering and the acculturation of Latino children. *Hispanic Journal of Behavioral Sciences*. 2002;24(3):369-378.
 77. Martinez CR, McClure H, Eddy J. Language brokering contexts and behavioral and emotional adjustment among Latino parents and adolescents. *The Journal of early adolescence*. 2008.
 78. Coatsworth JD, Pantin H, Szapocznik J. Familias unidas: A family-centered ecodevelopmental intervention to reduce risk for problem behavior among Hispanic adolescents. *Clin Child Fam Psychol Rev*. 2002;5(2):113-132.
 79. Hernandez M, McGoldrick M. Migration and the family life cycle. *The Expanded Family Life Cycle: Individual, Family, and Social Perspectives*. 3d ed. Boston: Allyn and Bacon. 1999:169-173.
 80. Cortes DE. Variations in familism in two generations of puerto ricans. *Hispanic Journal of Behavioral Sciences*. 1995;17(2):249-255.
 81. Santisteban DA, Mitrani VB. The influence of acculturation processes on the family. In: Chun KM, Organista PB, Marin G, eds. *Acculturation: Advances in theory, measurement and applied research*. Washington, DC: American Psychological Association; 2003:121-135.
 82. Miranda AO, Bilot JM, Peluso PR, Berman K, Van Meek LG. Latino families: The relevance of the connection among acculturation, family dynamics, and health for family counseling research and practice. *The Family Journal*. 2006;14(3):268-273.
 83. Bowen RL, Devine CM. "Watching a person who knows how to cook, you'll learn a lot". linked lives, cultural transmission, and the food choices of Puerto Rican girls. *Appetite*. 2011;56(2):290-298. doi: 10.1016/j.appet.2010.12.015 [doi].
 84. Larson N, Story M. A review of environmental influences on food choices. *Annals of Behavioral Medicine*. 2009;38(1):56-73

CHAPTER 1.

Effects of Latino children on their mothers' dietary intake and behaviors: The role of children's acculturation and the mother-child acculturation gap

ABSTRACT

Background: Research shows that acculturation is important to Latinas' dietary intake and related behaviors. Although evidence suggests children may also play a role, it remains unclear whether children's acculturation is related to mothers' dietary intake and behaviors.

Objectives: We examined the relationship between Latino children's acculturation and mothers' dietary intake and behaviors. We also examined the mother-child acculturation gap to identify dyad characteristics associated with mothers' diet.

Methods: Baseline surveys were collected in 2010 from 314 Latino mother-child (7-13 years old) dyads of Mexican-origin enrolled in a family-based dietary intervention in Southern California, USA. Mother's daily intake of fruits, vegetables, and sugary beverages, percent of calories from fat, weekly away-from-home eating, and percent of weekly grocery dollars spent on fruits and vegetables were assessed via self-report. Mothers' and children's bidimensional acculturation were examined using acculturation groups (assimilated, bicultural) derived from Hispanic and non-Hispanic dimensions of language. We also assessed the acculturation gap between mothers and children with the a) difference in acculturation between mothers' and children's continuous acculturation scores and b) mother-child acculturation gap typologies (e.g., *traditional* mothers of *assimilated* children).

Results: Findings show that having an assimilated versus a bicultural child was negatively associated with mothers' vegetable intake and positively associated with mothers' sugary beverage intake, percent of calories from fat, and frequency of away-from-home eating, regardless of mothers' acculturation. Traditional mothers of assimilated children reported more sugary beverage intake, calories from fat, and more frequent away-from-home eating than traditional mothers of bicultural children.

Conclusions: Results suggest that children's acculturation is associated with their mothers' dietary intake and behaviors and traditional mothers of assimilated children require more attention in future research.

INTRODUCTION

Even though theoretical models including the Ecological Model¹ posit the role of family members in individuals' dietary intake and related behaviors, most research has focused on how family and parental factors influence children's outcomes.²⁻⁴ For example, a well-established literature suggests that children regularly influence their parents' food-purchasing behaviors;⁵⁻⁸ however, as acknowledged by Fisher,⁹ few studies have examined how child-related factors impact their parents' health practices and outcomes. Understanding family influences on the health practices of family members are particularly relevant among Latinos given the importance of family and the interdependence observed among family members in the traditional Latino culture.¹⁰

Acculturation can also influence health behaviors, including dietary intake, among immigrant and US-born Latinos. Acculturation refers to the changes in beliefs, values, norms, and behaviors (e.g., dietary intake) that occur when individuals come into continuous and prolonged contact with a dominant culture that differs from their traditional culture.¹¹ Some believe that the *bidimensional model* best describes the process of acculturation, where aspects of the dominant culture are adopted or rejected, while aspects of the traditional culture are simultaneously retained or shed.¹² According to this model, there are four possible acculturation typologies: (a) *bicultural*, or maintaining elements of the traditional culture while simultaneously adopting elements of the dominant culture; (b) *assimilated*, or shedding the traditional culture and adopting aspects of the dominant culture; (c) *traditional*, or maintaining aspects of one's culture of

origin and rejecting the new dominant culture; and (d) *marginalized*, or rejecting both cultures.

Evidence suggests that Latinos who adopt the US culture and/or shed their traditional culture have a lower diet quality than those who reject the US culture and/or retain their traditional culture. In one systematic review, Latinos who were born in the US, spoke predominantly English, and/or adopted the dominant US culture (i.e., measured by acculturation measurement scales) consumed fewer fruits and vegetables, more salt, added sugar, and calories from fat, and engaged in more frequent away-from-home eating than their less assimilated counterparts.¹³ In another systematic review, Latinos who spoke predominantly English, were born in the US, or had spent more years in the US, consumed more fast food and snacks containing added fats than their Latino counterparts.¹⁴ Latinos who were acculturated to the dominant US culture consumed less fried foods but prepared more food using added fat than their less acculturated counterparts. Findings regarding acculturation and vegetable consumption were inconsistent.¹⁴

Although an individual's acculturation may partially explain their dietary intake and behaviors, theory suggests that family-level factors may also play an important role.¹ One possible salient factor is children's acculturation. The acculturation process is often conceptualized as an individual phenomenon; however, it occurs within the family context with other family members also undergoing similar processes.¹⁵⁻¹⁷ Research shows that family members tend to acculturate at different rates. For example, Latino immigrant children usually adopt the new dominant culture faster than their parents

because children have greater exposure to mainstream media, more readily learn and adopt English in school, and are more susceptible to external social influences than their parents.¹⁸ Children's adoption of "American" foods and/or shedding of their traditional food preferences (e.g., *dietary acculturation*) may also occur more readily than among parents because of children's exposure to these foods at school, through peers, and from the media.^{19,20} Because family members may affect each other's acculturation processes,¹⁵⁻¹⁷ it follows that children's acculturation may influence their parents' dietary intake and behaviors by acting as cultural food brokers, introducing their parents to new foods and ways of consuming foods.

Different acculturation rates among family members result in an "acculturation gap,"²¹ which may have its own role on dietary intake and behaviors. Stemming from Szapocznik and colleagues' work,²¹ most research on the parent-child acculturation gap focuses on the resulting family and child maladaptive outcomes.²² In this literature, the parent-child acculturation gap has been commonly conceptualized in two ways: the extent of the gap and the type of gap.²² These two conceptualizations examine whether it is the difference in acculturation between parent and child or a specific type of acculturation gap (e.g., dyads consisting of bicultural mothers of assimilated children) that is associated with health behaviors. The parent-child acculturation gap has yet to be examined as potentially important to mothers' diet. Thus, it is unclear which method of conceptualization is the most informative.

In keeping with theoretical models and frameworks that assert the role of family members on an individual's health behaviors,¹ this study first examined the role of

children's acculturation on mothers' dietary intake and behaviors. Second, the mother-child acculturation gap was investigated to identify the gap typologies that were associated with mothers' diet. An innovative aspect of this study is our testing of two of the most common methods for conceptualizing the acculturation gap to examine whether the mother-child acculturation difference scores or mother-child acculturation gap typologies are important in Latina mothers' dietary intake and behaviors.²³ Data were derived from 314 mother-child dyads of Mexican-origin enrolled in a randomized controlled trial (RCT) to promote healthier dietary intake. We expected to find mothers of assimilated versus not assimilated children to report a lower quality dietary intake and behaviors (e.g., fewer intake of fruits and vegetables, more frequent away-from-home eating). Furthermore, we expected to find a lower quality dietary intake and behaviors among mothers who came from dyads with larger gaps in acculturation and from dyad types that were more culturally assimilated than culturally traditional (e.g., bicultural mothers of assimilated children versus traditional mothers of bicultural children).

METHODS

Study design and procedures

Baseline data were collected in 2010 from 361 Latino mother-child dyads of Mexican-origin who participated in the RCT, *Entre Familia: Reflejos de Salud* (Within the Family: Reflections of Health).²⁴ Participants were residents of Imperial County, California, which is located on the US-Mexico border. In 2010, about 80% of Imperial County residents were Latino and 77% of residents were of Mexican-origin versus 38% of California residents identifying as Latino and 31% who reported being of Mexican-origin.²⁵ A convenience sampling approach was used to recruit mother-child dyads from

health fairs, clinics, and schools. Eligibility criteria for *Entre Familia* included mothers who (a) self-identified as Latina; (b) had a child between the ages of 7-13 years old; (c) were able to speak and read in Spanish; and (d) lived in the same household as their child for at least four days of the week. If a mother had more than one child between the ages of 7-13 years old, the child with the closest birthday to the baseline assessment was chosen to participate in the study. All study instruments and protocols were approved by the Institutional Review Board of San Diego State University.

Measures

Baseline data from the *Entre Familia* RCT were collected via structured in-person interviews in a location that was convenient to the participants (e.g. family homes, community locations). Interviews were conducted in the preferred language of the participants by one of six trained bilingual interviewers (Spanish or English). Mothers self-reported their dietary intake and sociodemographic characteristics and children self-reported their sociodemographic characteristics. Mothers and children self-reported their own acculturation.

Outcome Variables: Dietary Intake and Behaviors

Fruit and Vegetable Intake

The National Cancer Institute (NCI) All-Day Screener²⁶ assessed daily servings of fruits and vegetables (excluding French fries, potatoes, and beans/legumes). Questions asked mothers to report their frequency of consuming the fruit or vegetable item during a typical day in the past month, followed by an item asking them to estimate the serving size they usually consumed. Consistent with previous research,²⁷ mothers were provided with 3-dimensional food models to increase their accuracy in estimating their serving sizes. For each food, its frequency was converted to a daily average and then multiplied

by the MyPyramid servings size equivalent of the reported serving size. The sum of all fruits and all vegetables was computed separately. In the original validation study, the authors found a moderate correlation between the summary score for the screener and 24-hour dietary recalls among women ($r = .51$).²⁶

Sugary Beverage Intake

The 5-item subscale from the Youth/Adolescent Questionnaire (YAQ),²⁸ based on the Willett Food Frequency Questionnaire (FFQ)²⁹ assessed daily servings of sugary beverages in the past month (e.g., non-diet soft drinks, sports drinks). Response options were on a six-point frequency scale, ranging from “Never/less than 1 per month” to “2 or more cans/glasses per day”. Responses were converted into daily servings (equivalent to one glass, bottle, or can) and then summed to provide the average daily intake of sugary beverages. In the validation study, the correlation between the sugary beverages subscale of the YAQ and the Willett FFQ in adults ages 18-31 years was .62.³⁰

Percent of Calories from Fat

The 16-item NCI Multifactor Fat Screener³¹ estimated the daily percent of calories consumed from fat. The first 15 items asked mothers to indicate their frequency of consuming each item (e.g., skim milk, mayonnaise) over the past 12 months. The final item asked mothers to report their frequency of preparing foods with reduced fat margarine. Frequencies were standardized to the midpoint of responses and converted to the number of times per day. Percent calories from fat were calculated by multiplying the frequency by a weighted score based on mother’s age. In the validation study, the Fat Screener was moderately correlated with biomarkers (true intake of fat) in women ($r = .58$).³¹

Weekly Away-From-Home Eating

Six items assessed the frequency (0-7 days per week) that mothers ate foods that were prepared outside the home during a typical week in the last month.³² Items assessed eating away-from-home foods from (a) grocery stores, (b) relatives' or friends' homes, (c) fast food restaurants, (d) other restaurants (including take-out), (e) cafeterias, and (f) other outlets including vending machines and on-street vendors. The frequency of consuming foods and beverages from these sources were summed to obtain a continuous variable.

Percent of Weekly Grocery Dollars Spent on Fruits and Vegetables

Although grocery shopping has become a shared household responsibility,³³ mothers remain the primary grocery shoppers. Mothers were asked to estimate how much their family spent on groceries and how much (or what proportion) of that was spent on fruits and vegetables per week in the past month.³⁴ The amount spent on all groceries was divided by the amount spent on fruits and vegetables to obtain the percent of grocery dollars spent on fruits and vegetables.

Validity of Dietary Intake and Behavior Variables

Research shows that healthy (and unhealthy) dietary behaviors tend to cluster in diverse samples.^{35,36} To better understand the validity of the diet variables, we explored correlations between the healthy (fruit and vegetable intake, and percent spent on fruits and vegetables) and unhealthy (sugary beverage intake, percent calories from fat, frequency of away-from-home eating) behaviors) dietary variables. With the exception of a positive correlation between daily fruit and sugary beverage servings ($r = .25, p < .001$), the healthy behaviors were positively correlated with each other and negatively correlated

with unhealthy behaviors. Similar findings were observed with unhealthy dietary behaviors in the expected directions (**Supplement Table 1-1**).

Predictor Variables: Acculturation and Mother-Child Acculturation Gap Acculturation

The acculturation status of mothers and children were assessed with the 24-item Bidimensional Acculturation Scale for Hispanics (BAS).³⁷ Mothers and children responded to questions separately to obtain separate scores. The BAS has previously found important associations between acculturation and dietary intake among Latinos.¹⁴ This primarily language-based acculturation scale assesses language use, linguistic proficiency, and language of electronic media in English and Spanish to generate two dimension scores: Hispanic/Spanish-language dimension and non-Hispanic/English-language dimension. Twelve items measure each dimension. Depending on the item, response options range from “Almost always” to “Almost never” and “Very well” to “Very poorly,” on a 4-point Likert scale, with higher scores indicating greater Spanish/English language use. Based on theoretical and practical purposes, the developers recommend using 2.5 as the cutoff score for adherence to each dimension. In the current sample, internal consistency for the BAS on the Hispanic and non-Hispanic dimension among mothers was .77 and .96, respectively and among children was .85 and .73, respectively. The recommended cutoff score was used to place participants into one of Berry’s (1997) four acculturation groups: (a) *bicultural* (aka, integrated), or adherent to both dimensions (scores ≥ 2.5); (b) *assimilated*, or adherent to the non-Hispanic dimension but not to the Hispanic dimension; (c) *traditional* (aka, separated) or adherent to the Hispanic dimension but not the non-Hispanic dimension; and (d) *marginalized*, or

not adherent to either dimension. Of the original sample of 361 mothers, only seven mothers were assimilated and one was marginalized; in addition, thirty-two children were traditional and seven were marginalized. These dyads were removed from the present sample, leaving mothers who were either traditional or bicultural and children who were either bicultural or assimilated (N=314).

Acculturation Gap

Differences between mother's and child's acculturation. The absolute value of the difference score is the most frequently used conceptualization method in the family dysfunction and child maladjustment literature.²² This method is concerned with examining the role of the difference in acculturation between mothers and their children on mothers' dietary intake and behaviors. The acculturation gap was computed by subtracting children's from mothers' continuous acculturation score for each dimension (Hispanic and non-Hispanic). The absolute value of each difference was used to test whether the difference in a given acculturation dimension was associated with mothers' dietary intake and behaviors, regardless of the direction of the acculturation gap. In most cases, mothers had higher acculturation scores than children in the Hispanic dimension and lower acculturation scores than children in the non-Hispanic dimension.

Mother-child acculturation gap typologies. The following gap typologies were created based on Berry's (1997) acculturation groups: a) bicultural mothers of assimilated children; b) bicultural mothers of bicultural children; c) traditional mothers of assimilated children; and d) traditional mothers of bicultural children.¹² These typologies were used to assess whether the type of mother-child acculturation gap were associated with mothers' dietary intake and behaviors.

Sociodemographic characteristics

We collected sociodemographic characteristics posited to be associated with acculturation and dietary intake and behaviors based on previous research.^{14,38,39} Mothers reported their age (continuous variable), marital status (dichotomized as married/living as married versus single, divorced, and widowed), education (dichotomized as completed high school education versus < high school education), employment status (dichotomized as employed versus not employed; 88.3% of the latter were homemakers), household monthly income (four income brackets ranging from < \$1,000 to \geq \$3,000), and the number of children living in the home (continuous variable). Children reported their age (continuous variable) and gender (male/female). Because other proxies for acculturation have been found to have unique relationships with dietary intake,¹⁴ mothers and children reported the number of years they have lived in the US (continuous variable). Finally, mothers' and children's BMI were measured by evaluation staff and calculated as weight (kg)/height (m²). Continuous BMI was used for mothers and BMI categories using the CDC's age- and gender-adjusted cut points for normal weight, overweight, and obese was used for children.⁴⁰

Data analyses

Because the dietary variables were count variables, distributions were treated as either negative binomial if overdispersion was present or as Poisson if there was no overdispersion present. Correlations between sociodemographic and acculturation variables of at least 0.50 or variance inflation factors of 5 or greater were used to determine the presence of multicollinearity.⁴¹ We observed a moderate correlation ($r = .57, p < .001$) between child's age and child's number of years living in the US because

most children were born in the US and thus age was used in place for the number of years living in the US. Therefore, child's age was not included as a covariate.

First, to examine the role of children's acculturation on mothers' dietary intake and behaviors, children's acculturation group variables were tested (i.e., bicultural versus assimilated acculturation). A stepped approach was used to demonstrate the association of both the children's and the mothers' acculturation on mothers' diet. In the first step, separate bivariate associations of children's and mothers' acculturation with dietary variables were modeled. In the second step, children's and mothers' acculturation were simultaneously entered into the model. In the third step, sociodemographic variables were introduced into the model. A two-sided probability value of $p < .05$ was considered statistically significant.⁴²

Second, to identify the dyad characteristics that were associated with mothers' diet, two conceptualization methods were used to examine the acculturation gap: 1) absolute value of differences in acculturation dimension scores and 2) acculturation gap typologies. Due to these multiple comparisons, a two-sided probability value of $p < .03$ was considered statistically significant.⁴² In a similar stepped approach described above, bivariate associations with each dietary variable were first assessed, followed by adjusted models, controlling for the sociodemographic variables. When testing the absolute value of the difference in mother-child acculturation, both the Hispanic and non-Hispanic dimension difference scores were entered into the model together. When modeling the acculturation gap typologies, the reference group for the typology variable was the most traditional type of dyad in the sample: dyads in which mothers were traditional and

children were bicultural.

We observed five missing cases for the percent of calories from fat variable, one missing case for the percent of groceries spent on fruits and vegetables variable, and one or two missing cases for several covariates. Missing data were treated as missing and were not imputed. Analyses were performed using SAS® Version 9.4.

RESULTS

Demographic characteristics and mothers' dietary intake and behaviors

Table 1-1 provides the demographic characteristics of mothers and children and mothers' dietary intake and behaviors.

Acculturation and acculturation gap variables

Among mothers, the mean score for the Hispanic dimension was 3.5 (SD=0.3) and for the non-Hispanic dimension was 2.1 (SD=0.9). In contrast, among children, the mean score for the Hispanic dimension was 2.6 (SD=0.6) and for the non-Hispanic dimension was 3.3 (SD=0.4). Using Berry's (1997) acculturation groups, 68.5% of mothers were traditional and 44.0% of children were assimilated; fewer mothers were bicultural than children (31.5% versus 56.1%, respectively; **Table 1-1**). Using raw difference scores to describe the sample, we observed a positive difference score of 0.9 (SD=0.6) on the Hispanic dimension indicating that mothers scored higher than children, whereas a negative difference score of -1.2 (SD=0.9) was observed on the non-Hispanic dimension, indicating that mothers scored lower than children. The largest acculturation gap typology was comprised of traditional mothers of bicultural children (43.0%) followed by traditional mothers of assimilated children (25.5%), bicultural mothers of assimilated children (18.5%) and bicultural mothers of bicultural children (13.1%).

Association between child's acculturation and mother's diet

Having an assimilated versus a bicultural child was at least marginally ($p < .10$) associated with lower quality intake on all dietary variables except for daily servings of fruits in bivariate models (Step 1; **Table 1-2**). In bivariate models for mothers, being traditional versus bicultural was marginally associated with less frequent away-from-home eating ($\beta = -0.16, p = .07$). Regardless of mothers' acculturation (Step 3), having an assimilated (versus a bicultural) child was associated with fewer daily servings of vegetables ($\beta = -0.26, p = .02$), more daily servings of sugary beverages ($\beta = 0.21, p = .03$), higher percent of calories from fat ($\beta = 0.05, p = .03$), and more frequent away-from-home eating ($\beta = 0.20, p = .02$), after adjusting for sociodemographic characteristics. Traditional (versus bicultural) mothers were likely to consume more daily servings of vegetables ($\beta = 0.25, p = .08$) and daily servings of sugary beverage ($\beta = 0.21, p = .08$), though these associations were marginally significant.

Association between mother-child acculturation gap and mother's diet

Differences between mother and child's acculturation

To test whether the distance in acculturation between mothers and children was related to mothers' dietary intake and behaviors, we began by assessing bivariate associations (**Table 1-3**). The smaller the gap in mother-child *non-Hispanic* dimension scores, the more frequently mothers consumed away-from-home foods before ($\beta = -0.19, p = .001$) and after adjusting for sociodemographic characteristics ($\beta = -0.19, p = .01$).

Mother-child acculturation gap typologies

Table 1-4 shows the results of the role of the acculturation gap typologies on mothers' dietary intake and behavior. In bivariate models (Step 1), traditional mothers of assimilated children (versus traditional mothers of bicultural children) were at least

marginally associated with lower quality dietary intake and behaviors across all variables except fruit intake. After adjusting for sociodemographic characteristics (Step 2), traditional mothers of assimilated children consumed more daily servings of sugary beverages ($\beta = 0.26, p = 0.02$), a greater percent of calories from fat ($\beta = 0.07, p = .01$), and more frequent away-from-home foods ($\beta = 0.29, p = .01$) than traditional mothers of bicultural children.

DISCUSSION

To our knowledge, this is the first study to examine the role of children's acculturation and the mother-child acculturation gap on mother's dietary intake and behaviors. As hypothesized, children's acculturation was associated with mother's diet. Our findings suggest that Mexican-origin mothers of children who are assimilated to US culture, regardless of their own level of acculturation, may be at greater risk for consuming a diet that is of lower quality than mothers of children who are less assimilated. Furthermore, we found that the difference in acculturation between mothers and children was not as important as the type of mother-child acculturation gap typology in explaining mothers' dietary intake and behaviors. Contrary to what we hypothesized, our findings suggest that traditional mothers of assimilated children may consume a lower quality diet than other mothers.

Children who have shed their traditional Latino culture and adopted the US culture may play a negative role in Latina mothers' diet. Our findings indicate that regardless of Latina mothers' traditional or bicultural acculturation, mothers of assimilated versus bicultural children consumed fewer daily servings of vegetables, more

daily servings of sugary beverages, more calories from fat, and more frequent away-from-home eating. Research has shown that compared to first generation Latino adolescents, second and third generation adolescents consume fewer vegetables, more sugary beverages, and more calories from fat.⁴³ One hypothesized mechanism that would need to be corroborated with longitudinal data may be that as children acculturate and possibly adopt unhealthy “American” dietary practices,⁴⁴ they may also influence their mothers’ dietary intake and behaviors, above and beyond mothers’ own acculturation. Studies are needed to explore exchanges between Latina mothers and their children through observation or qualitative methods to examine whether these exchanges impact mothers’ dietary intake and behaviors.

We found that having an assimilated versus a bicultural child is associated with lower quality dietary intake, regardless of mothers’ acculturation status. However, *traditional* mothers of assimilated children were the dyads of greatest concern for lower quality dietary intake and behaviors. Traditional mothers may be less familiar with “American” foods and their nutritional content than bicultural mothers. A traditional mother of an assimilated child who may make frequent requests for lower quality foods may readily give in to these requests due to the mother’s lack of knowledge of the dietary quality of such foods. Furthermore, a power differential that occurs when children are more acculturated than their mothers results when the mother has to rely on her child not just for food knowledge but for many other matters (e.g., health information).^{45,46} This power differential may be a strong moderator in our findings and an important area for future research. Another potential explanation for why traditional mothers of assimilated children had the most concerning outcomes may be the potential conflict that arises when

children adopt the US culture faster than their parents.²² Traditional mothers experiencing culturally driven conflict with their assimilated children may try to appease their children by accommodating requests for the adoption of new, dominant culture foods and food-related customs. Our findings are important because children's assimilation to US culture may undermine the protective role that mothers' traditional cultural practices (including the type of food she will prepare for her family) may have on their own dietary intake and behaviors. Moreover, our sample largely consisted of homemakers, who are expected to have more time for grocery shopping and meal preparation and thus higher quality food intake,^{47,48} and yet even in this sample, having an assimilated child was associated with lower quality dietary intake and behaviors among mothers. Future research should replicate and extend these findings to discern why traditional mothers of assimilated children are at higher risk for consuming lower quality foods. Moreover, interventions could help with empowering mothers to respect their own food knowledge, resolve conflict with their assimilated children, and educate mothers about US foods.

Although previous studies have identified associations between adult Latinas' acculturation and dietary intake,^{13,14} we only identified marginal associations with vegetable and sugary beverage intake after adjusting for covariates. One possibility for our findings is our method of operationalizing acculturation. Rather than using either the continuous score for the Hispanic or non-Hispanic scale, as is common in the literature, we used acculturation groups based on the bidimensional model of acculturation,¹² which have previously provided valuable insight into other health behaviors (e.g., breastfeeding).⁴⁹ Further research can test whether our findings are consistent across methods of assessing acculturation.

Limitations

Our study should be considered in light of its limitations. Primary among them, mothers in this sample were required to speak and read Spanish, limiting our ability to examine mothers who were assimilated. Similarly, our sample was too homogenous to examine children who were traditional. Future research should include a more heterogeneous sample of Latina mothers and children to investigate the association of mothers' dietary intake and behaviors across other acculturation groups. Another limitation is that the BAS primarily measures language use and thinking; it does not measure cultural traditions, the extent of social interactions with dominant culture individuals, or other factors that may be important indicators of culture.⁵⁰ However, the BAS is a well-researched and validated tool that applies to various Spanish-speaking ethnic groups.⁵¹ Other methods of computing the acculturation gap were not explored in the present study (e.g., latent profile analysis by using mother-child acculturation scores to create dyad profiles). However, the methods tested here reflect those most commonly used in the literature.²³ Moreover, using latent profile analysis may create profiles that are suitable for the present sample but do not generalize to other populations who may differ on their distribution of acculturation scores. Finally, the use of screeners to measure dietary intake has several limitations.⁵² Screeners do not capture total intake of diet or detailed information about foods consumed, potentially excluding other important sources of intake and limiting our ability to accurately estimate dietary intake. Recall accuracy and social desirability bias may have affected mothers' reported frequency and estimate of portion sizes, possibly resulting in underestimating the intake of unhealthy foods/behaviors or overestimating the intake of healthy foods/behaviors. Moreover, the

screeners used in this study were adapted to include foods commonly found in a Mexican diet, which may not generalize to other Latino populations. Interpretation of the results should be treated with caution; the findings indicate trends that can be used for future hypothesis testing. Other methods of assessing dietary intake that can provide more accurate estimates of intake (e.g., 24-hour recall and biomarkers) should be considered in future work. A strength of our study, however was the use of multiple methods for assessing diet including screeners of fruit, vegetable, fat, and sugary beverage intake, an estimate of weekly away-from-home eating, and an estimate of families' grocery dollars spent on fruits and vegetables. The advantages of adding behavioral indicators of diet (i.e., away-from-home eating and fruit and vegetable spending) are that these variables can corroborate our assessment of dietary intake to help validate the screeners and they provide a more comprehensive understanding of participants' behaviors.

CONCLUSIONS

This study reinforced theoretical notions that family-level factors are important to individuals' health behaviors. Just as previous research has identified the influence of parents on their children's dietary intake, our study finds that children may also influence their mothers in this aspect. Further research is needed to investigate the associations found here, and researchers should design interventions that consider the role of children's acculturation on mothers' dietary intake and behaviors.

ACKNOWLEDGMENTS

Research reported in this manuscript was supported by the American Cancer Society (ACS; #RSGPB 113653) and the National Institute of Nursing Research

(#F31NR015965) of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the ACS or NIH.

Chapter 1, in full is a reprint of the material resubmitted to Social Science & Medicine: Soto, S.H., Arredondo, E.M., Marcus, B., Shakya, H., Roesch, S., Ayala, G. X. “Effects of Latino children on their mothers’ dietary intake and dietary behaviors: the role of children’s acculturation and the mother-child acculturation gap.” The dissertation author is the primary author of this material.

Table 1-1. Demographic characteristics of mothers and children and mothers' dietary variables (N=314)

	Mothers	Children
	<i>% (n) or mean ± SD</i>	
<i>Demographic characteristics</i>		
Age	39 ± 8	10 ± 2
Married	93.6 (294)	–
Did not complete high school	51.0 (160)	–
Household monthly income		–
< \$1,000	15.7 (49)	
\$1,000-\$1,999	41.4 (129)	
\$2,000-\$2,999	28.5 (89)	
≥ \$3,000	14.4 (45)	
Not employed	65.3 (205)	–
Number of children living in the home	3 ± 1	–
Female child	–	50.0 (157)
Foreign-born	83.8 (263)	17.8 (56)
Number of years living in the US	20 ± 11	9 ± 3
Mother BMI	31.3 ± 7.0	
Child BMI ^a		
Normal weight		47.0 (147)
Overweight		16.3 (51)
Obese		36.7 (115)
<i>Acculturation</i>		
Acculturation dimension scores		
Hispanic dimension score	3.5 ± 0.3	2.6 ± 0.6
Non-Hispanic dimension score	2.1 ± 0.9	3.3 ± 0.4
Acculturation groups		
Traditional	68.5 (215)	–
Bicultural	31.5 (99)	56.1 (176)
Assimilated	–	44.0 (138)
<i>Mothers' dietary intake and behaviors</i>	<i>Median</i>	
	<i>(min - max)</i>	
Daily servings of fruits	1.0 (0.0 – 12.5)	
Daily servings of vegetables	0.9 (0.0 – 10.1)	
Daily servings of sugary beverages	1.4 (0.0 – 8.6)	
Percent calories from fat	30.7 (17.9 – 67.3)	
Weekly away-from-home eating	3.0 (0.0 – 24.0)	
Percent of weekly grocery dollars spent on fruits and vegetables	29.4 (6.7 – 80.0)	

^a BMI categories adjusted for gender and age

Table 1-2. Separate regression model associations between having an assimilated child (versus bicultural) and mothers' dietary variables

	<i>Step 1</i> ^a			<i>Step 2</i> ^b			<i>Step 3</i> ^c		
	<i>n</i>	<i>β (SE)</i>	<i>p</i>	<i>n</i>	<i>β (SE)</i>	<i>p</i>	<i>n</i>	<i>β (SE)</i>	<i>p</i>
<i>Mothers' daily servings of fruits</i> ¹									
Child assimilated*	314	0.05 (0.11)	.61	314	0.07 (0.11)	.52	310	0.05 (0.11)	.67
Mother traditional*	314	0.07 (0.12)	.55		0.09 (0.12)	.47		0.22 (0.14)	.12
<i>Mothers' daily servings of vegetables</i> ²									
Child assimilated*	314	-0.24 (0.11)	.02	314	-0.22 (0.11)	.04	310	-0.26 (0.11)	.02
Mother traditional*	314	0.13 (0.11)	.24		0.09 (0.12)	.46		0.25 (0.14)	.08
<i>Mothers' daily servings of sugary beverages</i> ²									
Child assimilated*	314	0.17 (0.09)	.06	314	0.20 (0.09)	.03	310	0.21 (0.09)	.03
Mother traditional*	314	0.13 (0.10)	.19		0.17 (0.10)	.08		0.21 (0.12)	.08
<i>Mothers' percent calories from fat</i> ¹									
Child assimilated*	309	0.04 (0.02)	.04	309	0.04 (0.02)	.04	306	0.05 (0.02)	.03
Mother traditional*	309	-0.01 (0.02)	.82		0.004 (0.02)	.84		0.01 (0.03)	.62
<i>Mothers' frequency of weekly away-from-home eating</i> ¹									
Child assimilated*	314	0.20 (0.08)	.02	314	0.18 (0.09)	.04	310	0.20 (0.09)	.02
Mother traditional*	314	-0.16 (0.09)	.07		-0.13 (0.09)	.16		-0.06 (0.11)	.56
<i>Percent of weekly dollars spent on fruits and vegetables</i> ¹									
Child assimilated*	313	-0.09 (0.05)	.07	313	-0.08 (0.05)	.10	309	-0.08 (0.05)	.15
Mother traditional*	313	0.05 (0.05)	.34		0.03 (0.06)	.56		0.05 (0.07)	.46

Note: SE = standard error; bolded results indicated statistically significant findings ($p < .05$)

¹ Negative binomial distribution; ² Poisson distribution

^a Step 1 consists of the separate unadjusted models for mothers' and children's acculturation.

^b Step 2 includes both mother's and children's acculturation in the model.

^c Step 3 models are adjusted for mother's age, marital status, mother's education, mother's employment status, household monthly income, number of children in the home, gender of the child, mother's years in the US, child's years in the US, mother's BMI, and child's BMI category

* Reference = bicultural

Table 1-3. Separate regression model associations between the difference in children's acculturation dimension scores and mothers' dietary variables

	<i>Step 1</i> ^a			<i>Step 2</i> ^b		
	<i>n</i>	<i>β (SE)</i>	<i>p</i>	<i>n</i>	<i>β (SE)</i>	<i>p</i>
<i>Mothers' daily servings of fruits¹</i>						
Difference in Hispanic dimension score	314	0.08 (0.10)	.40	310	0.07 (0.10)	.48
Difference in non-Hispanic dimension score		-0.04 (0.07)	.61		-0.01 (0.09)	.89
<i>Mothers' daily servings of vegetables²</i>						
Difference in Hispanic dimension score	314	-0.05 (0.09)	.61	310	-0.09 (0.10)	.34
Difference in non-Hispanic dimension score		0.07 (0.07)	.31		0.16 (0.09)	.06
<i>Mothers' daily servings of sugary beverages²</i>						
Difference in Hispanic dimension score	314	0.14 (0.08)	.08	310	0.17 (0.08)	.04
Difference in non-Hispanic dimension score		0.05 (0.06)	.39		0.06 (0.07)	.45
<i>Mothers' percent calories from fat¹</i>						
Difference in Hispanic dimension score	309	0.002 (0.02)	.90	306	0.01 (0.02)	.74
Difference in non-Hispanic dimension score		-0.01 (0.01)	.53		-0.01 (0.02)	.70
<i>Mothers' frequency of weekly away-from-home eating¹</i>						
Difference in Hispanic dimension score	314	0.05 (0.08)	.52	310	0.08 (0.08)	.29
Difference in non-Hispanic dimension score		-0.19 (0.06)	.001		-0.19 (0.07)	.01
<i>Percent of weekly dollars spent on fruits and vegetables¹</i>						
Difference in Hispanic dimension score	313	-0.09 (0.05)	.07	309	-0.09 (0.05)	.07
Difference in non-Hispanic dimension score		0.03 (0.03)	.37		0.03 (0.04)	.48

Note: SE = standard error; bolded results indicated statistically significant findings ($p < .03$)

¹ Negative binomial distribution; ² Poisson distribution

^a Step 1 consists of the unadjusted models for mother-child acculturation difference scores. Hispanic and non-Hispanic difference scores included in the same model.

^b Step 2 models are adjusted for mother's age, marital status, mother's education, mother's employment status, household monthly income, number of children in the home, gender of the child, mother's years in the US, child's years in the US, mother's BMI, and child's BMI category

Table 1-4. Separate regression model associations between acculturation gap typologies and mothers' dietary variables

	Step 1 ^a			Step 2 ^b		
	<i>n</i>	<i>β</i> (SE)	<i>p</i>	<i>n</i>	<i>β</i> (SE)	<i>p</i>
<i>Mothers' daily servings of fruits¹</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		0.004 (0.15)	.98		-0.16 (0.18)	.36
Mom bicultural/child bicultural	314	-0.15 (0.18)	.39	310	-0.26 (0.19)	.18
Mom traditional/child assimilated		0.03 (0.13)	.80		0.03 (0.14)	.84
<i>Mothers' daily servings of vegetables²</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		-0.30 (0.15)	.05		-0.50 (0.18)	.01
Mom bicultural/child bicultural	314	-0.11 (0.16)	.51	310	-0.26 (0.17)	.13
Mom traditional/child assimilated		-0.24 (0.13)	.07		-0.27 (0.13)	.04
<i>Mothers' daily servings of sugary beverages²</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		-0.002 (0.13)	.99		-0.04 (0.15)	.82
Mom bicultural/child bicultural	314	-0.07 (0.15)	.64	310	-0.11 (0.16)	.51
Mom traditional/child assimilated		0.25 (0.11)	.02		0.26 (0.11)	.02
<i>Mothers' percent calories from fat¹</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		0.03 (0.03)	.27		0.02 (0.03)	.50
Mom bicultural/child bicultural	309	0.02 (0.03)	.46	306	0.02 (0.04)	.66
Mom traditional/child assimilated		0.06 (0.03)	.02		0.07 (0.03)	.01
<i>Mothers' frequency of weekly away-from-home eating¹</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		0.27 (0.12)	.02		0.22 (0.14)	.11
Mom bicultural/child bicultural	314	0.25 (0.13)	.05	310	0.20 (0.14)	.16
Mom traditional/child assimilated		0.26 (0.11)	.01		0.29 (0.11)	.01
<i>Percent of weekly dollars spent on fruits and vegetables¹</i>						
Mom traditional/child bicultural (Ref)						
Mom bicultural/child assimilated		-0.10 (0.07)	.15		-0.11 (0.08)	.20
Mom bicultural/child bicultural	313	-0.09 (0.08)	.27	309	-0.11 (0.09)	.22
Mom traditional/child assimilated		-0.12 (0.06)	.06		-0.11 (0.06)	.07

Note: SE = standard error; bolded results indicated statistically significant findings ($p < .03$)

¹ Negative binomial distribution; ² Poisson distribution

^a Step 1 consists of the unadjusted models for acculturation gap typologies

^b Step 2 models are adjusted for mother's age, marital status, mother's education, mother's employment status, household monthly income, number of children in the home, gender of the child, mother's years in the US, child's years in the US, mother's BMI, and child's BMI category

Supplement Table 1-1. Correlations between dietary variables

	Fruit intake	Vegetable intake	% spent on fruits and vegetables	Sugary beverage intake	% calories from fat	Away-from-home eating
Fruit intake	1.00					
Vegetable intake	.28***	1.00				
% spent on fruits and vegetables	.10~	.25***	1.00			
Sugary beverage intake	.25***	-.01	-.18*	1.00		
% calories from fat	-.10~	-.17**	-.19**	.20***	1.00	
Away-from-home eating	-.01	-.04	-.11*	.19***	.43***	1.00

~ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

REFERENCES

1. Bronfenbrenner U. *The ecology of human development: Experiments by nature and design*. Harvard University press; 2009.
2. Collins C, Duncanson K, Burrows T. A systematic review investigating associations between parenting style and child feeding behaviours. *Journal of Human Nutrition and Dietetics*. 2014;27(6):557-568.
3. Mazarello Paes V, Ong KK, Lakshman R. Factors influencing obesogenic dietary intake in young children (0-6 years): Systematic review of qualitative evidence. *BMJ Open*. 2015;5(9):e007396-2014-007396. doi: 10.1136/bmjopen-2014-007396 [doi].
4. Pinquart M. Associations of general parenting and parent-child relationship with pediatric obesity: A meta-analysis. *J Pediatr Psychol*. 2014;39(4):381-393. doi: 10.1093/jpepsy/jst144 [doi].
5. Wingert K, Zachary DA, Fox M, Gittelsohn J, Surkan PJ. Child as change agent. the potential of children to increase healthy food purchasing. *Appetite*. 2014;81:330-336.
6. Turner JJ, Kelly J, McKenna K. Food for thought: Parents' perspectives of child influence. *Br Food J*. 2006;108(3):181-191.
7. Atkin CK. Observation of parent-child interaction in supermarket decision-making. *The Journal of Marketing*. 1978:41-45.
8. Gaumer CJ, Arnone C. Grocery store observation: Parent-child interaction in family purchases. *J Food Prod Market*. 2009;16(1):1-18.
9. Fisher L. Research on the family and chronic disease among adults: Major trends and directions. *Families, Systems, & Health*. 2006;24(4):373.
10. Galanti G. The Hispanic family and male-female relationships: An overview. *J Transcult Nurs*. 003;14(3):180-185.
<http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2003103214&site=ehost-live>.
11. Berry JW. Conceptual approaches to acculturation. In: Chun KM, Balls Organista P, Marin G, eds. *Acculturation: Advances in theory, measurement, and applied research*. Washington, DC: American Psychological Association; 2003:17-37.
12. Berry JW. Immigration, acculturation, and adaptation. *Appl Psychol*. 1997;46(1):5-34.

13. Perez-Escamilla R. Acculturation, nutrition, and health disparities in Latinos. *Am J Clin Nutr*. 2011;93(5):1163S-7S. doi: 10.3945/ajcn.110.003467 [doi].
14. Ayala GX, Baquero B, Klinger S. A systematic review of the relationship between acculturation and diet among Latinos in the united states: Implications for future research. *J Am Diet Assoc*. 2008;108(8):1330-1344.
15. Nauck B. Intercultural contact and intergenerational transmission in immigrant families. *Journal of Cross-Cultural Psychology*. 2001;32(2):159-173.
16. Basáñez T, Dennis JM, Crano WD, Stacy AW, Unger JB. Measuring acculturation gap conflicts among Hispanics: Implications for psychosocial and academic adjustment. *J Fam Issues*. 2014;35(13):1727-1753. <http://search.proquest.com/docview/1664224177?accountid=14524>. doi: <http://dx.doi.org/10.1177/0192513X13477379>.
17. Chun KM. Conceptual and measurement issues in family acculturation research. *Acculturation and parent-child relationships: Measurement and development*. 2006:63-78.
18. Hwang W. Acculturative family distancing: Theory, research, and clinical practice. *Psychotherapy: Theory, research, practice, training*. 2006;43(4):397.
19. Arandia G, Nalty C, Sharkey JR, Dean WR. Diet and acculturation among Hispanic/Latino older adults in the United States: A review of literature and recommendations. *J Nutr Gerontol Geriatr*. 2012;31(1):16-37. doi: 10.1080/21551197.2012.647553 [doi].
20. Satia-Abouta J, Patterson RE, Neuhouser ML, Elder J. Dietary acculturation: Applications to nutrition research and dietetics. *J Am Diet Assoc*. 2002;102(8):1105-1118.
21. Szapocznik J, Scopetta MA, Kurtines W, Aranalde MD. Theory and measurement of acculturation. *Revista Interamericana de Psicología*. 1978.
22. Telzer EH. Expanding the acculturation gap-distress model: An integrative review of research. *Hum Dev*. 2011;53(6):313-340. <http://search.proquest.com/docview/858288426?accountid=14524>. doi: <http://dx.doi.org/10.1159/000322476>.
23. Birman D. Measurement of the "acculturation gap" in immigrant families and implications for parent-child relationships. In: *Acculturation and parent-child relationships: Measurement and development*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, Mahwah, NJ; 2006:113-134. <http://search.proquest.com/docview/621093965?accountid=14524>.

24. Ayala GX, Ibarra L, Arredondo E, et al. Promoting healthy eating by strengthening family relations: Design and implementation of the entre familia: Reflejos de salud intervention. *Cancer Disparities: Causes and Evidence-Based Solutions*. Springer US. 2011:237-252.
25. U.S. Census Bureau. 2010 demographic profile. Retrieved from: https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml. Updated 2010.
26. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: Performance of 2 new short instruments and a food frequency questionnaire. *J Am Diet Assoc*. 2002;102(12):1764-1772.
27. Ayala GX. An experimental evaluation of a group- versus computer-based intervention to improve food portion size estimation skills. *Health Educ Res*. 2006;21(1):133-145. doi: cyh049 [pii].
28. Rockett HR, Wolf AM, Colditz GA. Development and reproducibility of a food frequency questionnaire to assess diets of older children and adolescents. *J Am Diet Assoc*. 1995;95(3):336-340.
29. Willett WC, Sampson L, Stampfer MJ, et al. Reproducibility and validity of a semiquantitative food frequency questionnaire. *Am J Epidemiol*. 1985;122(1):51-65.
30. Larson N, Harnack L, Neumark-Sztainer D. Assessing dietary intake during the transition to adulthood: A comparison of age-appropriate FFQ for youth/adolescents and adults. *Public Health Nutr*. 2012;15(04):627-634.
31. Thompson FE, Midthune D, Subar AF, Kipnis V, Kahle LL, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *J Am Diet Assoc*. 2007;107(5):760-767.
32. Ayala GX, Rogers M, Arredondo EM, et al. Away-from-home food intake and risk for obesity: Examining the influence of context. *Obesity*. 2008;16(5):1002-1008.
33. Food Marketing Institute (FMI). U.S. grocery shopper trends. 2016.
34. Dubowitz T, Zenk SN, Ghosh-Dastidar B, et al. Healthy food access for urban food desert residents: Examination of the food environment, food purchasing practices, diet and BMI. *Public Health Nutr*. 2015;18(12):2220-2230.
35. Newby PK, Tucker KL. Empirically derived eating patterns using factor or cluster analysis: A review. *Nutr Rev*. 2004;62(5):177-203.

36. Sauvageot N, Schritz A, Leite S, et al. Stability-based validation of dietary patterns obtained by cluster analysis. *Nutrition journal*. 2017;16(1):4.
37. Marín G, Gamba RJ. A new measurement of acculturation for Hispanics: The bidimensional acculturation scale for Hispanics (BAS). *Hispanic Journal of Behavioral Sciences*. 1996;18(3):297-316.
38. Hiza HA, Casavale KO, Guenther PM, Davis CA. Diet quality of americans differs by age, sex, race/ethnicity, income, and education level. *Journal of the Academy of Nutrition and Dietetics*. 2013;113(2):297-306.
39. Wang DD, Leung CW, Li Y, et al. Trends in dietary quality among adults in the United States, 1999 through 2010. *JAMA Internal Medicine*. 2014;174(10):1587-1595.
40. Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC growth charts for the United States: Methods and development. *Vital Health Stat 11*. 2002;(246)(246):1-190.
41. Neter J, Kutner MH, Nachtsheim CJ, Wasserman W. *Applied linear statistical models*. Vol 4. Irwin Chicago; 1996.
42. Rice WR. Analyzing tables of statistical tests. *Evolution*. 1989;43(1):223-225.
43. Liu JH, Chu YH, Frongillo EA, Probst JC. Generation and acculturation status are associated with dietary intake and body weight in Mexican American adolescents. *J Nutr*. 2012;142(2):298-305. doi: 10.3945/jn.111.145516 [doi].
44. Van Hook J, Quiros S, Frisco ML, Fikru E. It is hard to swim upstream: Dietary acculturation among Mexican-origin children. *Population research and policy review*. 2016;35(2):177-196.
45. Weisskirch RS, Alva SA. Language brokering and the acculturation of Latino children. *Hispanic Journal of Behavioral Sciences*. 2002;24(3):369-378.
46. Martinez CR, McClure H, Eddy J. Language brokering contexts and behavioral and emotional adjustment among Latino parents and adolescents. *The Journal of early adolescence*. 2008.
47. Devine CM, Jastran M, Jabs J, Wethington E, Farell TJ, Bisogni CA. "A lot of sacrifices:" Work-family spillover and the food choice coping strategies of low-wage employed parents. *Soc Sci Med*. 2006;63(10):2591-2603. <http://search.proquest.com/docview/621554828?accountid=14524>. doi: <http://dx.doi.org/10.1016/j.socscimed.2006.06.029>.

48. Colby SE, Morrison S, Haldeman L. What changes when we move? A transnational exploration of dietary acculturation. *Ecol Food Nutr.* 2009;48(4):327-343. doi: 10.1080/03670240903022379 [doi].
49. Chapman DJ, Pérez-Escamilla R. Acculturative type is associated with breastfeeding duration among low-income Latinas. *Maternal & child nutrition.* 2013;9(2):188-198.
50. Cabassa LJ. Measuring acculturation: Where we are and where we need to go. *Hispanic Journal of Behavioral Sciences.* 2003;25(2):127-146.
51. Wallace PM, Pomery EA, Latimer AE, Martinez JL, Salovey P. A review of acculturation measures and their utility in studies promoting Latino health. *Hispanic Journal of Behavioral Sciences.* 2009.
52. Thompson FE, Subar AF, Coulston A, Boushey C. Dietary assessment methodology. *Nutrition in the Prevention and Treatment of Disease.* 2008;2:3-39.

CHAPTER 2 .

Family environment, children's acculturation and Latina mothers' dietary intake and behaviors: An autoregressive cross-lagged study

ABSTRACT

Background: Many Latinos do not meet dietary recommendations for healthy eating. Family systems theory posits that the family environment affects family members' dietary behaviors. Furthermore, research suggests that children's acculturation is associated with Latina mothers' dietary intake and behaviors.

Purpose: This longitudinal study examined the temporal relations of the family environment on Latina mothers' dietary intake and behaviors, and whether these relations differed between mothers of assimilated versus bicultural children.

Methods: Data were collected at three time points from 162 Latina mothers enrolled in the delayed treatment group of a randomized controlled trial. Mothers' daily fruit and vegetable intake, and sugary beverages, percent of calories from fat, weekly away-from-home eating, and percent of weekly grocery dollars spent on fruits and vegetables were examined. The family environment was measured by mother-reported family interactions around food and family expressiveness. Separate autoregressive cross-lagged models examined temporal relations between the family environment and dietary variables, adjusting for sociodemographic variables. Interactions between the family environment and children's acculturation were also tested.

Results: Less positive family interactions around food at baseline predicted more frequent away-from-home eating four months later among mothers of assimilated children. More family expressiveness at four months predicted more dollars spent on

fruits and vegetables at ten months among mothers of bicultural children, however it did not predict intake of these foods.

Conclusions: Findings suggest the importance of a positive family environment on certain dietary behaviors exhibited by the mother. Family interventions aimed at improving dietary intake and associated behaviors should promote a positive family environment around food, and consider children's acculturation.

INTRODUCTION

Most Latino adults residing in the U.S. are not meeting the daily recommended dietary intake of fruits and vegetables and are exceeding the recommended daily allowances for fats and sugar needed to prevent chronic health conditions (1). Several personal (2), social (3), and cultural (4) contributors to dietary intake have been identified among Latino populations including the role of family (5). Among traditional Latinos, particularly, the family is an important, central element of daily life (6), which may have direct and indirect influences on Latinos' dietary intake. Research on the promotion of healthy dietary intake and related behaviors among Latinos may benefit from developing a better understanding of the role of the family, particularly for Latinas who are primarily responsible for the food shopping and meal preparation for their families (7).

Family systems theory posits that various dimensions of 'the family' are important sources of influence on an individual's health behaviors and those health behaviors engaged in as a family (e.g., family meals). Unlike most public health theories, individuals are not the primary interest in family systems theory, rather the relationships and interactions of family members (8). The quality of the relationships between family members, including how cohesive, disengaged, and expressive family members are with each other, characterize the family environment. Because dietary intake and behaviors typically occur among family members (9), the family environment may be an important determinant of individuals' dietary quality.

One indicator of the family environment is how expressive family members are with one another. As defined by Moos and Moos, family expressiveness is the extent to

which family members are encouraged to act openly and express themselves directly (10). Eating behaviors may often require communication between family members; for example, family members likely express their opinions and preferences when deciding which restaurant to visit or what to eat for dinner. The extent to which families express themselves in a positive manner may impact family members' food-related decisions. Therefore, investigating the role of family expressiveness may prove beneficial in understanding mothers' dietary intake and behaviors.

As with most research on family-level predictors of behavior (11), studies examining the relation between family expressiveness and dietary intake in adults are limited. In a study of 42 mothers of children under the age of 12 years old, no associations were found between self-reported family expressiveness and mothers' dietary nutrients and intake (e.g., fruits and vegetables (12)). Researchers examining 44 parents of 4th and 5th grade Girl Scout troops found no differences in parents' mean fruit, vegetable, or fiber intake by family expressiveness scores (13). These studies used cross-sectional designs, and their study samples were not Latino. Given the few studies in this area, additional research is needed to build the evidence on whether family expressiveness is a predictor of mothers' dietary intake and behaviors, and as a consequence, a promising target for future interventions.

Though the evidence is limited, the two studies described above did not show statistically significant correlations between family expressiveness and mothers' diet. While this may be attributable to the small sample sizes, it could also be that family expressiveness may be mediated by an unmeasured construct. Family interactions around

food (i.e., interpersonal communication regarding healthy eating) may be an important mediator between family expressiveness and mothers' dietary intake and behaviors. Having more positive interactions around food has been found to be a strong predictor of behavioral strategies to increase dietary fiber and decrease dietary fat consumption among Latina mothers (14). In a study among 155 Midwestern wives, positive family interactions around food were associated with less fat and saturated fat intake and more dietary fiber, fruit, and vegetable intake (15). These studies suggest that family interactions around food are important to diet-related behavioral strategies and to dietary intake, though it remains unclear whether these interactions are associated with Latina mothers' dietary intake and behaviors. It is also important to determine whether families with greater expressiveness give rise to more positive family interactions around food, resulting in better dietary quality among mothers.

Family relationships (e.g., mother-child dyads) are a salient aspect of family systems theory because the quality of these relationships can influence the overall family environment (8). According to Smokowski's acculturation gap-distress model (16), the family environment can become less communicative, more detached, and more conflict-ridden because of differences in acculturation between Latina mothers and their children. Though not always the case (17), the family environment may be negatively impacted when children adopt the behaviors, values, and norms of the dominant culture, which may differ from their parents' expectations (18). In a recent study (19), having children who were assimilated to the US culture was associated with mothers' intake of lower quality foods and unhealthier dietary behaviors than mothers of children who were bicultural, especially when mothers were culturally traditional. That study demonstrated

that children's acculturation might be important to mothers' diet quality; however, the role of the family environment on these associations is unknown.

Based on family systems theory, we used a longitudinal design to explore the causal links between the family environment and Mexican-origin Latina mothers' dietary intake and behaviors. Specifically, we tested whether family interactions around food mediated the association between family expressiveness and mothers' dietary intake. We also examined differences in these associations by mothers of assimilated versus bicultural children. We expected that mothers of bicultural children would have a more positive family environment and thus better diet quality than mothers of assimilated children.

METHODS

Study design and participant characteristics

Baseline (M1), 4-month (M2), and 10-month (M3) post-baseline data were obtained from 181 Mexican-origin Latino mother-child dyads who participated in the delayed treatment control condition of the randomized controlled trial (RCT), *Entre Familia: Reflejos de Salud* (Within the Family: Reflections of Health (20)). A convenience sample of mother-child dyads was recruited from Imperial County, California, situated along the US-Mexico border. Recruitment sites included health fairs, clinics, and schools. Mothers were eligible if they (a) self-identified as Latina; (b) had a child between the ages of 7-13 years old; (c) could speak and read in Spanish; and (d) lived in the same household as their child for at least four days of the week. If there was more than one eligible child, the one with the closest birthday to the baseline assessment was recruited to participate. In 25% of families, data were also collected from fathers,

though not included in the present study due to the small sample size. For the current study, mothers who were culturally traditional (e.g., maintained traditional Latino culture and did not adopt US culture) and children who were either bicultural or assimilated to US culture (both based on the Bidimensional Acculturation Scale (BAS (21))) were included (N=162 mother-child dyads). The study was approved by San Diego State University's Institutional Review Board.

Measures

Bilingual research assistants collected data in a location that was convenient to the families. Unless otherwise specified, we used data collected from mothers.

Dietary outcomes: Mother-reported dietary intake and dietary behaviors

We used the 19-item National Cancer Institute (NCI) All-Day Screener (22) to assess daily servings of fruits and vegetables (excluding French fries, potatoes, and beans/legumes) at each time point. Mothers reported their frequency of consuming the fruit or vegetable during a typical day in the past month and estimated their usual serving size with the assistance of food models to improve the accuracy of self-report. We converted frequencies to daily averages and then multiplied by the MyPyramid servings size equivalent of the reported servings size of each food. In the validation study (22), the correlation between the summary score for daily servings of fruits and vegetables and 24-hour dietary recalls among women were moderate ($r = .51$).

The 5-item subscale from the Youth/Adolescent Questionnaire (YAQ (23)) based on the Willett Food Frequency Questionnaire (FFQ (24)) assessed daily servings of sugary beverages in the past month at each time point. Response options for the frequency of consumption ranged from "Never/less than 1 per month" to "2 or more

cans/glasses per day” and were converted into daily servings equivalent to one glass, bottle, or can and then summed to provide the average daily intake of sugary beverages. The correlation of the sugary beverages subscale between the YAQ and the Willett FFQ in a young adult sample between the ages of 18-31 was .62 (25).

The 16-item NCI Multifactor Fat Screener (26) was used to estimate the daily percent of calories consumed from fat at each time point. Mothers reported their frequency of consuming each item over the past 12 months. Frequencies were standardized to the midpoint of responses and converted to the number of times per day. The frequencies were then multiplied by a weighted score based on participant’s age and gender for the portion size of each item (26). The Fat Screener was moderately correlated ($r = .58$) with biomarkers (true intake of fat) in women enrolled in the validation study (26).

Six items assessed the frequency of consuming foods that were prepared away from home during a typical week in the last month at each time point (27). We calculated a sum score of mothers’ frequency of consuming foods that were prepared from the following sources: (a) grocery stores, (b) relatives’/friends’ homes, (c) fast food restaurants, (d) other restaurants, (e) cafeterias, and (f) other outlets including vending machines and on-street vendors.

Mothers in the current study estimated how much their family spent on: (a) all groceries and (b) fruits and vegetables every week in the past month at M1 and M3 only. The amount spent on fruits and vegetables was divided by the total amount to obtain the percent of grocery dollars spent on fruits and vegetables.

Mother-reported family environment

We measured family interactions around food in the past month at each time point using a 5-item scale (28), modified from a previous scale measuring family nutrition interaction (29). Mothers responded to items using a 5-point Likert scale (1=Never, 5=Very Often). Sample items included “*I discussed the importance of eating a nutritious combination of foods with my family*” and “*Family members talked to each other about nutritious foods.*” We obtained a mean score of the five items, with higher scores indicating more positive family interactions around food. Internal consistency of this scale at M1 was .76 among mothers in the current study.

We assessed family expressiveness at each time point using 5-items from Bloom’s Family Relationships Index in the Family Functioning Scale (30). Sample items include, “*Family members felt free to say what was on their minds*” and “*In our family, it was important for everyone to express their opinion,*” with response options on a 4-point Likert scale (1=Very untrue, 4= Very true). We reverse coded two items so that higher mean scores indicated greater family expressiveness. Family expressiveness had an internal consistency of .77 at M1. Although we collected measures for other aspects of the family environment (i.e., cohesiveness and disengagement), we did not examine them due to low internal consistency scores.

Potential moderator: Child-reported acculturation

Children self-reported their acculturation at M1 using the 24-item BAS (31). The BAS assesses language use, linguistic proficiency, and language of electronic media in two languages to generate a score for the Hispanic/Spanish dimension and the non-Hispanic/English dimension. Item response options are on a 4-point Likert scale. We

obtained a mean score ranging from 1-4 for each dimension with higher scores indicating greater Spanish/English language use. To categorize children as either *bicultural* (aka, integrated, adherent to both dimensions; $n=88$) or *assimilated* (adherent to the non-Hispanic dimension but not to the Hispanic dimension; $n=74$), we used the mean cutoff score of 2.5 (32). In this sample of children, internal consistency for the BAS was .86 on the Hispanic and .75 on the non-Hispanic dimension.

Mother-reported sociodemographic characteristics

Sociodemographic characteristics reported by mothers at M1 included mother and child's age, mother's highest level of education completed, mother's employment status, household monthly income, marital status, the number of years living in the US, child's gender, and the number of children living in the home. Research assistants measured mothers' and children's height and weight, which were used to calculate body mass index (BMI, kg/m^2). For children, BMI was converted to categories using the CDC's age- and gender-adjusted cut points for normal weight, overweight, and obese for children (33).

Data analyses

Sample sizes at each time point were 162 at M1, 147 at M2, and 144 at M3.

Missing data at M2 and M3 were not imputed. Mothers missing at M2 had higher Hispanic dimension scores ($M=3.66$, standard deviation [SD]=0.29) than the total sample at M1 ($M=3.47$, $SD=0.33$), $t(160)=2.10$, $p=0.04$ and mothers missing at M3 were younger ($M=34.39$, $SD=6.51$) than the total sample at M1 ($M=39.56$, $SD=7.88$), $t(159)=2.67$, $p=0.01$. To reduce biased parameter estimates, mothers' acculturation and age were treated as auxiliary variables in the model testing (34).

Data were initially explored using descriptive statistics and correlations between study variables in SAS® Version 9.4 (SAS Institute Inc., Cary, NC). Then, autoregressive cross-lagged (ARCL) models were conducted in MPlus (Muthén & Muthén, Los Angeles, CA (35)) across three time points for each dietary variable to test the temporal associations of the family environment predictors with mothers' dietary intake and behaviors. ARCL analyses allow us to examine patterns of influence between variables across time. By regressing variables on themselves measured at earlier time points, we can test for changes in a variable above and beyond its previous levels (autoregressive effects). We can also test the influence of one construct (e.g., family expressiveness) on another (e.g., fruit intake) at a later time (cross-lagged effects), controlling for earlier measured levels of both constructs (36). ARCL also allows us to investigate mediation paths over time. **Figure 2-1(a)** depicts the theoretical model that was tested with each dietary variable and shows the predictive paths of most interest in the current study.

Dietary data were count variables and non-normally distributed; therefore, a maximum likelihood estimation with robust standard errors was employed in ARCL analyses (37). The following sociodemographic characteristics were significantly ($p \leq .05$) correlated with study variables at M1 and were retained in models as covariates: mothers' and child's BMI, mothers' marital status, household monthly income, and children's acculturation. We evaluated model fit using the Comparative Fit Index (CFI), the Root Mean Squared Error of Approximation (RMSEA), and the Standardized Root Mean Residual (SRMR). Models with CFI values greater than .90 (38), and RMSEA (39) and SRMR (40) values at .08 or less were deemed to have an acceptable fit.

After testing ARCL models for each dietary outcome, we tested for differences in the overall model by children's acculturation measured at M1. Interactions were tested between children's acculturation and the family environment predictors in time sequential paths between family interactions around food/family expressiveness and dietary variables (see **Figure 2-1 (b)**). If interactions were found ($p < .10$), separate models were conducted for mothers with assimilated and bicultural children to enable interpretation.

RESULTS

Descriptive characteristics

Sociodemographic characteristics are shown in Table 1. Family interactions around food were stable across time, with average scores on the 1-5 scale ranging from 3.21 at M1 to 3.34 at M3. Family expressiveness was high on the 1-4 scale, ranging from 3.55 at M1 to 3.60 at M3. More positive family interactions around food and higher levels of family expressiveness were correlated in the expected direction with mothers' dietary variables. However, greater family expressiveness was correlated with fewer servings of fruit at M3 ($r = -.21, p \leq .05$). We observed weak to strong positive correlations ($r = .19 - .44$) between family interactions around food and family expressiveness across the three time points. Table 2 shows mothers' study variables across time and stratified by children's acculturation groups. Overall, mothers' dietary quality, family interactions around food, and family expressiveness were more positive among mothers of bicultural versus assimilated children.

The role of the family environment on mothers' diet

An ARCL model for each dietary variable was tested to explore the temporal relations between the family environment and mothers' dietary intake and behaviors.

First, we observed correlations between the family environment and dietary variables. At each time point, more positive family interactions around food were consistently correlated with more daily servings of vegetables, a higher percent of grocery dollars spent on fruits and vegetables, and fewer calories from fat. Unexpectedly, more positive family interactions around food at M3 were correlated with more frequent away-from-home eating at M3 ($\beta = 0.17, p = .04$; **Figure 2-2**). Greater family expressiveness was consistently correlated with more daily servings of vegetables at each time point (**Supplement Figure 2-1**). Conversely, more positive family expressiveness at M2 was correlated with fewer daily servings of fruit at M2 ($\beta = -0.10, p = .05$; **Supplement Figure 2-2**).

Second, we examined temporal associations between the family environment variables and mothers' diet. **Figure 2-2** shows that mothers who reported more positive family interactions around food at M1 reported consuming away-from-home foods less frequently at M2 ($\beta = -0.22, p = .01$). This model did not explain a significant proportion of mothers' away-from-home eating at M2 ($R^2 = 0.18, p = .10$) or M3 ($R^2 = 0.13, p = .09$). Similarly, mothers who reported greater family expressiveness at M2 spent more grocery dollars on fruits and vegetables at M3 ($\beta = 0.26, p = .001$, **Figure 2-3**). A significant though small proportion of the variance in the percent of grocery dollars spent on fruits and vegetables at M3 was explained by the model ($R^2 = 0.11, p = .01$). No other statistically significant temporal associations between the family environmental variables and mothers' dietary variables were observed. However, the theorized model explained a statistically significant proportion of the following dietary variables: vegetable intake at M3 ($R^2 = 0.23, p = .10$; **Supplement Figure 2-1**), fruit intake at M3 ($R^2 = 0.20, p = .01$;

Supplement Figure 2-2), calories from fat at M2 ($R^2 = 0.09$, $p = .10$) and M3 ($R^2 = 0.19$, $p = .003$; **Supplement Figure 2-3**), and sugary beverage intake at M2 ($R^2 = 0.08$, $p = .04$) and M3 ($R^2 = 0.23$, $p < .001$; **Supplement Figure 2-4**).

Third, we examined the causal path between family expressiveness and mothers' dietary variables through interactions around food. According to Baron and Kenny (41), mediation is present when three conditions are met: (a) family expressiveness predicts interactions around food, (b) interactions around food predict the dietary variable, and (c) a previously significant path between family expressiveness and the dietary variable becomes non-significant when the first two conditions are met. Using these criteria, we did not find evidence of mediation.

Differences in the role of the family environment on mothers' diet by children's acculturation

For the frequency of mothers' away-from-home eating, a stronger temporal relation was found between fewer positive family interactions around food at M1 and more frequent away-from-home eating at M2 among mothers of assimilated children ($\beta = -0.34$, $p = .002$) than mothers of bicultural children ($\beta = -0.05$, $p = .56$; **Figure 2-4**). A stronger temporal relation was found between greater family expressiveness at M2 and more grocery dollars spent on fruits and vegetables at M3 among mothers of bicultural children ($\beta = 0.22$, $p = .02$) than mothers of assimilated children ($\beta = 0.20$, $p = .10$; **Figure 2-5**).

DISCUSSION

Based on family systems theory, we examined the temporal relations between the family environment and Latina mothers' dietary intake and behaviors. Our findings

suggest that among culturally traditional Latinas of Mexican origin, family expressiveness and interactions around food predict dietary behaviors that may involve communication between family members including eating foods prepared outside the home and grocery shopping. Researchers should consider emphasizing a positive family environment if intervening on dietary behaviors that involve shared decision-making among family members. Although the family environment did not predict specific dietary intake variables, within-time correlations revealed that a more positive family environment typically co-occurred with better diet quality. This finding highlights the need for investigating possible leverage points in the family environment that may be targeted in interventions promoting healthy eating.

It is important to note that a positive family environment was not consistently associated with better diet quality. For example, although we found that more positive family interactions around food at M1 predicted less frequent intake of away-from-home foods at M2, the direction of this association reversed in the correlation between these two variables at M3. Similarly, greater family expressiveness was correlated with fewer daily servings of fruit at the M2 assessment. Within-time correlations may reveal recent connections between the family environment and diet that do not reflect long-term effects between the two variables. Possible alternative explanations for these findings include measurement error in the outcome or predictor variables or spurious findings resulting from using a small sample. Future studies with more accurate dietary assessments (e.g., 24-hour recall) and larger samples are required to confirm or refute these correlations.

Our previous study showed that culturally traditional mothers of assimilated children consumed more daily servings of sugary beverages, more calories from fat, and

more frequent away-from-home foods than mothers who had children who were not assimilated (19). The current findings suggest that one potential mechanism for the difference in the diet quality of mothers of assimilated and bicultural children may be the family environment. For example, mothers with assimilated children who had fewer positive interactions around healthy eating were more likely to purchase away-from-home foods. This may be the result of a combination of factors including mothers more likely to acquiesce to assimilated children's request for away-from-home foods, particularly when interactions around food are less positive. In addition, these families may not prioritize consuming healthy foods. We also found that mothers who came from families with greater expressiveness also spent more grocery dollars on fruits and vegetables when they had a bicultural child. It may be the case that when mothers live in family environments that encourage and support their values, they are better able to stand firm in their decision to purchase traditional foods rich in fruits and vegetables. Moreover, when mothers have a bicultural child who is more likely to be open and accepting of consuming traditional foods than an assimilated child, mothers may feel more empowered to purchase these foods. Examining other indicators of the family environment (e.g., cohesion, disengagement) can provide additional evidence for the importance of a positive and warm family environment on diet.

Children's acculturation as a moderator between the family environment and mothers' dietary behaviors also appears to support Smokowski's acculturation gap-distress model (16), which suggests a weakening of the family environment in families where children assimilate to U.S. culture faster than their parents. The literature focusing on the acculturation gap-distress model primarily focuses on child depression, substance

use, and other maladaptive outcomes (17). Our study extends this line of research to Latina mothers' diet. Mothers may choose away-from-home foods more frequently if their home environment is less harmonious, and possibly to appease their assimilated child's food preferences. Additionally, a positive family environment coupled with a bicultural child who has retained his/her palate for more traditional foods may enable mothers to purchase more fruits and vegetables. These findings may have implications beyond mothers' dietary intake and behaviors to their children and spouses. Further qualitative and observational research can help contextualize and explain our findings and build the evidence needed to develop effective interventions.

Limitations

Our study results should be considered in light of its limitations. Although we controlled for several sociodemographic factors, there may be other unmeasured confounders driving the temporal associations observed. Our small sample size may have also attenuated the observed effects. Therefore, replication studies are needed to confirm and expand our findings. Our sample of culturally traditional mothers, which do not include bicultural or assimilated mothers, further limited the generalizability of our findings. Similarly, the children in our study were limited to those who were bicultural or assimilated. Finally, the dietary variables were self-reported, potentially introducing measurement error in the form of recall or social desirability bias. Future research should incorporate 24-hour recall assessments or biomarkers to more accurately assess dietary intake. In an effort to overcome the limitations of using self-reported measures, we trained research assistants to use food models during data collection to improve servings size estimates. We also assessed a variety of diet variables to cross-validate our findings.

In most cases, relationships between the dietary variables were found in the expected direction. While our findings may not provide quantitatively accurate dietary results, they do provide trends that can be confirmed with other studies.

Conclusions

In sum, our study suggests that a more positive family environment may lead to mothers engaging in healthier dietary behaviors that require discussion and negotiation between family members. Future interventions that seek to promote healthy dietary behaviors involving communication and shared decision-making may benefit from considering the family environment. Further research that explores other potential confounders, examines a more generalizable sample of Latino families, and investigates dietary intake and behavior through a family systems lens will further explain our findings and provide direction for future interventions

ACKNOWLEDGMENTS

Research reported in this manuscript was supported by the American Cancer Society (ACS; #RSGPB 113653) and the National Institute of Nursing Research (#F31NR015965) of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the ACS or NIH.

Chapter 2, in full is a reprint of the material submitted to *Annals of Behavioral Medicine*: Soto, S.H., Arredondo, E.M., Shakya, H., Roesch, S., Marcus, B., Ayala, G. X. "Family environment, children's acculturation and mothers' dietary intake and behaviors

among Latinas: an autoregressive cross-lagged study.” The dissertation author is the primary author of this material.

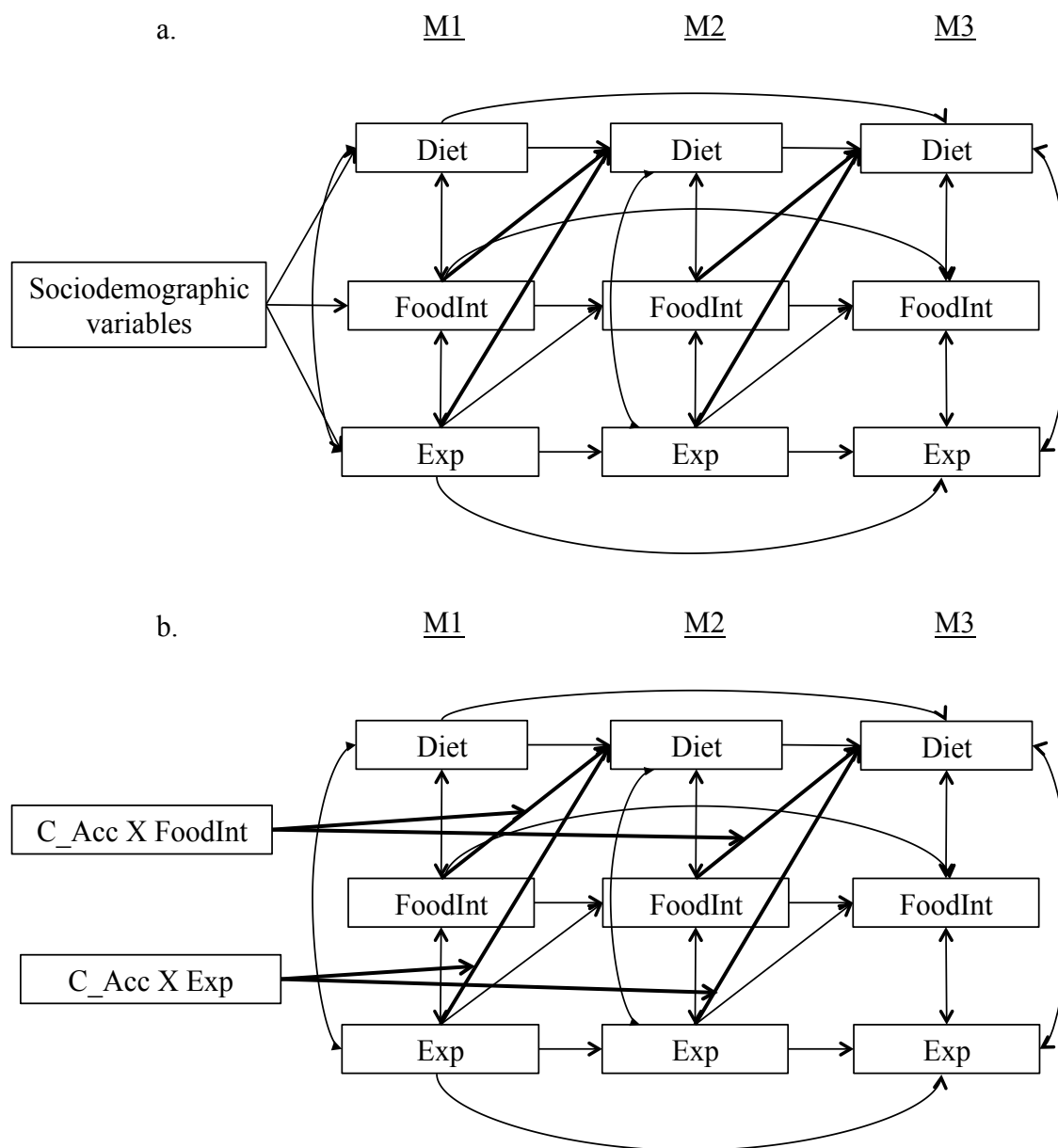


Figure 2-1. Theoretical models.a. Theorized overall model. b. Theorized model testing interactions. The bolded lines indicate paths of primary interest in the current study. FoodInt = family interactions around food, exp = family expressiveness, C_Acc = child's acculturation.

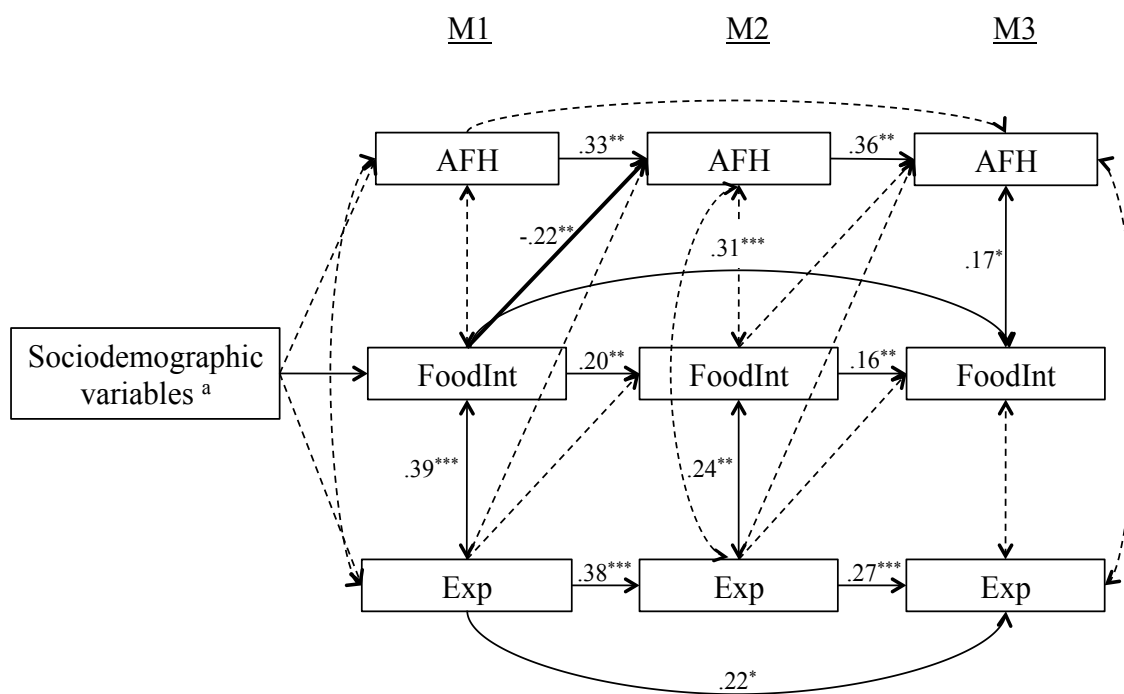


Figure 2-2. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' away-from-home eating. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. The bolded line indicates a path of primary interest in the current study. Standardized coefficients are shown. AFH = away-from-home eating, FoodInt = interactions around food, Exp = expressiveness. N=162, CFI: 0.90, RMSEA: 0.05, SRMR: 0.07. ^a All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.

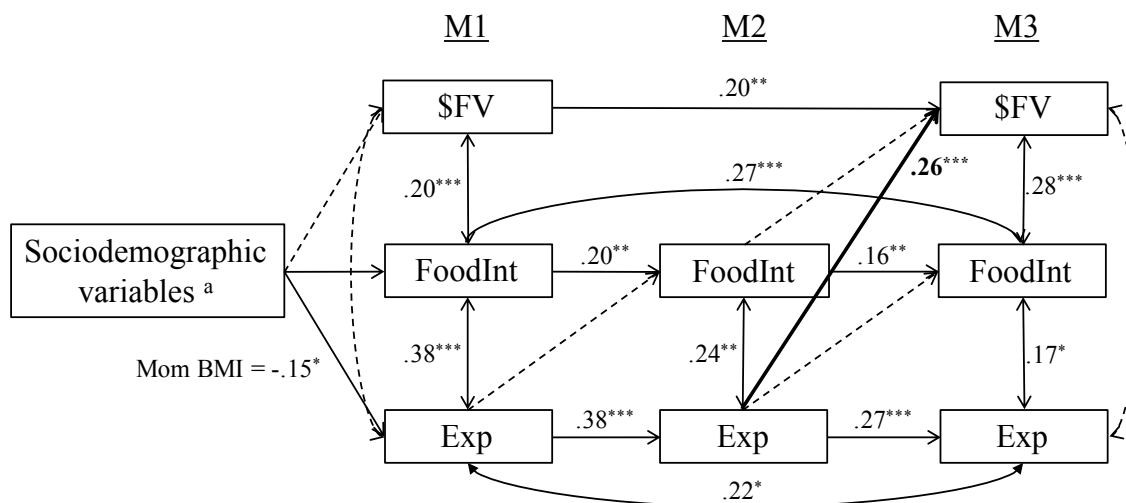
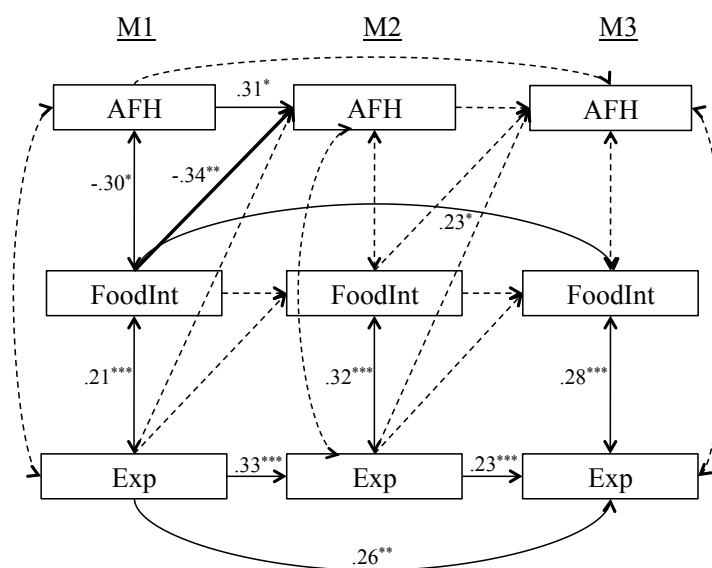


Figure 2-3. Auto-regressive lagged analysis results of family expressiveness and interactions around food with the percent of grocery dollars spent on fruits and vegetables. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. The bolded line indicates a path of primary interest in the current study. Standardized coefficients are shown. \$FV = percent of grocery dollars spent on fruits and vegetables, FoodInt = interactions around food, Exp = expressiveness. N=162; CFI: 0.90, RMSEA: 0.05, SRMR: 0.08. ^a All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.

a. assimilated



b. bicultural

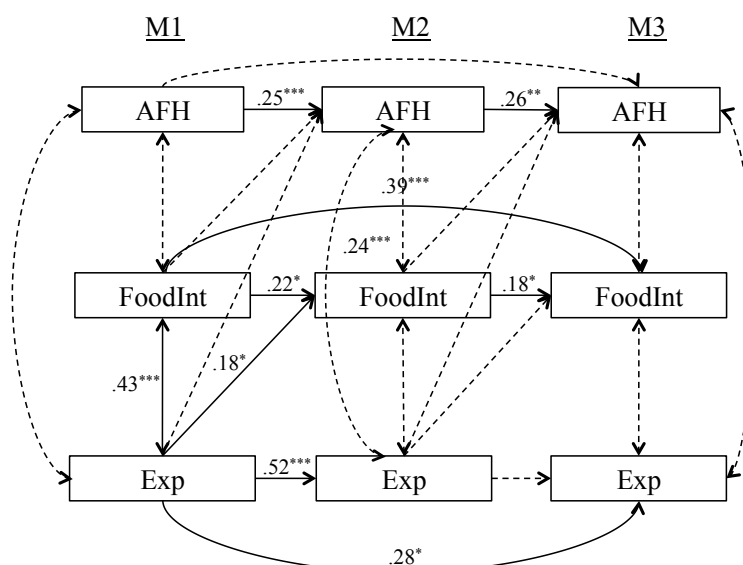
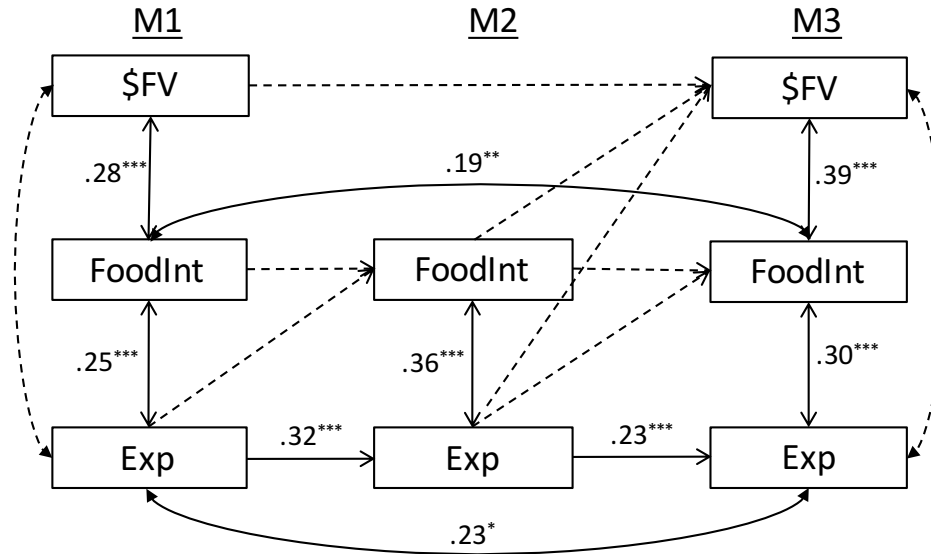


Figure 2-4. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' away-from-home eating among mothers with (a) assimilated and (b) bicultural children. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. Standardized coefficients are shown. AFH = away-from-home eating, FoodInt = interactions around food, Exp = expressiveness. (a) N=74, CFI: 0.89, RMSEA: 0.07, SRMR: 0.13; (b) N=88, CFI: 1.00, RMSEA: 0.00, SRMR: 0.07. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.

a. assimilated



b. bicultural

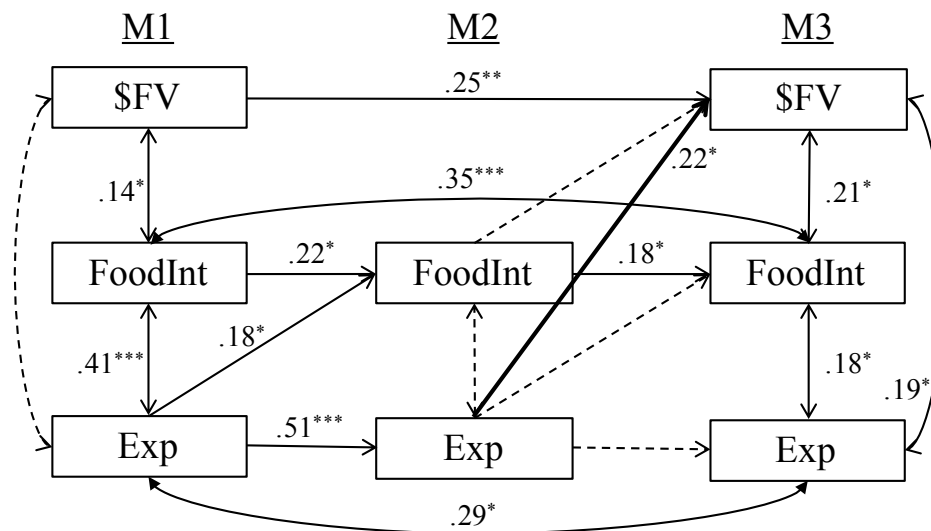
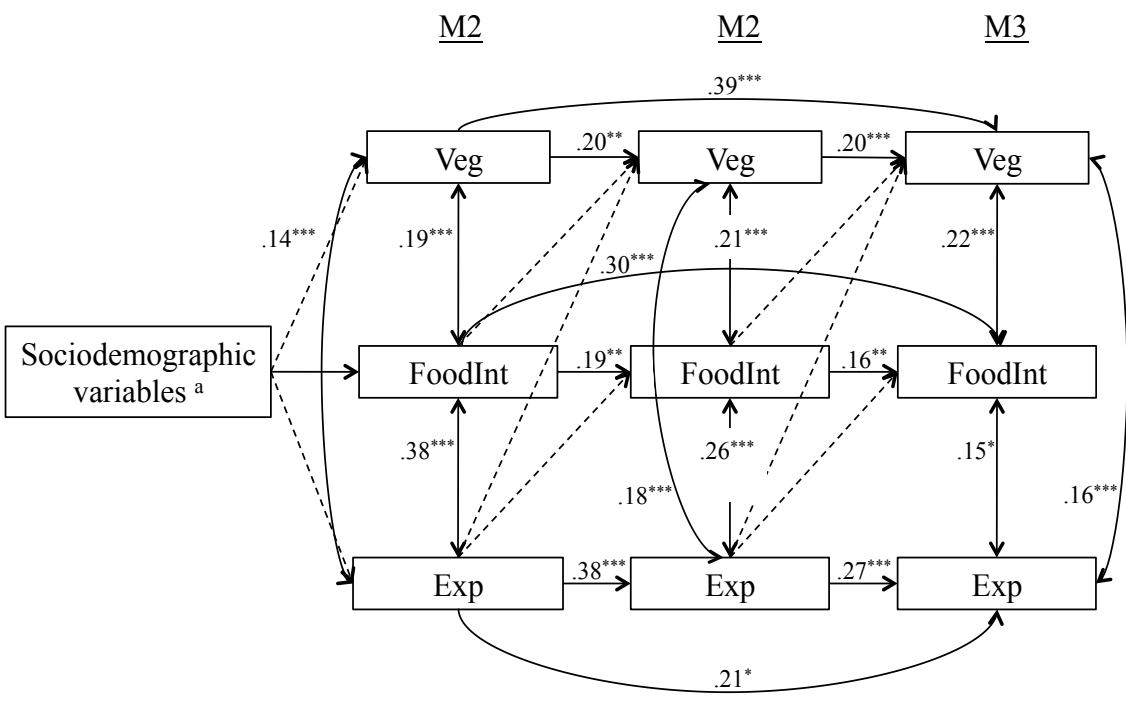
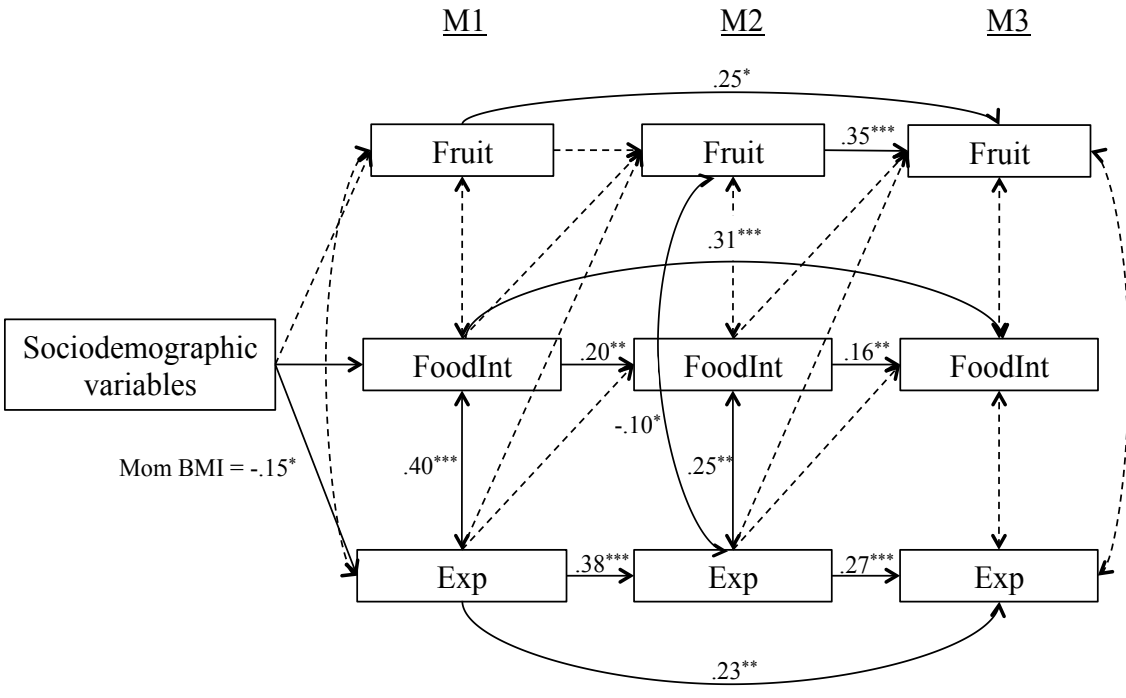


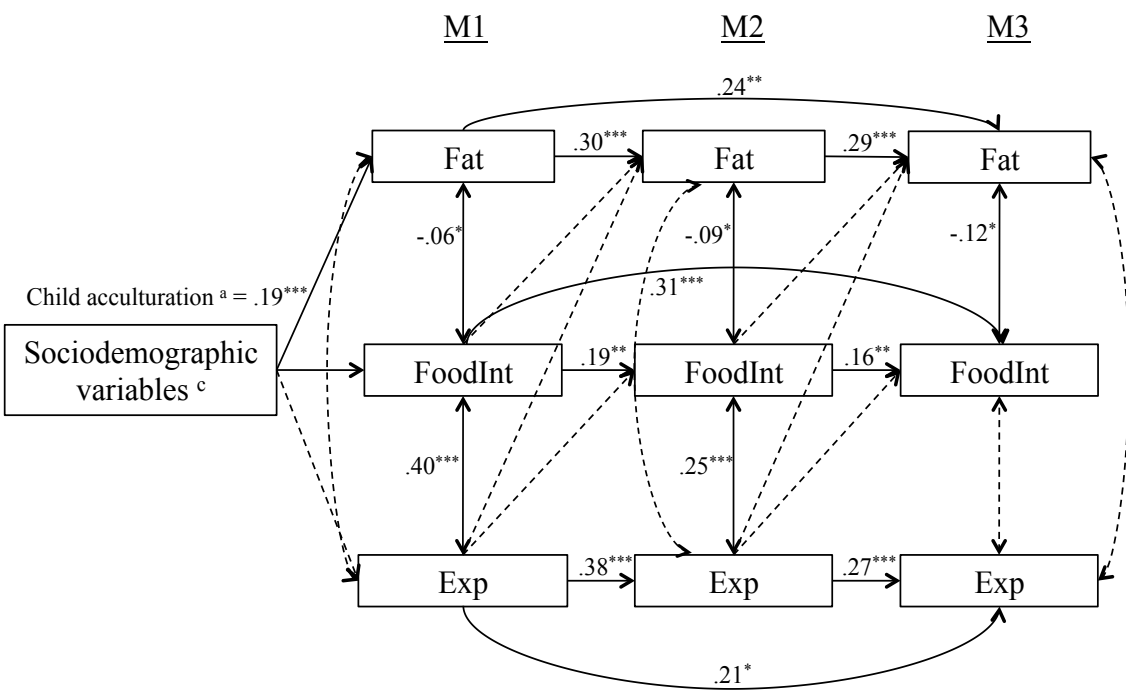
Figure 2-5. Auto-regressive lagged analysis results of family expressiveness and interactions around food with the percent of grocery dollars spent on fruits and vegetables among mothers with (a) assimilated and (b) bicultural children. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. The bolded line indicates a paths of primary interest in the current study. Standardized coefficients are shown. \$FV = percent of grocery dollars spent on fruits and vegetables, FoodInt = interactions around food, Exp = expressiveness. (a) N=74, CFI: 0.83, RMSEA: 0.08, SRMR: 0.13; (b) N=88, CFI: 1.00, RMSEA: 0.00, SRMR: 0.08. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.



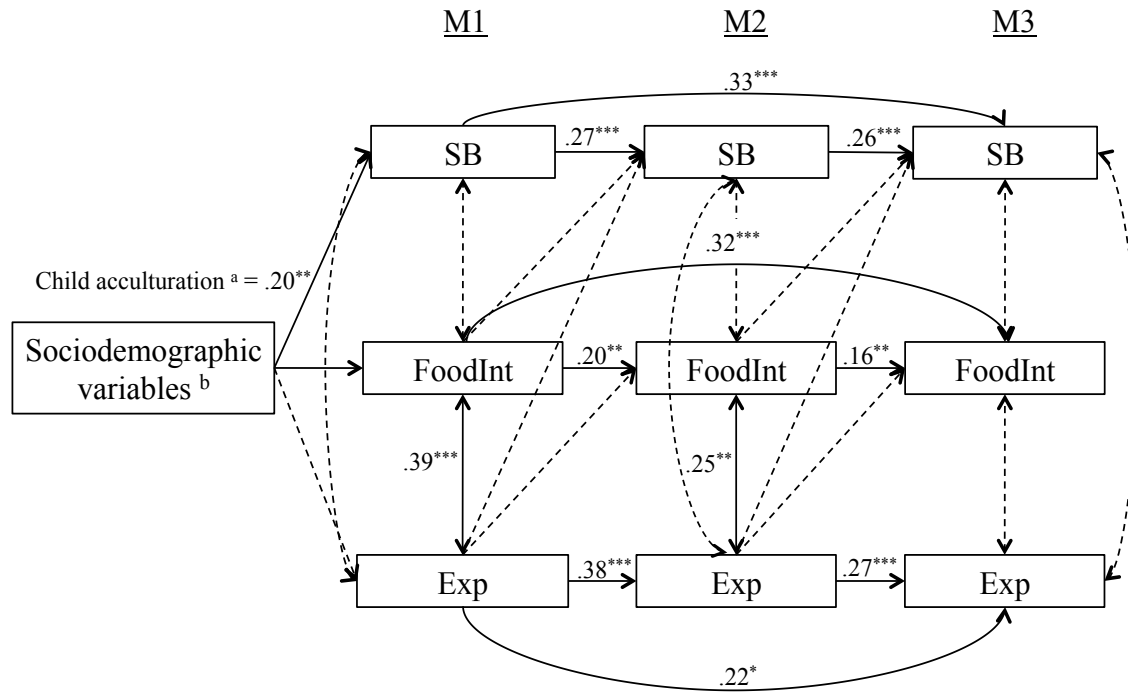
Supplement Figure 2-1. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily vegetable servings. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. Standardized coefficients are shown. FoodInt: interactions around food; Exp: expressiveness. N=162; CFI: 0.94, RMSEA: 0.03, SRMR: 0.07. ^a All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.



Supplement Figure 2-2. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily fruit servings. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. Standardized coefficients are shown. FoodInt = interactions around food, Exp = expressiveness. N=162, CFI: 0.85, RMSEA: 0.05, SRMR: 0.08. ^a All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.



Supplement Figure 2-3. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' calories from fat. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. Standardized coefficients are shown. FoodInt = interactions around food, Exp = expressiveness. N=162, CFI: 0.96, RMSEA: 0.03, SRMR: 0.07. ^a Assimilated vs. bicultural, ^c All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.



Supplement Figure 2-4. Auto-regressive lagged analysis results of family expressiveness and interactions around food with mothers' daily sugary beverage servings. Solid lines indicate statistically significant paths, dashed lines indicate non-significant paths. Standardized coefficients are shown. FoodInt = interactions around food, Exp = expressiveness. N=162, CFI: 0.84, RMSEA: 0.06, SRMR: 0.08. ^a Assimilated vs. bicultural, ^b All sociodemographic variables associated with interactions around food. * $p \leq 0.05$; ** $p \leq 0.01$, *** $p \leq 0.001$.

Table 2-1. Correlations and descriptive statistics among family environmental variables and mothers' dietary intake and behaviors (N = 162; Continued)

	Mothers' dietary intake and behaviors														
	Daily fruit intake			Daily vegetable intake			Daily sugary beverage intake			% Calories from Fat			Weekly away-from-home eating		
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
	Correlations														
Diet M1 ^a	1.00			1.00			1.00			1.00			1.00		
Diet M2 ^a	.04	1.00		.21 [*]	1.00		.37 [*]	1.00		.28 [*]	1.00		.47 [*]	1.00	
Diet M3 ^a	.30	.31 [*]	1.00	.45 [*]	.28 [*]	1.00	.42 [*]	.32 [*]	1.00	.31 [*]	.39 [*]	1.00	.16	.24 [*]	1.00
FoodInt M1	.13	-.08	.13	.32 [*]	.01	.19 [*]	-.05	-.03	.03	-.29 [*]	-.16	-.18 [*]	-.20 [*]	-.27 [*]	-.03
FoodInt M2	.17 [*]	.10	.12	.20 [*]	.21 [*]	.20 [*]	-.02	-.17 [*]	-.11	.03	-.03	.01	.01	-.12	.03
FoodInt M3	.02	-.11	-.02	.12	-.08	.16	.08	-.04	-.05	-.14	-.14	-.14	-.22 [*]	-.34 [*]	.06
Exp M1	.06	-.09	.08	.21 [*]	.08	.13	-.18 [*]	-.11	-.13	-.17 [*]	-.16	-.07	-.10	-.10	-.07
Exp M2	.07	-.07	.03	.17 [*]	.16	.11	-.04	-.03	-.16	.01	-.03	.00	.00	-.04	-.01
Exp M3	-.10	-.00	-.21 [*]	.00	-.06	.14	-.05	-.21 [*]	-.03	-.07	-.09	-.03	-.16 [*]	-.15	.04
	Descriptive statistics														
N	162	147	144	162	147	144	162	146	144	159	145	143	162	147	144
Mean	1.47	1.46	1.40	1.15	1.31	1.51	1.72	1.58	1.51	31.74	31.06	31.05	3.28	2.80	2.62
SD	1.72	1.65	1.16	0.93	1.00	1.11	1.35	1.18	1.01	5.38	4.43	3.82	2.96	2.70	1.99
	Family environmental variables														
	FoodInt M1		FoodInt M2		FoodInt M3		Exp M1		Exp M2		Exp M3				
	Correlations														
FoodInt M1	1.00														
FoodInt M2	.32 [*]		1.00												
FoodInt M3	.41 [*]		.21 [*]		1.00										
Exp M1	.42 [*]		.25 [*]		.19 [*]		1.00								
Exp M2	.30 [*]		.33 [*]		.05		.44 [*]		1.00						
Exp M3	.29 [*]		.25 [*]		.24 [*]		.33 [*]		.28 [*]		1.00				
	Descriptive statistics														
N	162		146		144		162		146		144				
Mean	3.21		3.32		3.34		3.55		3.61		3.60				
SD	0.85		0.71		0.69		0.60		0.48		0.50				

Note: FoodInt=mother-reported family interactions around food, scores range from 1-5, higher scores indicate more positive interactions; Exp=mother-reported family expressiveness, scores range from 1-4, higher scores indicate greater expressiveness; M1=baseline; M2=post-baseline; M3=10 months post-baseline; % spent on fruits and vegetables was only measured at M1 and M3

^a Correlations between the diet variable indicated in the column header
* $p \leq 0.05$

Table 2-2. Means and standard deviations of mothers' dietary and family environment variables stratified by children's acculturation group

Variables stratified by time-point and children's acculturation						
	Baseline		4 months		10 months	
	<i>n</i>	<i>Mean (SD)</i>	<i>n</i>	<i>Mean (SD)</i>	<i>n</i>	<i>Mean (SD)</i>
<i>Mothers' dietary intake and behaviors</i>						
Daily servings of fruit						
Child bicultural	88	1.36 (1.41)	80	1.52 (1.90)	78	1.44 (1.25)
Child assimilated	74	1.61 (2.02)	67	1.39 (1.30)	66	1.36 (1.04)
Daily servings of vegetables						
Child bicultural	88	1.25 (1.11)	80	1.32 (1.13)	78	1.61 (1.19)
Child assimilated	74	1.03 (0.65)	67	1.31 (0.82)	66	1.39 (1.01)
Daily servings of sugary beverages						
Child bicultural	88	1.49 (1.00)*	79	1.47 (1.18)	78	1.27 (0.86)*
Child assimilated	74	1.98 (1.64)*	67	1.72 (1.18)	66	1.80 (1.10)*
Percent calories from fat						
Child bicultural	85	30.77 (3.46)*	79	30.86 (3.50)	77	30.74 (3.84)
Child assimilated	74	32.86 (6.83)*	66	31.31 (5.36)	66	31.42 (3.79)
Weekly away-from-home eating						
Child bicultural	88	2.98 (2.09)	80	2.78 (2.22)	78	2.55 (2.09)
Child assimilated	74	3.64 (3.73)	67	2.82 (3.20)	66	2.70 (1.89)
Percent of weekly grocery dollars spent on fruits and vegetables						
Child bicultural	88	32.03 (13.25)			78	35.55 (14.03)*
Child assimilated	74	30.05 (13.35)			65	29.39 (9.10)*
<i>Family environment</i>						
Family interactions around food ^a						
Child bicultural	88	3.32 (0.86)	79	3.44 (0.65)*	78	3.40 (0.61)
Child assimilated	74	3.07 (0.83)	67	3.19 (0.75)*	66	3.28 (0.78)
Family expressiveness ^b						
Child bicultural	88	3.60 (0.54)	79	3.69 (0.44)*	78	3.70 (0.44)*
Child assimilated	74	3.49 (0.66)	67	3.53 (0.51)*	66	3.48 (0.54)*

Note: SD = standard deviation

^a Scores range from 1-5 with higher scores indicating more positive interactions

^b Scores range from 1-4 with higher scores indicating greater expressiveness

* Statistically significant differences between mothers with assimilated versus bicultural children ($p \leq 0.05$) based on independent samples t-tests

REFERENCES

1. Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):624-635. e6.
2. Creighton MJ, Goldman N, Pebley AR, Chung CY. Durational and generational differences in Mexican immigrant obesity: is acculturation the explanation? *Soc Sci Med*. 2012;75(2):300-310. doi: 10.1016/j.socscimed.2012.03.013 [doi].
3. Akresh IR. Dietary assimilation and health among Hispanic immigrants to the United States. *J Health Soc Behav*. 2007;48(4):404-417.
4. Sallis JF, Owen N, Fisher EB. Ecological models of health behavior. *Health behavior and health education: Theory, research, and practice*. 2008; 4:465-485.
5. Satia JA. Diet-related disparities: understanding the problem and accelerating solutions. *J Am Diet Assoc*. 2009;109(4):610-615. doi: 10.1016/j.jada.2008.12.019 [doi].
6. Galanti G. The Hispanic family and male-female relationships: an overview. *J Transcult Nurs*. 2003;14(3):180-185.
<http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2003103214&site=ehost-live>.
7. Sliwa SA, Must A, Peréa F, Economos CD. Maternal employment, acculturation, and time spent in food-related behaviors among Hispanic mothers in the United States. Evidence from the American Time Use Survey. *Appetite*. 2015;87:10-19.
<http://search.proquest.com/docview/1664222030?accountid=14524>. doi: <http://dx.doi.org/10.1016/j.appet.2014.10.015>.
8. Bavelas JB, Segal L. Family systems theory: Background and implications. *J Commun*. 1982;32(3):99-107.
9. Coveney J. What does research on families and food tell us? Implications for nutrition and dietetic practice. (Review Article). *Nutrition & Dietetics: The Journal of the Dietitians Association of Australia*. 2002;59(2):113-120.
10. Moos RH, Moos BS. *Family environment scale manual*. Consulting Psychologists Press; 1994.

11. Fisher L. Research on the family and chronic disease among adults: Major trends and directions. *Families, Systems, & Health*. 2006;24(4):373.
12. Kintner M, Boss PG, Johnson N. The relationship between dysfunctional family environments and family member food intake. *Journal of Marriage and the Family*. 1981:633-641.
13. Djuric Z, Cadwell WF, Heilbrun LK, et al. Relationships of psychosocial factors to dietary intakes of preadolescent girls from diverse backgrounds. *Maternal & child nutrition*. 2006;2(2):79-90.
14. Schmied EA, Parada H, Horton LA, Madanat H, Ayala GX. Family support is associated with behavioral strategies for healthy eating among Latinas. *Health Educ Behav*. 2014;41(1):34-41. doi: 10.1177/1090198113485754 [doi].
15. Schafer RB, Schafer E, Dunbar M, Keith PM. Marital food interaction and dietary behavior. *Soc Sci Med*. 1999;48(6):787.
16. Smokowski PR, Rose R, Bacallao ML. Acculturation and Latino family processes: How cultural involvement, biculturalism, and acculturation gaps influence family dynamics. *Family Relations: An Interdisciplinary Journal of Applied Family Studies*. 2008;57(3):295-308.
<http://search.proquest.com/docview/622038031?accountid=14524>. doi:
<http://dx.doi.org/10.1111/j.1741-3729.2008.00501.x>.
17. Telzer EH. Expanding the acculturation gap-distress model: An integrative review of research. *Hum Dev*. 2011;53(6):313-340.
<http://search.proquest.com/docview/858288426?accountid=14524>. doi:
<http://dx.doi.org/10.1159/000322476>.
18. Miranda AO, Bilot JM, Peluso PR, Berman K, Van Meek LG. Latino families: The relevance of the connection among acculturation, family dynamics, and health for family counseling research and practice. *The Family Journal*. 2006;14(3):268-273.
19. Soto SH, Arredondo EM, Marcus B, Shakya H, Roesch S, Ayala GX. Effects of Latino children on their mothers' dietary intake and dietary behaviors: the role of children's acculturation and the mother-child acculturation gap. *Manuscript revised and resubmitted for publication*. 2017.
20. Ayala GX, Ibarra L, Arredondo E, et al. Promoting healthy eating by strengthening family relations: design and implementation of the Entre Familia: Reflejos de Salud intervention. *Cancer Disparities: Causes and Evidence-Based Solutions*. Springer US. 2011:237-252.

21. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences*. 1987;9(2):183-205.
22. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. *J Am Diet Assoc*. 2002;102(12):1764-1772.
23. Rockett HR, Wolf AM, Colditz GA. Development and reproducibility of a food frequency questionnaire to assess diets of older children and adolescents. *J Am Diet Assoc*. 1995;95(3):336-340.
24. Willett WC, Sampson L, Stampfer MJ, et al. Reproducibility and validity of a semiquantitative food frequency questionnaire. *Am J Epidemiol*. 1985;122(1):51-65.
25. Larson N, Harnack L, Neumark-Sztainer D. Assessing dietary intake during the transition to adulthood: a comparison of age-appropriate FFQ for youth/adolescents and adults. *Public Health Nutr*. 2012;15(04):627-634.
26. Thompson FE, Midthune D, Subar AF, Kipnis V, Kahle LL, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *J Am Diet Assoc*. 2007;107(5):760-767.
27. Ayala GX, Rogers M, Arredondo EM, et al. Away-from-home Food Intake and Risk for Obesity: Examining the Influence of Context. *Obesity*. 2008;16(5):1002-1008.
28. Elder JP, Ayala GX, Slymen DJ, Arredondo EM, Campbell NR. Evaluating psychosocial and behavioral mechanisms of change in a tailored communication intervention. *Health Educ Behav*. 2009;36(2):366-380. doi: 1090198107308373 [pii].
29. Gillespie AH, Achterberg CL. Comparison of family interaction patterns related to food and nutrition. *J Am Diet Assoc*. 1989;89(4):509-512.
30. Bloom BL. A Factor Analysis of Self-Report Measures of Family Functioning. *Fam Process*. 1985;24(2):225-239.
31. Marín G, Gamba RJ. A new measurement of acculturation for Hispanics: The Bidimensional Acculturation Scale for Hispanics (BAS). *Hispanic Journal of Behavioral Sciences*. 1996;18(3):297-316.
32. Berry JW. Immigration, acculturation, and adaptation. *Appl Psychol*. 1997;46(1):5-34.

33. Kuczmariski RJ, Ogden CL, Guo SS, et al. 2000 CDC Growth Charts for the United States: methods and development. *Vital Health Stat 11*. 2002;(246)(246):1-190.
34. Little RJ, Rubin DB. *Statistical analysis with missing data*. John Wiley & Sons; 2014.
35. Muthén L, Muthén B. Mplus: Statistical analysis with latent variables. User's guide (Version 7.11). *Los Angeles, CA: Muthen and Muthen*. 2013.
36. Selig JP, Little TD. Autoregressive and cross-lagged panel analysis for longitudinal data. In: Laursen B, Little TD, Card NA, eds. *Handbook of Developmental Research Methods*. New York, NY: Guilford Press; 2012:265.
37. Yuan K, Bentler PM. Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological methodology*. 2000;30(1):165-200.
38. Bentler PM. Comparative fit indexes in structural models. *Psychol Bull*. 1990;107(2):238.
39. Steiger JH. Structural model evaluation and modification: An interval estimation approach. *Multivariate behavioral research*. 1990;25(2):173-180.
40. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*. 1999;6(1):1-55.
41. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*. 1986;51(6):1173..

CHAPTER 3 .

Exploring how children influence their Latina mothers' diet: Qualitative interviews with mothers of bicultural and assimilated children

ABSTRACT

Background: Social and cultural factors influence dietary intake and behaviors. Research shows that mothers consume a lower quality diet when they have a child who is assimilated to the U.S. culture versus bicultural.

Objective: The purpose of this study was to qualitatively compare and contrast how bicultural and assimilated children influenced their culturally traditional mothers' dietary intake and behaviors.

Methods: Separate one-on-one interviews with 21 Mexican-origin mothers and their bicultural (n=11) or assimilated (n=10) children (10-13 years old) were conducted. Surveys assessing mothers' daily fruit and vegetable intake, and sugary beverages, percent of calories from fat, weekly away-from-home eating, and percent of weekly grocery dollars spent on fruits and vegetables were also collected. Interview and survey data were analyzed separately and then compared between mothers of bicultural versus assimilated children. We used framework analysis to reduce qualitative data to themes and subthemes. Survey data showed that mothers of bicultural children consumed a better quality diet than mothers of assimilated children.

Results: Mothers described several ways that their children's food preferences influenced their diet, cooking, food purchasing, and away-from-home eating.

Furthermore, mothers believed their children's food preferences both influenced and

were influenced by mothers' feeding styles. Mothers of bicultural children described using more "Mexican" (i.e., authoritative) feeding styles that they believed shaped their children's palate into preferring traditional foods. Mothers of assimilated children explained that their children's preference for "American" over culturally traditional foods resulted in their use of more permissive or indulgent feeding styles.

Conclusions: Quantitative research is needed to test and confirm the directionality between feeding styles and child's food preferences. Interventions may need to consider the reciprocal influences between mothers' feeding styles, children's food preferences, and how children influence their mothers' dietary intake and behaviors.

INTRODUCTION

Researchers have known for decades that risk for chronic disease tends to cluster in families¹, and recently, this has also been shown among Latinos.² Shared health behaviors (e.g., diet and physical activity) between family members are among the primary reasons for the clustering observed.³ As with many American adults, most Latinos are not meeting dietary recommendations to adopt eating patterns needed to prevent chronic diseases including cardiovascular disease and cancer.^{4,5} Given that dietary behaviors tend to occur in the presence of others, as in the case of family meals or deciding to eat at a restaurant, previous research has shown that the family is very relevant to understanding the determinants of dietary risk for disease.⁶⁻⁸ However, most research examining the predictors of adults' dietary intake have been limited to those that examine individual level factors.^{7,9,10} The importance of family in the context of dietary behaviors may be particularly relevant to Latinos, given that Latino culture revolves around the family unit and individuals value interdependence with family members over independence.¹¹ To design effective, culturally appropriate dietary interventions for Latino populations, researchers need to explore the social and cultural context in which dietary intake and related behaviors occur.^{6,8}

There is substantial evidence showing the role of parents on children's dietary intake and BMI through parenting and feeding styles, modeling dietary behaviors, and making foods available in the home.¹² For example, among an ethnically diverse sample of 718 parents of children in Head Start programs, children had a lower BMI if their mothers had an authoritative feeding style (i.e., encouraging children to eat while also offering choices based on children's response to foods offered) than if their mothers had a

more indulgent feeding style (i.e., few demands, boundaries, and more freedom around eating).¹³ In a diverse sample of immigrant mothers from Latin America and their children between the ages of 3-12 years old, having an indulgent versus an authoritative feeding style was associated with children consuming fewer servings of whole grains.¹⁴ Feeding styles are one aspect of general parenting style, which can also be described as authoritative (open communication, encouragement of independence, clear boundaries) and indulgent (acceptance toward child without boundaries), among other styles (i.e., authoritative and uninvolved).¹³ Evidence that a parent's feeding style is representative of their general parenting style may explain why parenting styles have been found to have similar associations with child diet outcomes as feeding styles.¹⁵

Although evidence for the importance of parents on their children's diet is abundant, the evidence is limited for the role of children on their Latino parents' dietary intake.⁶ Theories including Social Cognitive Theory,¹⁶ the Ecological Model,¹⁷ and Family Systems Theory¹⁸ suggest that the family context is as relevant to behaviors in adults as in children. Evidence shows that children's food preferences play a role in what mothers cook for their families.⁶ Furthermore, qualitative studies exploring sources of influence on the foods Latina immigrant mothers prepare and consume with their family has identified children's preferences for "American" foods as a basis for conflict with their children and a motivator for keeping traditional foods in the home.¹⁹⁻²³

Another important determinant of Latinas' dietary intake and behaviors is acculturation.^{24,25} Research shows that Latinas who have retained their traditional culture and have not adopted the U.S. culture tend to consume more fruits, vegetables, less salt,

and fewer added sugars and calories from fat than Latinas who have adopted the U.S. culture.²⁵ Studies have also shown that Latinos who have adopted the U.S. culture tend to cook less frequently and eat out more often,^{26,27} contributing to lower quality.^{28,29} Recently, studies have shown that children's acculturation may also influence Latina mothers' dietary intake and behaviors.^{30,31} These studies suggest that even among culturally traditional Latina mothers, having a child who has assimilated to the U.S. (i.e., adopted the U.S. culture and shed traditional culture) is associated with less favorable dietary intake and behaviors in mothers than having a child who is bicultural. Although this evidence suggests that children's acculturation may be important to mothers' diet, we do not know why this is the case or how it occurs.

Building on theoretical models that assert the role of family members on individual's health behaviors, this study used qualitative methods to explore how children influenced their Latina mothers' dietary intake and behaviors. Because research shows that with transition to adolescence, Latino children can be as influential in their parents' cultural socialization as parents are in their children's cultural socialization,³² we collected data from mothers and their children between the ages of 10-13 years. Using qualitative interviews with mothers and their children, and quantitative surveys with mothers, we compared how bicultural versus assimilated children influenced their mothers' dietary intake and behaviors.

METHODS

We conducted semi-structured, one-on-one interviews with mothers and children, and surveys with mothers. Using triangulation, the process of using multiple methods to

observe the same phenomenon, the three sources of data (interviews with mothers and children, and surveys from mothers) were analyzed separately and then combined to provide a more complete understanding of how children impact their mothers' dietary intake and behaviors.³³ This study was approved by San Diego State University's Institutional Review Board.

Participants and sampling

We used purposive convenience sampling to recruit Latina mothers of children between 10-13 years of age from elementary schools, Latino-serving grocery stores, after Spanish-language mass in a Catholic church, and by word of mouth. Most participants lived in Chula Vista, California, located in San Diego County, which is situated near the U.S.-Mexico border. We gave mothers a brief introduction to the study, and if they were interested in participating, they provided their contact information. Interested mothers were contacted via telephone by trained bilingual and bicultural Research Assistants (RA) and screened for eligibility. Mothers were eligible if they: a) had at least one child between 10-13 years old, b) lived with their child at least four days per week to minimize variance of mothers' contact with their children across the sample, c) did not live with anyone who was on a medically prescribed diet to avoid cases where a prescribed diet drove food choices in the home, and d) were culturally traditional based on the Bidimensional Acculturation Scale (BAS).³⁴ Children were eligible if they were within the eligible age range and if they were bicultural or assimilated to the U.S. based on their responses to the BAS. If mothers had more than one child between 10-13 years old, the child with the closest birthdate to the day of the screening was chosen to participate. Eighty-nine mothers were recruited, 58 were ineligible, eight were not reachable (e.g.,

wrong number, disconnected phone line), and two were not interested in participating. Twenty-one mothers were eligible and agreed to participate in the study.

Procedure for data collection

Data were collected by a trained bilingual and bicultural RA in the location of mothers' choice (at home or a local library). The entire assessment protocol, including the interviews and survey, lasted between 60-90 minutes. Surveys were collected prior to conducting the semi-structured interview for several reasons: a) to help cue mothers about a variety of dietary intake and behaviors that she may otherwise forget to discuss in the semi-structured interview,³⁵ and b) to prime mothers to speak about their own dietary intake and behaviors rather than focus on their child's diet. We gave mothers a \$15 gift card for their time. We were flexible with children's needs (e.g., after-school events or homework) by allowing mothers to decide if their children should be interviewed first. Semi-structured one-on-one interviews occurred with the children, typically lasting between 15-20 minutes. Children were given their choice of a variety of school supplies as an incentive for participation. Although mothers were usually interviewed without children present, it was not always possible to interview children without the mother nearby (n=9 bicultural children and n=4 assimilated children were not interviewed alone).

Quantitative data

Mothers responded to sociodemographic questions and a survey on their dietary intake and behaviors. Daily intake of fruit and vegetable (excluding French fries, potatoes, and beans/legumes) consumption was assessed using the 19-item National Cancer Institute (NCI) All-Day Screener.³⁶ In the validation study, the correlation between the summary score for the screener and 24-hour dietary recalls among women

were moderate in the validation study ($r = .51$).³⁶ Daily servings of sugary beverages were measured by the 5-item subscale from the Youth/Adolescent Questionnaire (YAQ),³⁷ which was based on the Willett Food Frequency Questionnaire (FFQ).³⁸ In the validation study, the correlation of the sugary beverages subscale between the YAQ and the Willett FFQ in young adults between the ages of 18-31 was .62.³⁹ Mothers' daily percent of calories consumed from fat was estimated by the 16-item NCI Multifactor Fat Screener.⁴⁰ In the validation study, the Fat Screener was moderately correlated with biomarkers of fat in women ($r = .58$).⁴⁰ We obtained the sum of mothers' frequency of consuming foods that were prepared away from home during a typical week in the last month from the following sources: (a) grocery stores, (b) relatives' or friends' homes, (c) fast food restaurants, (d) other restaurants (including take-out), (e) cafeterias, and (f) other outlets including vending machines and on-street vendors.⁴¹ Finally, mothers estimated the percent of grocery dollars spent on fruits and vegetables per week in the past month.

Qualitative data

We developed the semi-structured interview guides, which we then pilot tested with three mothers and their children. The pilot participants were not included in the study sample. The interviews with mothers lasted approximately 30-60 minutes and were conducted in Spanish. Using open-ended questions, the semi-structured interview guide allowed for participants to diverge from the questions to discuss related topics and elaborate on new themes.⁴² During the interview, questions primarily focused on the child participant, though mothers frequently discussed other children when responding to the questions. Interviews were designed to elicit mothers': 1) views about how their

children's food preferences differed or were similar to their own, 2) beliefs about how living in the US versus their country of origin influenced their own and their children's diet, 3) experiences accommodating meal preparation, grocery shopping, and away-from-home eating for their children, 4) views about how their family discussed food and handled food-related conflict, and 5) perspectives on other sources of influence on their dietary intake and behaviors.

Interviews with children were also semi-structured and were conducted in English. Children were asked to discuss their: 1) food preferences, 2) beliefs about traditional Mexican foods, 3) perspectives about potential sources of influence on their diet (e.g., parents, family, friends, school), 4) experiences requesting food purchases, meals, or away-from-home eating from their parents, and 5) family discussions around food.

We used an iterative process, common in qualitative research,⁴³⁻⁴⁵ whereby preliminary data collection and analysis are conducted concurrently, often resulting in modifications to the interview guide to ensure the adequate exploration of emerging themes.^{33,46} By allowing the interview guide to evolve when new insights emerged in early data, we were able to fully explore themes that we had not anticipated when the interview guides were first developed.⁴³ For example, after conducting five interviews, we discovered that children influenced the way mothers cooked or prepared family meals in more ways than we had anticipated. As such, we added several questions and probes to mothers' interviews that reflected themes we heard in the earlier interviews. Examples of how the interview guides were modified include asking about mothers adjusting their meals to suit children who had an athletic event the following day or asking for examples

of how children introduced their mothers to new foods. Interviews were conducted until no new insights were gleaned from new data and saturation of the themes had been reached.⁴⁷ Interviews were audio recorded and transcribed verbatim in the language they were conducted in.

Data analyses

Quantitative and qualitative data were assessed separately and then brought together in a side-by-side comparison to examine how trends in the differences in mothers' dietary intake and behavior data by child acculturation confirmed (or contradicted) the differences found in the qualitative data.³³ Descriptive statistics (e.g., means, frequencies) were computed for sociodemographic and dietary variables in SPSS (version 22; IBM, Armonk, NY). The first author (S.S.), who attended most of the interviews, conducted the analyses. After each set of interviews with a mother and child, S.S. met with the RA who conducted the interviews to discuss initial impressions of the interviews. To become immersed in the content of the interviews, S.S. also listened to the audio of the interviews and identified key themes and subthemes that were used to create an initial codebook. Separate codebooks were created for mothers' and for children's data analyses.

We used framework analysis, a variant of content analysis to analyze the qualitative data.⁴⁸ Data were coded and organized using the qualitative software program, Atlas.ti (Mac v.1.6.0 (1999) Berlin, Scientific Software Development). After the transcripts were coded, codes were hierarchically grouped to reduce the data to themes and subthemes for interpretation. To build a picture of the data collected as a whole,⁴⁸ the themes and subthemes from the mother and child interviews, and mothers' quantitative

data were summarized and compared across respondents. Comparisons were drawn between mothers of assimilated versus bicultural children to assess for similarities and differences across the two groups. To interpret the findings, themes were mapped to describe the phenomena examined (**Figure 3-1**) and used to summarize the findings and link with the original data to explain the findings using participant quotes.⁴⁸

We maximized data validity by triangulating on different sources of data.³³ Quantitative data self-reported by mothers, and one-on-one qualitative interviews with mothers and their children were combined. Illustrative quotes from mothers and children to connect our themes to participants' voices. Several methods described by Graham⁴⁹ were employed to ensure reliability of the data. All transcripts were examined for quality assurance to ensure that they were a verbatim representation of the interviews. The evolution of the codebook was carefully documented and crosschecked with previously coded interviews to ensure the use of stable codes across interviews. Further, to confirm consistency in the coding, a second coder examined a randomly selected 20% of mother and 20% of child transcripts and met with S.S. to discuss discrepancies and come to an agreement on codes and code definitions.

RESULTS

Sample characteristics

Twenty-one mother-child dyads participated in the study, including 11 mothers of bicultural children and 10 mothers of assimilated children. All women were biological mothers of the children interviewed except for one grandmother who was raising her biological grandchild. All mothers of bicultural children were born in Mexico compared to 80.0% of mothers of assimilated children. Most children in our sample were boys

(72.7% bicultural and 60.0% assimilated) and two bicultural children and one assimilated child was born in Mexico (**Table 3-1**).

Mothers' dietary intake and behaviors

Consistent with previous research,^{30,31} mothers of bicultural children generally had a better dietary quality than mothers of assimilated children. Compared to mothers of assimilated children, mothers of bicultural children reported more daily servings of fruits, vegetables, a higher percent of grocery dollars spent on fruits and vegetables, a lower percent of calories from fat, and less frequent away-from-home eating. Conversely, more daily servings of sugary beverages were observed among mothers of bicultural children ($M = 0.9$, $SD = 0.5$) than assimilated children ($M = 0.6$, $SD = 0.5$; **Table 3-1**). Due to the small sample size, statistical analyses were limited. However, we observed a significant difference in means of the frequency of weekly away-from-home eating between the two groups. Mothers of bicultural children consumed away-from-home foods significantly less frequently ($M = 2.4$ days, $SD = 1.5$) than mothers of assimilated children ($M = 4.1$ days, $SD = 2.8$; **Table 3-1**).

Themes found in qualitative interviews with mothers and children

We identified several themes describing how children's food preferences influence mothers' dietary intake and behaviors, and how children's food preferences were related to mothers feeding style (**Figure 3-1**). Because similar themes were found across mother and child interviews, themes from both interviews were combined. In many cases, themes and subthemes that were present in both groups (mothers of bicultural and assimilated children), however they differed in the way that the themes

were expressed or in their frequency. Below, we separate the results by group when these differences occur.

Feeding style and child food preferences

Mothers of bicultural children: Mothers frequently described their feeding style to explain their children's food preferences and behaviors. Mothers of bicultural children explained that with few exceptions, they employed a "Mexican" feeding style to indicate that children were expected to eat what mothers cooked.

He has to adapt to what we eat. That is, he doesn't say 'oh don't buy that because I don't want to eat that.' No. For example, a meal of enchiladas and rice. 'You are going to eat that because that is what we have.' We don't let him eat something different later.

Mothers' attributed shared food preferences with their children to the use of this feeding style. Mothers used the term *acostumbrado/a* (used to) to explain that this method of parenting is why children were *used to* eating what their mothers prepared. In other words, mothers believed that by cooking their traditional Mexican dishes and insisting that children ate what was prepared, they had shaped their children's palate to prefer these foods.

They often ask me to make salmon, they like salmon a lot with white rice. Or I don't know, tacos dorados [fried tacos]. They ask for simple things, sometimes they even ask for lentils with taquitos and fresh cheese or things like that because I've gotten them used to it.

When we asked a mother of a bicultural child how she considers her child's food preferences when making food for her family, she said:

My children are the type that eat everything because I've always cooked and so since they were little I've gotten them used to eating what I cook.

When asked if she has ever wished that her parents purchased the foods she saw on television, one bicultural child said:

Um no cause I kinda grew up eating the foods that my parents make.

While bicultural children also enjoyed “American” foods including pizza and hamburgers, their mothers would only indulge these food cravings on occasion, limiting their exposure to non-traditional foods. Additionally, although some bicultural children disliked certain foods (e.g., onion), mothers explained that overall, they did not have difficulty cooking for their family because everyone liked the same things.

I have always done the cooking and I see that my children prefer what I cook for them. And so I prepare what I see that they like and what pleases them.

Having children who preferred their mothers’ traditional cooking meant that mothers could freely continue to cook and grocery shop as they wished, with few food-related conflicts with their children.

Mothers of assimilated children: In contrast to mothers of bicultural children who believed that their feeding style shaped their child’s food preferences, mothers of assimilated children believed that their child’s food preferences influenced their feeding style. Although three mothers of assimilated children also said they employed a traditional “Mexican” feeding style, many reported being less assertive and more indulgent and permissive with their children. Examples of indulgent and permissive feeding styles included preparing family meals that were liked by children but not by mothers (e.g., spaghetti) or allowing children to consume a separate meal than what was

prepared for the family. Two mothers explained that the reason they did not use a traditional “Mexican” feeding styles was because they did not want to parent their children the way their mothers parented them. These mothers (the only two that were born in the U.S. in our sample) said they did not want to be strict about food and eating with their children.

There were times when I wouldn't want to eat and my mom would say, 'you have to eat it' but she wouldn't explain why you have to eat it. Because you're going to grow, it will energize you, things like that. So then ok I would eat it but I would almost throw up. So remembering all that, how my mom would force me to eat, well I don't want to do that with my kids, right?

Mothers described their assimilated children's food preferences as being different from their own. As a result, food-related conflicts were common between mothers and children, discussed in 80% of interviews. Mothers also expressed unpleasant situations because their children disliked their cooking and conveyed a lack of control in their ability to feed their families.

Sometimes I don't even know what to make. I don't even know what to remove, what to add. I just feel frustrated.

Four mothers were concerned that if they did not give in to their children's food preferences, they would not eat.

I fulfill his food cravings or else he won't eat! So I try to make what they like and well I eat it with them because if I make what I like they won't want to eat.

How children influenced what their mothers cooking and prepared

While mothers explained that their feeding styles shaped their children's food preferences, mothers also described how their children's food preferences influenced what foods mothers cooked and prepared. Although the following themes and subthemes were found across both acculturation groups, the similarities and differences in mother-child food preferences influenced how these themes manifested across mothers of bicultural versus assimilated children.

Mothers acquiesced to their children's food preferences when cooking or preparing meals in a number of ways: 1) mothers used children's food preferences to decide what to cook or prepare, 2) mothers changed the way foods were prepared to children's liking, 3) mothers included foods or meals because their children preferred them, and 4) mothers limited or excluded foods because their children disliked them.

Mothers used children's food preferences to decide what to cook or prepare

When deciding what to prepare for their families, it was common for mothers to base their decision on what their children preferred to eat. This influence often came in the form of mothers asking their children for suggestions. Children also said that mothers frequently prepared the foods they liked, sometimes without having to ask their mothers for them.

Mothers of bicultural children: This subtheme was heard in 55% of mothers of bicultural children. Among these mothers, the whole family usually shared the same food preferences; therefore mothers' dietary intake remained stable. For example, when asked if she ever cooked anything only because her daughter preferred it, this mother of a bicultural child said:

Well usually when she asks for something special, we generally all like it. Father, mother, and my other child. It's not like it's special just for her.

Although many mothers said they at least occasionally consider their children's food preferences when cooking, many mothers also insisted that the decision on what to prepare for their family was ultimately theirs. Nearly all (91%) mothers of bicultural children indicated that they do not always change their cooking based on their child's preferences.

Mothers of assimilated children: This subtheme was heard in 70% of mothers of assimilated children. Mothers of assimilated children said they chose meals (e.g., spaghetti) because they knew their children would eat them, even if mothers did not prefer the meal. The following quote comes from a mother of an assimilated child who was asked how her child's food preferences influence her diet:

Well I think it changes because we want them to remain happy with the family so that they'll eat. Or else they won't eat and we want them to eat. Do you understand? Like we want that they eat so we eat what they eat.

Most (80%) mothers of assimilated children gave examples of how they do not change how they cook for their child. The following quote comes from a mother of an assimilated child:

I don't necessarily [change the way I cook] for her or for the other one. I am a mother who likes to spoil them but I don't depend on them to decide what to cook.

Mothers changed the way foods were prepared to children's liking

Approximately one third of mothers across both groups described changing the way they prepared foods to suit their children's preferences and in some cases their

children's needs. For example, mothers said they would cook lighter, healthier dishes the night before their child participated in a sports game and a heavier dish after the game. Mothers also said they would choose to fry meat, chicken, or fish instead of preparing it using another method because they knew this was how their child preferred to eat it. For instance, a mother of a bicultural child explained:

I cook in the way that I know they will eat the best. For example, because they prefer things breaded, I make things breaded so they'll eat better.

Mothers included foods or meals because their children preferred them

About 70% of all mothers explained that the primary reason they ate take-out pizza, cooked spaghetti dinners, baked sweets with their child, or included other foods was because of their children's preferences for these foods. In each case, mothers said they would probably not eat these foods if their child did not ask for them.

Mothers limited or excluded foods because their children disliked them.

Mothers across both groups often reported limiting the amount of hot spices used in their cooking, eliminating certain foods including *nopales*, or sometimes making a dish without vegetables to please their children.

Mothers of bicultural children: While mothers in both groups reported limiting or excluding foods because their children disliked them, this was less common among mothers of bicultural children (27%).

Mothers of assimilated children: This theme was heard from 60% of mothers of assimilated children. Assimilated children also acknowledged that their mothers eliminated the foods they did not like including cauliflower and fish. These mothers also

said they cut back on making certain meals including soups, stuffed peppers, or fish because their children did not like them. A mother of an assimilated child explained:

For example, stuffed pepper [chile relleno] is too spicy for them with green salsa [chile], he won't try it and won't eat it. I love it, I used to make it once a month but now twice a year... Also the mole because he doesn't like Mexican spice, he likes the kind of spice that he wants. I'm talking about chicken wings but with the hot sauce that they love, 'oh this is delicious' and they lick their fingers. But if it tastes like Mexican food and it has too much pepper [chile], that's it. They won't eat it. So really, I've stopped making it as frequently. I'll make it if I'm craving it but I don't include it into my menu of meals.

How mothers did not allow children to influence what mothers cooked and prepared

While the subthemes above describe how children's food preferences influenced what mothers cooked and consumed, mothers also employed several methods of avoiding having to change how and what they cooked because of their children's food preferences. The subthemes were 1) children had to eat what the mothers prepare, 2) children chose what goes on their plate or put aside the foods they did not like, 3) mothers disguised foods that children disliked, 4) children cooked/prepared meals for themselves, and 5) mothers cooked separate meals for children.

Children had to eat what the mothers prepare.

Mothers of bicultural children: The expectation that children have to eat what their mothers serve was described in nearly half of the interviews with mothers of bicultural children. Children explained that when their mothers cooked their least favorite meals their response was that they "just ate it." However, some bicultural children did not typically encounter this situation because they usually enjoyed all of the meals their mothers prepared.

Uh, well I really don't have a least favorite. Like I eat everything that they give me. I just eat it, but sometimes I don't like it. But I don't really have a least favorite.

Mothers of assimilated children: This theme was only discussed in a third of interviews with mothers of assimilated children. In many cases, mothers described using one or more of the methods described below to avoid changing what they cooked for their children's preferences.

Children chose what goes on their plate or put aside the foods they did not like

Mothers of bicultural children: Another solution to keep from adjusting meals to suit their children was to allow children to choose what foods go on their plate or put aside the foods they dislike. However, this subtheme was not common among bicultural children (27%).

Mothers of assimilated children: Sixty percent of mothers of assimilated children discussed allowing children to choose what goes on their plate because their children were also more likely to dislike the foods prepared by their mothers.

Mothers disguised foods that children disliked

If the food item that the child disliked was essential to the meal, including onion, garlic, and celery, mothers across both groups used methods of disguise to maintain the integrity of the recipe (27% of mothers of bicultural versus 20% of assimilated children). Common methods of disguise included finely dicing the ingredient or blending the ingredients so they would be indistinguishable from each other.

Children cooked/prepared meals for themselves

Mothers of bicultural children: This theme was not heard among mothers of bicultural children.

Mothers of assimilated children: The most extreme measures mothers took to keep their children's food preferences from disrupting on their cooking was to allow children to make their own meals or preparing separate meals for children. Half of mothers of assimilated children described allowing their children to make their own meals. The following quote comes from a mother who said she has frequent conflicts with her son around food:

So he ends up mad but at the end of the day. He knows he either has to eat that food or he has to make something... Sometimes I say ok, don't eat it and make yourself something else. It's not like 'ok, what do you want?' No, it's fine if you don't like it. Make yourself a sandwich. He doesn't use the stove but he can make a sandwich, a hotdog, something fast. But I'm not going to cook for each person.

Mothers cooked separate meals for children

Mothers of bicultural children: Approximately 40% of mothers of bicultural children described instances where they made separate dishes for their children. These mothers said that they often cooked separate meals to do something special for their children. For example, one mother would occasionally make boxed macaroni and cheese for her children as a treat. Meanwhile, she prepared something separate for herself and her husband.

Mothers of assimilated children: As with mothers of bicultural children, 40% of mothers of assimilated children described cooking separate meals for children. However, mothers explained that they usually prepared separate meals because their children did not like what mothers had prepared.

How children influenced their mothers' food purchases

Children primarily influenced the foods mothers purchased in two ways: mothers either avoided purchasing foods disliked by children or purchased foods because children liked them. Avoiding purchasing foods that children disliked was less common, discussed in about one third of all interviews with mothers than buying foods that children liked, discussed in nearly all interviews.

Avoiding purchasing foods that children disliked

Mothers of bicultural children: Mothers of bicultural children avoided purchasing things like brown rice and lentils because their children would not eat them. However, nearly 40% of mothers of bicultural children also explained that they did not allow their children's dislike of foods to keep them from purchasing them. When these mothers of bicultural children were asked if they purchase foods they know their children do not like, they said:

“Yes, I still buy them... because in the end he eats what I give him.”

“Like beets. He doesn't like them but, because I add them to my smoothie, I still buy them.”

Mothers of assimilated children: Mothers of assimilated children were similar to mothers of bicultural children except that they also reported avoiding purchasing vegetables that they knew their children would not eat.

Purchasing foods because children liked them

Most mothers said they purchased foods because their children liked them. Primary among these foods were fruits. Mothers said they were open to their children choosing whatever fruits they wanted. However, regardless of acculturation, children

asked for and received unhealthy snacks including cookies, chips, candy, and sugary beverages. In most cases, children shared these snacks with their mothers.

How children influenced their mothers' away-from-home eating

Mothers of bicultural children: Mothers of bicultural children discussed eating foods prepared outside the home typically only on Sundays.

Mothers of assimilated children: Mothers of assimilated children explained that they frequently catered to their children's requests for pizza or other types of fast food because they knew their children would eat and enjoy them.

Among all mothers, several common subthemes emerged related to how children influenced mothers' away-from-home eating: 1) children chose the restaurant; 2) mothers shared foods or meals that children ordered; and 3) children were rewarded with away-from-home foods.

Children chose the restaurant

Mothers in both groups explained that children were allowed to choose the restaurant because eating foods from restaurants was an experience meant for the children.

Mothers of bicultural children: Allowing children to choose the restaurant was common among families with a bicultural child (91%), usually because the child would choose a restaurant favored by the rest of the family.

Mothers of assimilated children: Sixty percent of mothers with an assimilated child discussed allowing their child to choose the restaurant. One reason why mothers let

their child choose the restaurant was because their child would otherwise not like the restaurant their parents chose:

Which ones do we go to? Like IHOP, Denny's, rarely Applebee's, Chili's... I hardly take them to Mexican restaurants because some eat and others don't.

Mothers shared foods or meals that children ordered

Nearly 30% of mothers of bicultural children and 40% of mothers of assimilated children said they allowed their children to choose a meal (e.g., pizza) or food (e.g., desert) that was going to be shared among family members. The following quote is from a mother of a bicultural child:

The children decide, well he decides. And we give them the option to decide on the weekend. The weekend is theirs because during the week, it's true, I am very strict about what they eat.

In other cases, mothers across both groups said trying their child's food led to mothers discovering a new favorite food (e.g., barbecued ribs). The following is a quote from a mother of a bicultural child:

I eat the boneless- I really liked those. Is that what they're called? The little chicken with buffalo or something like that. And although it irritates my stomach I eat them. I don't eat a lot but yes, he was like 'try them mom' and I ate one and oh yes I liked them and the next time 'ok order the little chicken that you ordered the other day.'

Mothers of bicultural children: Nearly all (91%) mothers of bicultural children also said that they would try their children's food or sometimes finish their plate because they often enjoyed the same foods as their children.

Mothers of assimilated children: Trying the food children ordered was less common among mothers of assimilated children (60%) because children often chose foods that mothers did not prefer.

Children were rewarded with away-from-home foods

Another way that children influenced their mothers' eating was with being rewarded for school-related accomplishments. Forty-five percent of mothers of bicultural and 60% of mothers of assimilated children discussed using food as a reward. Typical methods of rewarding children included buying ice cream and taking children to their favorite restaurants.

Other sources of influence on mothers' dietary intake and behaviors

During the interviews, mothers described other sources of influence on their dietary intake and behaviors. These included spouses, other children, household income, health programs at child's school, and themselves.

Spouses

Spouses were often cited as an important source of influence on mothers' cooking. For example, mothers said they cooked more red meat than they would otherwise because their husband preferred it. Approximately one third of all mothers also explained that their spouses were often more indulgent with their children than they were, overriding their parenting.

My husband is more like let them be kids. If they want sweets give them sweets. If they want chocolate, give them chocolate... but my husband goes 'don't be that strict and let them be kids; tomorrow they're worry and they'll decide if they want to eat it or not.'

Mothers of assimilated children: In two cases, mothers of assimilated children described how they were the only ones in the family that wanted to consume traditional Mexican food while their husbands and children were united in preferring American foods. For example, one mother of an assimilated child whose husband was non-Latino white said:

I adjusted to their food because before when I wanted to make my things and then theirs, there would be too much food that wouldn't even fit in the refrigerator... So if my husband and my son made food they liked and I made what I like, things from my hometown, then there would be two different dinners for all. So if I made pork in salsa verde, refried beans, and rice, all Mexican, but they made pizza with pasta, which doesn't even go with my food. So little by little I started adapting more to American food. Every now and then I'll cook Mexican food and sometimes they eat it and sometimes they don't.

Other children

Mothers of bicultural children: Mothers with multiple children often discussed the influences of other children on their dietary intake and behaviors. Mothers of bicultural children explained that the whole family typically liked the same foods, making it easier to plan meals.

Mothers of assimilated children: Mothers of assimilated children cited difficulty handling all of their children's different food preferences. A couple of these mothers explained that they served as the "taxi" for their children by purchasing foods from a number of different fast food restaurants to suit each child's preferences.

Household income

Limited household income was discussed as an important source of influence in purchasing foods at the grocery store or purchasing away-from-home foods among 36% of mothers of bicultural and 20% of mothers of assimilated children. Mothers explained

that one main reason for purchasing the snacks children requested in grocery stores was having enough money. Some mothers also said their family rarely ate at restaurants because they could not afford to do so. For example, families often chose buffet restaurants over restaurants with a menu because buffet restaurants were more economical. Some mothers with large families said they could not afford to take their children to restaurants and instead brought home fast food or pizza as an alternative. Bicultural children also understood that their family's financial resources were limited by finding cheaper alternatives at the grocery store or insisting that the family stay home rather than go out to eat to avoid spending the money.

Mothers as the most important source of influence

Mothers of bicultural children: Over half (55%) of mothers of bicultural children believed mothers were the most important sources of influence on mothers' dietary intake and behaviors. These mothers explained that because they were in charge of purchasing foods and feeding their family, they were ultimately responsible for their own diet. Several mothers identified culture as a source of influence. For example, a mother of a bicultural child said that the reason she cooks the way she does is primarily because that is the way her mother cooked.

Mothers of assimilated children: Forty percent of mothers of assimilated children said they were their most important source of influence. Some mothers of assimilated children acknowledged that their cooking had changed as a result of living in the US because they were more susceptible to consuming away-from-home foods, preparing meals using pre-cooked foods, consuming more fried foods, and fewer vegetables:

It's easier here [in the US] to cook things faster. Even pizza, you put it in the oven and it's done. They make it easy for you to warm foods up in microwaves, I usually don't buy those but I just started to try the little bags that come with everything prepared like pasta with broccoli. And I do make spaghetti.

DISCUSSION

Recent evidence has shown that even among traditional mothers, dietary intake and behaviors vary according to children's acculturation.^{30,31} The purpose of our study was to explore how and why this may occur. In our sample of traditional, predominantly Mexican-origin mothers, we found differences in feeding styles, children's food preferences, and how children influenced their mothers' diet, cooking, food purchasing, and away-from-home eating across children's acculturation status. These qualitative results were supported by the survey results showing that mothers of bicultural children mostly consumed a better diet quality than mothers of assimilated children. We also found evidence of bidirectional influences between mothers and children. For example, some mothers explained that mothers' feeding styles influenced children's food preferences and others said that children's food preferences influenced feeding styles. In all cases, participants reported that children's food preferences influenced mothers' diet. Our study extends previous research on the active role that mothers play in their children's diet and preferences¹² by exploring how children's food preferences may link back to mothers' diet.

Although we did not intend to explore mothers' feeding styles, the differences in feeding styles by mothers of bicultural versus assimilated children suggested a potentially important precursor to children's food preferences. Mothers of bicultural children

described using a more traditional, “Mexican” feeding style that may correspond to an authoritative style that encourages eating using non-directive and nurturing behaviors.⁵⁰ Mothers who employed this feeding style frequently cooked traditional foods that they typically expected their children to consume, and thus created a palate for these foods among their bicultural children. Additionally, these mothers limited their children’s exposure of non-traditional foods, creating an environment focused on traditional foods. Our findings suggest that an authoritative feeding style may be how children come to prefer the same traditional foods as their mothers, making it easier for mothers to maintain their traditional diet. Thus, addressing mothers’ feeding style may be a promising approach to improve child food preferences and indirectly, improve mothers’ diet in future interventions.

On the other hand, mothers of assimilated children often described using a more permissive and indulgent feeding style and frequently described limiting or excluding foods disliked by their children, allowing non-traditional foods into their home, and consuming away-from-home foods to appease their children’s food preferences. An authoritative feeding style has been associated with more favorable diet and BMI outcomes in children than a permissive and indulgent feeding style.⁵¹ Mothers frequently described scenarios where they were not in control of their child’s feeding, which may have lowered their self-efficacy to prepare and consume better quality foods. Interventions may benefit from empowering mothers at the dinner table.

For dietary interventions to be effective, mothers of assimilated children may benefit from strategies that increase their knowledge about the nutritional content of non-

traditional foods,¹⁰ increase their self-efficacy for preparing meals that will be enjoyed by all family members,^{10,52} and increase their self-efficacy for establishing and enforcing food rules, elevate their role as superior to children, and gain control at the dinner table.⁵³ In light of some mothers' opposition to using a more demanding feeding style due to their own childhood experiences, care must be given to distinguish between authoritarian (encourage eating with demanding, directive, and unsupportive behaviors) versus authoritative (encourage eating with non-directive, nurturing and responsive behaviors) feeding styles.¹³ Quantitative research can also help elucidate some of our findings and control for potential confounders. For example, more mothers of bicultural children had low monthly household incomes than mothers of assimilated children, which may have limited their ability to purchase away-from-home foods. Thus, future studies should examine how child acculturation is associated with mothers' diet across levels of household income. Longitudinal research is also needed to investigate differences in feeding styles by child acculturation to: a) determine directionality, and b) examine how feeding styles indirectly relate to mothers' dietary intake and behavior. Finally, our study described the experiences of mothers of children in late childhood/early adolescence. Given that food preferences are established around age five⁵⁴ and external influences begin to impact children around age six,⁵⁵ interventions may be more effective if conducted with mothers of young children.

Though the literature is limited, a review found that feeding styles are generally indicative of general parenting styles.¹⁵ Mothers with more permissive and indulgent feeding styles may also have a more permissive style of parenting in general, which prompts a broader question: are mothers with a more permissive parenting style

“allowing” their children to become assimilated? Conversely, perhaps mothers who employ a more authoritative parenting style are more likely to transmit their cultural values to their children and ensure that they retain their traditional culture as they adopt aspects of the U.S. culture (i.e., bicultural). We found that most children, regardless of acculturation, enjoyed and wanted non-traditional foods. Unlike most mothers of bicultural children, mothers of assimilated children often yielded to these preferences. These mothers may also allow their children to adopt other aspects of the U.S. culture, facilitating their children’s assimilation. Additional research is needed to determine whether mothers’ parenting style helps determine children’s acculturation.

Limitations

The present study has some limitations that should be considered. Given the qualitative design, our study is not generalizable to other populations. Specifically, our sample consisted of self-selected mothers who predominantly lived in Chula Vista, CA, were culturally traditional, of mostly Mexican-origin, and had children between 10-13 years old who were mostly boys. Furthermore, eligibility criteria was not limited to immigrant mothers, therefore, some of the questions regarding differences in diet preferences living in the U.S. versus Mexico were not relevant. Most bicultural children (n=9) compared to assimilated children (n=4) were interviewed in the presence of their mothers (typically preparing dinner or doing chores nearby). This may have inhibited some of the children and therefore, we may have heard more open perspectives from assimilated children who were more likely to have privacy than from bicultural children. However, the use of multiple methods of data collection from multiple sources may help overcome this limitation. Indeed, mothers’ interviews and surveys supported the data we

collected from children. Another limitation was our method of assessing dietary intake through self-reported. Self-report is susceptible to recall bias and social desirability to under-report unhealthy and over-report healthy dietary intake. However, these findings are not intended to be quantitatively accurate, but to provide estimates of trends, which reflect those found in previous studies.^{30,31} Finally, the qualitative data were largely interpreted by the first author, thus susceptible to personal biases. To counteract this potential, a second coder helped to develop the codebook after coding 20% of all interviews and the last author assisted with the interpretation of the findings.

CONCLUSIONS

In this study, we responded to the call for research to better understand the intersection between social and cultural factors of dietary intake and behaviors.^{1,7,10} We found evidence of the reciprocal relationship between mothers' feeding styles and their children's food preferences, and how children's food preferences influence mothers' dietary intake and behaviors. Our results provide a qualitative description of why mothers of assimilated children may consume a lower quality diet than mothers of bicultural children^{30,31} and generate hypotheses that can be tested in future work.

ACKNOWLEDGMENTS

The authors thank Jordana Breton, of San Diego State University for her important contributions to the study as the bilingual interviewer of mothers and children. The authors also thank the rest of the project team of undergraduate students from San Diego State University for their enthusiasm and contributions to recruitment, screening, and transcribing data: Jacqueline Herrera, Giselle Ontiveros, and Denisse Peña. Research

reported in this manuscript was supported by the National Institute of Nursing Research (#F31NR015965) of the National Institutes of Health (NIH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH

Chapter 3 is currently being prepared for submission to *Appetite*: Soto, S.H., Arredondo, E.M., Ayala, G. X., Marcus, B., Shakya, H. (in preparation). “Exploring how children influence their Latina mothers’ dietary behaviors: qualitative interviews with mothers of bicultural and assimilated children.” The dissertation author was the primary investigator and author of this material..

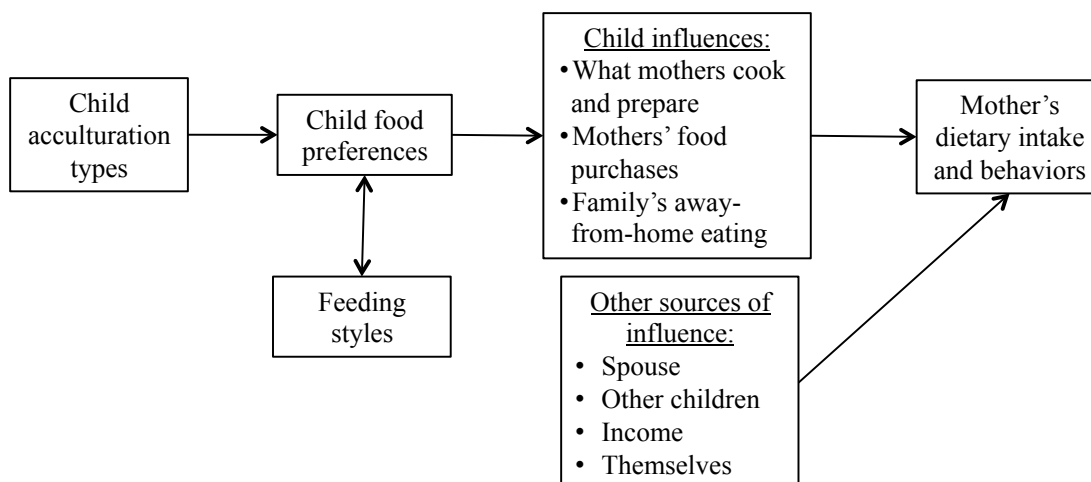


Figure 3-1. Narrative themes from interviews with mothers and children.

Table 3-1. Participant demographic characteristics (N=21 mother-child dyads)

	Mothers and their bicultural children (n=11)	Mothers and their assimilated children (n=10)
	<i>% (n) or mean ± SD</i>	
<i>Mothers' sociodemographic characteristics</i>		
Age	43 ± 9	39 ± 6
Married/living as married	90.9 (10)	80.0 (8)
Completed high school/GED	36.4 (4)	10.0 (1)
Employment		
< 35 hours/week	18.2 (2)	10.0 (1)
Not employed or homemaker	81.8 (9)	90.0 (9)
Monthly household income < \$2,000	63.6 (7)	40.0 (4)
Number of children	3 ± 1	4 ± 2
Born in Mexico (vs. US)	100.0 (11)	80.0 (8)
Years resided in the US	16.4 ± 7.7	14.8 ± 6.1
Hispanic acculturation score ^a	3.7 ± 0.3	3.9 ± 0.2
Non-Hispanic acculturation score ^a	1.8 ± 0.4	1.8 ± 0.4
Normal weight (vs overweight or obese)	9.1 (1)	30.0 (3)
<i>Children's sociodemographic characteristics</i>		
Age	12 ± 1	11 ± 1
Child gender (male)	72.7 (8)	60.0 (6)
Born in Mexico (vs. US)	18.2 (2)	10.0 (1)
Years child has resided in the US	9.8 ± 4.6	9.0 ± 4.2
Hispanic acculturation score ^a	3.1 ± 0.3	2.1 ± 0.3
Non-Hispanic acculturation score ^{a*}	3.4 ± 0.3	3.6 ± 0.4
Normal weight (vs overweight or obese)	72.7 (8)	50.0 (5)
<i>Mothers' dietary intake and behaviors</i>		
Daily servings of fruits	1.0 ± 1.0	0.6 ± 0.5
Daily servings of vegetables	0.9 ± 0.8	0.7 ± 0.4
Daily servings of sugary beverages	0.9 ± 0.5	0.6 ± 0.5
Percent calories from fat	29.7 ± 4.6	31.1 ± 3.2
Weekly away-from-home eating [*]	2.4 ± 1.5	4.1 ± 2.8
Percent of weekly grocery dollars spent on fruits and vegetables [*]	41.3 ± 13.6	26.2 ± 6.7

^a Scale is from 1-4 with higher score indicating greater adherence to the dimension

* Indicated statistically significant difference between the two groups ($p < 0.01$)

REFERENCES

1. Venters MH. Family-oriented prevention of cardiovascular disease: A social epidemiological approach. *Soc Sci Med*. 1989;28(4):309-314.
2. Carnethon MR, Ayala GX, Bangdiwala SI, et al. Association of cardiovascular risk factors between hispanic/latino parents and youth: The Hispanic community health study/study of latino youth. *Ann Epidemiol*. 2017;27(4):260-268. e2.
3. Drenowatz C, Erkelenz N, Wartha O, Brandstetter S, Steinacker JM, URMEL-ICE Study Group. Parental characteristics have a larger effect on children's health behaviour than their body weight. *Obesity facts*. 2014;7(6):388-398.
4. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *J Nutr*. 2010;140(10):1832-1838.
5. Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):624-635. e6.
6. Brown JL. Intra-family influences on food choice at mid-life. *Frontiers in Nutritional Science*. 2006;3:263.
7. Nestle M, Wing R, Birch L, et al. Behavioral and social influences on food choice. *Nutr Rev*. 1998;56(5):50-64.
8. Coveney J. What does research on families and food tell us? implications for nutrition and dietetic practice.(review article). *Nutrition & Dietetics: The Journal of the Dietitians Association of Australia*. 2002;59(2):113-120.
9. Shaikh AR, Yaroch AL, Nebeling L, Yeh M, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults: A review of the literature. *Am J Prev Med*. 2008;34(6):535-543. e11.
10. Brug J. Determinants of healthy eating: Motivation, abilities and environmental opportunities. *Fam Pract*. 2008;25 Suppl 1:i50-5. doi: 10.1093/fampra/cm063 [doi].
11. Galanti G. The hispanic family and male-female relationships: An overview. *J Transcult Nurs*. 2003;14(3):180-185.
<http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2003103214&site=ehost-live>.

12. Larsen JK, Hermans RC, Sleddens EF, Engels RC, Fisher JO, Kremers SP. How parental dietary behavior and food parenting practices affect children's dietary behavior. interacting sources of influence? *Appetite*. 2015;89:246-257.
13. Hughes SO, Shewchuk RM, Baskin ML, Nicklas TA, Qu H. Indulgent feeding style and children's weight status in preschool. *J Dev Behav Pediatr*. 2008;29(5):403-410. doi: 10.1097/DBP.0b013e318182a976 [doi].
14. Tovar A, Choumenkovitch SF, Hennessy E, et al. Low demanding parental feeding style is associated with low consumption of whole grains among children of recent immigrants. *Appetite*. 2015;95:211-218.
15. Collins C, Duncanson K, Burrows T. A systematic review investigating associations between parenting style and child feeding behaviours. *Journal of Human Nutrition and Dietetics*. 2014;27(6):557-568.
16. Bandura A. Health promotion from the perspective of social cognitive theory. *Psychology and Health*. 1998;13(4):623-649.
17. Bronfenbrenner U. *The ecology of human development: Experiments by nature and design*. Harvard University press; 2009.
18. Bavelas JB, Segal L. Family systems theory: Background and implications. *J Commun*. 1982;32(3):99-107.
19. Sussner KM, Lindsay AC, Greaney ML, Peterson KE. The influence of immigrant status and acculturation on the development of overweight in Latino families: A qualitative study. *Journal of Immigrant and Minority Health*. 2008;10(6):497-505.
20. Colby SE, Morrison S, Haldeman L. What changes when we move? A transnational exploration of dietary acculturation. *Ecol Food Nutr*. 2009;48(4):327-343. doi: 10.1080/03670240903022379 [doi].
21. Gray VB, Cossman JS, Dodson WL, Byrd SH. Dietary acculturation of Hispanic immigrants in Mississippi. *Salud Publica Mex*. 2005;47(5):351-360.
22. Edmonds VM. The nutritional patterns of recently immigrated Honduran women. *J Transcult Nurs*. 2005;16(3):226-235. doi: 16/3/226 [pii].
23. Himmelgreen DA, Perez-Escamilla R, Segura-Millan S, Romero-Daza N, Tanasescu M, Singer M. A comparison of the nutritional status and food security of drug-using and non-drug-using Hispanic women in hartford, connecticut. *Am J Phys Anthropol*. 1998;107(3):351-361. doi: 10.1002/(SICI)1096-8644(199811)107:3<351::AID-AJPA10>3.0.CO;2-7 [pii].

24. Ayala GX, Baquero B, Klinger S. A systematic review of the relationship between acculturation and diet among Latinos in the united states: Implications for future research. *J Am Diet Assoc.* 2008;108(8):1330-1344.
25. Perez-Escamilla R. Acculturation, nutrition, and health disparities in Latinos. *Am J Clin Nutr.* 2011;93(5):1163S-7S. doi: 10.3945/ajcn.110.003467 [doi].
26. Dubowitz T, Acevedo-Garcia D, Salkeld J, Lindsay AC, Subramanian SV, Peterson KE. Lifecourse, immigrant status and acculturation in food purchasing and preparation among low-income mothers. *Public Health Nutr.* 2007;10(4):396-404. doi: S1368980007334058 [pii].
27. Mills S, White M, Brown H, et al. Health and social determinants and outcomes of home cooking: A systematic review of observational studies. *Appetite.* 2016.
28. An R. Fast-food and full-service restaurant consumption and daily energy and nutrient intakes in US adults. *Eur J Clin Nutr.* 2015.
29. Mancino L, Todd J, Lin B. Separating what we eat from where: Measuring the effect of food away from home on diet quality. *Food Policy.* 2009;34(6):557-562.
30. Soto SH, Arredondo EM, Shakya H, Roesch S, Marcus B, Ayala GX. Family environment, children's acculturation and mothers' dietary intake and behaviors among Latinas: An autoregressive cross-lagged study. *Annals of Behavioral Medicine.* 2017(Manuscript submitted for publication).
31. Soto SH, Arredondo EM, Marcus B, Shakya H, Roesch S, Ayala GX. Effects of Latino children on their mothers' dietary intake and dietary behaviors: The role of children's acculturation and the mother-child acculturation gap. *Social science & medicine.* 2017(Manuscript revised and resubmitted for publication).
32. Updegraff KA, Umaña-Taylor AJ. What can we learn from the study of Mexican-Origin families in the United States? *Fam Process.* 2015;54(2):205-216.
33. Creswell JW. *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage publications; 2013.
34. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences.* 1987;9(2):183-205.
35. Deshefy-Longhi T, Sullivan-Bolyai S, Dixon JK. Data collection order: A primer. *South Online J Nurs Res.* 2009;9(3):6.

36. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: Performance of 2 new short instruments and a food frequency questionnaire. *J Am Diet Assoc.* 2002;102(12):1764-1772.
37. Rockett HR, Wolf AM, Colditz GA. Development and reproducibility of a food frequency questionnaire to assess diets of older children and adolescents. *J Am Diet Assoc.* 1995;95(3):336-340.
38. Willett WC, Sampson L, Stampfer MJ, et al. Reproducibility and validity of a semiquantitative food frequency questionnaire. *Am J Epidemiol.* 1985;122(1):51-65.
39. Larson N, Harnack L, Neumark-Sztainer D. Assessing dietary intake during the transition to adulthood: A comparison of age-appropriate FFQ for youth/adolescents and adults. *Public Health Nutr.* 2012;15(04):627-634.
40. Thompson FE, Midthune D, Subar AF, Kipnis V, Kahle LL, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percentage energy from fat. *J Am Diet Assoc.* 2007;107(5):760-767.
41. Ayala GX, Rogers M, Arredondo EM, et al. Away-from-home food intake and risk for obesity: Examining the influence of context. *Obesity.* 2008;16(5):1002-1008.
42. Bernard HR. Interviewing: Unstructured and semistructured. *Research methods in anthropology: Qualitative and quantitative approaches.* 2006;21.
43. Chapman A, Hadfield M, Chapman C. Qualitative research in healthcare: An introduction to grounded theory using thematic analysis. *Journal of the Royal College of Physicians of Edinburgh.* 2015;45(3):201-205.
44. Curry LA, Nembhard IM, Bradley EH. Qualitative and mixed methods provide unique contributions to outcomes research. *Circulation.* 2009;119(10):1442-1452. doi: 10.1161/CIRCULATIONAHA.107.742775 [doi].
45. Francis JJ, Johnston M, Robertson C, et al. What is an adequate sample size? operationalising data saturation for theory-based interview studies. *Psychology and Health.* 2010;25(10):1229-1245.
46. DiCicco-Bloom B, Crabtree BF. The qualitative research interview. *Med Educ.* 2006;40(4):314-321.
47. Charmaz K. *Constructing grounded theory.* Sage; 2014.

48. Ritchie J, Spencer L. Qualitative data analysis for applied policy research. *The qualitative researcher's companion*. 2002;573(2002):305-329.
49. Graham G. Analyzing qualitative data. *Qualitative Research Kit*. London: Sage. 2007.
50. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: Parenting styles in a child-feeding context. *Appetite*. 2005;44(1):83-92. doi: S0195-6663(04)00122-9 [pii].
51. Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting styles, feeding styles, feeding practices, and weight status in 4-12 year-old children: A systematic review of the literature. *Front Psychol*. 2015;6:1849. doi: 10.3389/fpsyg.2015.01849 [doi].
52. Pollard J, Kirk SL, Cade J. Factors affecting food choice in relation to fruit and vegetable intake: A review. *Nutrition research reviews*. 2002;15(2):373-387.
53. De Bourdeaudhuij I. Family food rules and healthy eating in adolescents. *Journal of health psychology*. 1997;2(1):45-56.
54. Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. *Pediatrics*. 1998;101(3 Pt 2):539-549.
55. Rozin P. Food is fundamental, fun, frightening, and far-reaching. *Social Research*. 1999:9-30.

DISCUSSION

OVERVIEW

This dissertation provided an in-depth examination of how children and the extent of their acculturation to the U.S. culture, play a role in Latina mothers' dietary intake and behaviors. Guided by theoretical models that posit the importance of familial- and cultural determinants on health behavior,¹⁻³ this dissertation used a variety of methods to build the evidence in this under-studied area of research. Three studies were conducted: 1) a cross-sectional analysis of the association of child acculturation and the mother-child acculturation gap with mothers' dietary intake and behaviors; 2) a longitudinal analysis of the temporal associations between the family environment and mothers' diet, by children's acculturation; and 3) a qualitative comparison of how bicultural versus assimilated children influence their mothers' dietary intake and behaviors. Results from these analyses form a more comprehensive understanding of child and cultural factors that may determine the dietary intake and behaviors of predominantly Mexican-origin Latina mothers.

Three themes can be distilled from this dissertation. First, the type of mother-child dyad of greatest concern for mothers' intake of a lower quality diet was traditional mothers of assimilated children, compared to traditional mothers of bicultural children. Second, family communication predicted socially bound dietary behaviors in traditional mothers. And third, assimilated and bicultural children influenced their mothers' dietary intake and behaviors in different and reciprocating ways. These themes emphasize the importance of family and culture in the health behaviors of Latina mothers. These studies

will inform new hypotheses for future testing, identify potential dietary risk factors in need of further investigation, and offer strategies for designing more effective dietary interventions.

Chapter 1, *Effects of Latino children on their mothers' dietary intake and dietary behaviors: The role of children's acculturation and the mother-child acculturation gap*, examined how children's acculturation and the mother-child acculturation gap related to mothers' dietary intake and behaviors. The study found that mothers' diet was of lowest quality when they had assimilated versus bicultural children, especially when mothers were culturally traditional. This finding was corroborated in the second and third studies; thus, as theories suggest,¹⁻³ mothers' health behaviors are likely to be at least partially determined by those they with whom they eat and drink with.

Several factors may explain why compared to other mother-child dyads, traditional mothers of assimilated children were found to be of greatest concern for consuming a low quality diet. Research has shown that with greater assimilation to the U.S., Latino adolescents consume lower quality foods and adopt "American" dietary practices.^{4,5} Moreover, traditional mothers may not be familiar with the non-traditional foods their assimilated children request, limiting mothers' ability to make informed decisions about nutrient-dense foods low in added sugars and fat. In addition to improving the nutritional quality of traditional foods, dietary interventions should equip Latina mothers with nutritional knowledge about non-traditional foods, enabling them to make better dietary decisions. Another potential factor for why traditional mothers of assimilated children may consume lower quality foods is the power differential that can

develop between Latina mothers and their children. When children have a better grasp on the dominant culture than their mothers, children may gain power over their mothers in a variety of contexts.^{6,7} Power struggles also occur between children and mothers at the dinner table when children refuse to eat.⁸ In Chapter 3, power struggles and conflict were described among traditional mothers of assimilated children and were one of the reasons mothers gave for why they changed the way they cooked. Interventions can address these power struggles by equipping mothers with strategies to elevate their authority to gain control at the dinner table, and how to establish and enforce rules and boundaries around food.⁹

In Chapter 2, *Family environment, children's acculturation and mothers' dietary intake and behaviors among Latinas: An autoregressive cross-lagged study*, longitudinal associations between the family environment (i.e., family expressiveness and interactions around food) and traditional mothers' dietary intake and behaviors were examined across bicultural versus assimilated children. Positive family communication predicted two dietary behaviors: less frequent away-from-home eating and a greater percent of groceries spent on fruits and vegetables. Of the dietary variables assessed, these two were different in that they typically occur within social settings and often require shared decision-making and discussion. Therefore, fostering positive communication within families may be a key target for interventions promoting healthier, socially bound dietary behaviors. For example, encouraging more positive interactions around food may help establish healthy eating as a family priority. Further, promoting family expressiveness, which includes building mothers' confidence to communicate openly and freely can enable her to assert her values and preferences for healthier foods. Addressing an

important gap in the literature, Chapter 2 highlights the relevance of the family environment in adult Latinas' dietary intake and behaviors.

Building on the first chapter, Chapter 2 also examined the interactions between the family environment and children's acculturation to build the evidence for the role of children on mothers' diet. Findings suggest that positive family communication may result in healthier dietary behaviors in mothers of bicultural versus assimilated children. Bicultural children may be more open and accepting of mothers' messages around healthy eating than assimilated children who may prefer non-traditional over traditional foods. As a result, mothers of bicultural children may feel more empowered to cook at home more frequently rather than purchasing away-from-home foods, and purchase more fruits and vegetables because their bicultural children will consume them.

The first two chapters provided cross-sectional and longitudinal evidence for the role of children's acculturation on mothers' diet. While quantitative methods can test for the presence of associations and prediction, they cannot explain why those associations occur. In Chapter 3, *Exploring how children influence their Latina mothers' dietary behaviors: Qualitative interviews with mothers of bicultural and assimilated children*, one-on-one semi-structured interviews with mothers and their children were used to compare *how* bicultural and assimilated children influenced their mothers' dietary intake and behaviors. Mothers of assimilated children said they limited or excluded foods disliked by their children, frequently allowed non-traditional foods into their home, and consumed away-from-home foods to appease their children's food preferences. Conversely, mothers of bicultural children had an easier time cooking traditional foods,

purchasing the foods mothers wanted to purchase, and eating at restaurants mothers preferred. Previous qualitative studies have remarked on the negative influence of children who adopt “American” foods on their mothers’ cooking and eating behaviors.¹⁰⁻

¹³ To date, Chapter 3 is the first study to explore how child influence differs across characteristics of the child, including acculturation.

Many of the differences in influence between bicultural and assimilated children were attributed to children having similar (as in the case of most bicultural children) or different (as in the case of most assimilated children) food preferences. Mothers of bicultural children explained that similarities in food preferences were likely the consequence of mothers’ “Mexican” (i.e. authoritative) feeding style. Indeed, research shows that mothers who have more authoritative, or encouraging feeding styles with clear boundaries have children who consume more vegetables and whole grains than mothers who have a more indulgent, or a feeding style with few demands or boundaries.^{14,15} On the other hand, mothers of assimilated children explained that their children’s different food preferences resulted in mothers employing a permissive or indulgent feeding style to appease their children. These mothers described a food environment where they were often not in control of their children’s eating habits, which has been cited as a barrier to fruit and vegetable purchases in previous literature.¹⁶ This finding highlights the need for intervention strategies that help mothers to gain control at the dinner table. Also, given that interventions have shown that mothers’ feeding styles are modifiable,⁷⁻¹⁹ future interventions can test whether mothers who adopt an authoritative feeding style indirectly improve their own dietary quality.

In Social Cognitive Theory, reciprocal determinism explains how the three components of the theory (behavior, environment, individual) simultaneously influence to each other.¹ Reciprocal determinism is also an underlying component of Family Systems Theory, which acknowledges the connectedness and reactivity that occurs between family members.³ In Chapter 3, the bi-directional influences that occur between mothers and children became apparent. This research found that mothers' feeding style may be the source of children's food preferences and in some cases, children's food preferences may drive mothers' feeding styles. Furthermore, mothers described how children's food preferences influenced mothers' dietary intake and behaviors. These results exemplify why limiting an investigation to the role of mothers on their children's health outcomes may be short-sided. While it may be true that mothers' feeding styles are an important predictor of children's diet, children's acculturation may drive how mothers parent their children. Similarly, mothers' feeding styles may indirectly influence their own diet, through their children's food preferences. Until further research investigates these potential pathways of influence using longitudinal and experimental trials, the field will not develop a complete understanding of the most relevant factors associated with mothers' diet.

STRENGTHS AND LIMITATIONS

The findings of this dissertation should be viewed in light of its limitations. The studies were conducted with predominantly Mexican-origin families, however, the Latino population residing in the U.S. consists of individuals representing many different nationalities and ethnic backgrounds.²⁰ Because Latinos are a heterogeneous group of individuals, whose dietary intake and behaviors vary by subgroup, findings from

investigating Mexican-origin families may not generalize to other Latino subgroups.²¹ Research is needed to confirm the findings of this dissertation among other Latino subgroups. Even among Mexican-origin Latinos, our findings may not generalize given that the samples used in this dissertation consisted of mothers who were able to speak Spanish and who lived in Southern California near the U.S.-Mexico border. In particular, mothers from Chapters 1 and 2 resided in Imperial County, a rural county with a Latino population of 83%.²² This sample may not represent other Mexican-origin mothers who live in urban areas with lower concentrations of Latinos. In such areas, it may be more difficult for mothers to maintain their traditional culture, regardless of their children's acculturation. Further, the mothers in Chapters 2 and 3 were culturally traditional with bicultural or assimilated children. There are several other types of mother-child dyads (e.g., assimilated mothers of assimilated children) were not investigated. It will be important to know if there are other "high-risk" dyads for low quality dietary intake and behaviors among Latina mothers. However, the use of a specific population of Mexican-origin traditional mothers of bicultural or assimilated children allowed for the in-depth investigation of a homogenous group, providing hypotheses that can be tested in other groups.

A strength of this dissertation was the use of a longitudinal study to infer causation in Chapter 2. However, while this study controlled for several sociodemographic covariates, there may have been unmeasured confounders driving the temporal associations found. Furthermore, the sample size was relatively small (N=162), consisting only of those enrolled in the delayed treatment group of the randomized controlled trial, *Entre Familia: Reflejos de Salud* (Within the Family: Reflections of

Health).²³ The small sample size may have contributed to inconsistent findings showing within-time correlations in unexpected directions between family interactions around food and away-from-home eating and between family expressiveness and daily fruit servings. Additional longitudinal studies including randomized controlled trials, the gold standard for establishing causal influence, are needed to confirm the findings in Chapter 2. Similarly, additional research is needed to investigate the causal path of influence implied in the findings from Chapter 3. Although this study suggested reciprocating influences between mothers' feeding style, children's food preferences, and mothers' diet, qualitative data cannot establish causal relationships. The purpose of Chapter 3 was not to test relationships, but to explore relationships and generate hypotheses to inform future research.

Lastly, these studies used self-reported assessments of dietary intake, dietary behaviors, acculturation, and the family environment. Primary concerns with using self-report, especially when measuring diet, are poor recall accuracy and social desirability bias.²⁴ Poor recall accuracy may affect estimates of frequency and portion sizes of foods consumed. Meanwhile, social desirability bias may result in underestimating the intake of unhealthy foods and overestimating the intake of healthy foods. The diet screeners used in this dissertation were limited by their inability to capture total intake of diet, potentially excluding other important sources of intake. Several precautions were implemented to mitigate these limitations. First, research assistants were trained to use food models to help mothers provide accurate portion size estimates.²⁵ Second, a variety of methods were used to assess diet including measuring a number of dietary intake (i.e., fruit, vegetable, percent of calories from fat, and sugary beverage intake) and diet-related

behaviors (e.g., away-from-home eating, percent of groceries spent on fruits and vegetables). Using multiple methods allowed for corroborating and building a comprehensive understanding of the findings.²⁶

Chapters 1-3 used the Bidimensional Acculturation Scale (BAS)²⁷ to assess acculturation of mothers and their children. While the BAS is a commonly used and validated measure that applies to various Spanish-speaking ethnic groups,²⁸ it primarily measures language use and thinking. The BAS does not measure cultural traditions, interactions with dominant culture individuals, or other factors that may also be important indicators of culture,²⁹ which may be relevant when examining dietary outcomes. Future studies may consider testing the relationships found in this dissertation using acculturation measures that assess other aspects of culture such as the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II).³⁰ Furthermore, given differences found in associations of acculturation measures and proxies of acculturation with Latinos' dietary intake,³¹ proxies including years in the US, nativity, and generation status should also be explored.

FUTURE DIRECTIONS

Much research has examined the role of mothers and family factors on children.³²⁻
³⁴ The rationale for focusing on child outcomes is justified given the public health concern for the increased incidence of diet-related diseases, including obesity, type 2 diabetes, and metabolic syndrome, especially among Latino children.³⁵⁻³⁷ However, the influence of mothers on children does not flow in one direction, rather it is a feedback loop with the influence flowing back and forth between mother and child.³ This

dissertation recognized that children are not passive recipients of their mothers' parenting; rather, children are relevant to their mothers' diet and warrant further investigation. The field of public health will benefit from bridging the gap between how mothers influence their children to how child influence their mothers.

This dissertation also underscores the value of reaching outside the field of public health for theories that can provide an informative framework for researching families. For example, Family Systems Theory incorporates valuable constructs that can identify key leverage points for dietary intervention including the family environment, family boundaries of outside materials (e.g., "American" foods), family member "roles," and reciprocate relationships between family subsystems (e.g., mother-child dyads).³ An example of how the field can grow using a family systems perspective is by building a better understanding of how the family environment promotes and prevents healthy eating in mothers. Although other aspects of the family environment could not be examined (e.g., family conflict, disengagement), Chapter 2 demonstrated that family expressiveness and interactions around food can positively influence diet. Chapter 3 showed more food-related conflict between mothers and their assimilated versus bicultural children. Moreover, previous research has found positive associations between family conflict and the presence of metabolic syndrome in adult Latinos.³⁸ Taken together, this evidence suggests that the family environment may be a significant determinant of dietary intake and behaviors, meriting further examination.

Using a family systems perspective means that all family members should be considered in how they relate to mothers' dietary intake and behaviors including spouses.

Although most studies exclude or do not make an effort to recruit a sufficient number of fathers to enable hypothesis testing, there is a growing interest in understanding the role of fathers on their children's diet.^{39,40} Furthermore, spousal influence on wives' diet has also been investigated, though most of this research involves clinical populations.⁴¹⁻⁴³ An important gap in this literature is the examination of the indirect influence of husbands on mothers' dietary intake and behaviors through children. Chapter 3 found that fathers often override mothers' food-related rules, potentially compounding the promotion of unhealthy foods in families with assimilated children. Further research is needed to understand the mechanisms of child and father influences on mothers. Building this area of the field will help prioritize strategies delivered in future dietary interventions; it underscores the value of framing public health questions using a family systems perspective.

CONCLUSIONS

Most adult Latinos in the U.S. are not meeting the daily recommended dietary intake of fruits and vegetables and are exceeding the recommended allowance for fats and sugar needed to prevent chronic health conditions including obesity, cardiovascular disease, and cancer.^{44,45} Therefore, it is imperative that researchers identify the factors that prevent and promote healthy eating to inform effective interventions. This dissertation contributes to the field by building evidence for the significant role of children and their acculturation on Latina mothers' dietary intake and behaviors. Results from these studies extend previous research by bridging family, children, acculturation, and diet literatures to demonstrate that children's acculturation and the family environment have an important role in mothers' dietary intake and behaviors.

REFERENCES

1. Bandura A. Health promotion from the perspective of social cognitive theory. *Psychology and Health*. 1998;13(4):623-649.
2. Bronfenbrenner U. *The ecology of human development: Experiments by nature and design*. Harvard University press; 2009.
3. Bavelas JB, Segal L. Family systems theory: Background and implications. *J Commun*. 1982;32(3):99-107.
4. Liu JH, Chu YH, Frongillo EA, Probst JC. Generation and acculturation status are associated with dietary intake and body weight in Mexican American adolescents. *J Nutr*. 2012;142(2):298-305. doi: 10.3945/jn.111.145516 [doi].
5. Van Hook J, Quiros S, Frisco ML, Fikru E. It is hard to swim upstream: Dietary acculturation among Mexican-origin children. *Population research and policy review*. 2016;35(2):177-196.
6. Martinez CR, McClure H, Eddy J. Language brokering contexts and behavioral and emotional adjustment among Latino parents and adolescents. *The Journal of early adolescence*. 2008.
7. Weisskirch RS, Alva SA. Language brokering and the acculturation of Latino children. *Hispanic Journal of Behavioral Sciences*. 2002;24(3):369-378.
8. Brown JL. Intra-family influences on food choice at mid-life. *Frontiers in Nutritional Science*. 2006;3:263.
9. De Bourdeaudhuij I. Perceived family members' influence on introducing healthy food into the family. *Health Educ Res*. 1997;12(1):77-90.
10. Colby SE, Morrison S, Haldeman L. What changes when we move? A transnational exploration of dietary acculturation. *Ecol Food Nutr*. 2009;48(4):327-343. doi: 10.1080/03670240903022379 [doi].
11. Gray VB, Cossman JS, Dodson WL, Byrd SH. Dietary acculturation of Hispanic immigrants in mississippi. *Salud Publica Mex*. 2005;47(5):351-360.
12. Sussner KM, Lindsay AC, Greaney ML, Peterson KE. The influence of immigrant status and acculturation on the development of overweight in Latino families: A qualitative study. *Journal of Immigrant and Minority Health*. 2008;10(6):497-505.

13. Edmonds VM. The nutritional patterns of recently immigrated Honduran women. *J Transcult Nurs*. 2005;16(3):226-235. doi: 16/3/226 [pii].
14. Tovar A, Choumenkovitch SF, Hennessy E, et al. Low demanding parental feeding style is associated with low consumption of whole grains among children of recent immigrants. *Appetite*. 2015;95:211-218.
15. Patrick H, Nicklas TA, Hughes SO, Morales M. The benefits of authoritative feeding style: Caregiver feeding styles and children's food consumption patterns. *Appetite*. 2005;44(2):243-249. doi: S0195-6663(04)00144-8 [pii].
16. Kilcast D, Cathro J, Morris L. Practical approaches to increasing vegetable consumption. *Nutr Food Sci*. 1996;96(5):48-51.
17. Aboud FE, Akhter S. A cluster-randomized evaluation of a responsive stimulation and feeding intervention in Bangladesh. *Pediatrics*. 2011;127(5):e1191-7. doi: 10.1542/peds.2010-2160 [doi].
18. Daniels LA, Mallan KM, Nicholson JM, Battistutta D, Magarey A. Outcomes of an early feeding practices intervention to prevent childhood obesity. *Pediatrics*. 2013;132(1):e109-18. doi: 10.1542/peds.2012-2882 [doi].
19. Burrows T, Warren J, Collins C. The impact of a child obesity treatment intervention on parent child-feeding practices. *Pediatric Obesity*. 2010;5(1):43-50.
20. Motel S, Patten E. The 10 largest Hispanic origin groups: Characteristics, rankings, top counties. *Washington, DC: Pew Hispanic Center*. 2012.
21. Siega-Riz AM, Sotres-Alvarez D, Ayala GX, et al. Food-group and nutrient-density intakes by Hispanic and Latino backgrounds in the Hispanic community health study/study of Latinos. *Am J Clin Nutr*. 2014;99(6):1487-1498. doi: 10.3945/ajcn.113.082685 [doi].
22. U.S. Census Bureau. *American community survey 1-year estimates*. Retrieved from *Census reporter profile page for imperial county, CA*. . 2015.
23. Ayala GX, Ibarra L, Arredondo E, et al. Promoting healthy eating by strengthening family relations: Design and implementation of the Entre Familia: Reflejos de Salud intervention. *Cancer Disparities: Causes and Evidence-Based Solutions*. Springer US. 2011:237-252.
24. Thompson FE, Subar AF, Coulston A, Boushey C. Dietary assessment methodology. *Nutrition in the Prevention and Treatment of Disease*. 2008;2:3-39.

25. Ayala GX. An experimental evaluation of a group- versus computer-based intervention to improve food portion size estimation skills. *Health Educ Res.* 2006;21(1):133-145. doi: cyh049 [pii].
26. Campbell DT, Fiske DW. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychol Bull.* 1959;56(2):81.
27. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable EJ. Development of a short acculturation scale for Hispanics. *Hispanic Journal of Behavioral Sciences.* 1987;9(2):183-205.
28. Wallace PM, Pomery EA, Latimer AE, Martinez JL, Salovey P. A review of acculturation measures and their utility in studies promoting Latino health. *Hispanic Journal of Behavioral Sciences.* 2009.
29. Cabassa LJ. Measuring acculturation: Where we are and where we need to go. *Hispanic Journal of Behavioral Sciences.* 2003;25(2):127-146.
30. Cuellar I, Arnold B, Maldonado R. Acculturation rating scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic journal of behavioral sciences.* 1995;17(3):275-304.
31. Ayala GX, Baquero B, Klinger S. A systematic review of the relationship between acculturation and diet among Latinos in the united states: Implications for future research. *J Am Diet Assoc.* 2008;108(8):1330-1344.
32. Larsen JK, Hermans RC, Sleddens EF, Engels RC, Fisher JO, Kremers SP. How parental dietary behavior and food parenting practices affect children's dietary behavior. interacting sources of influence? *Appetite.* 2015;89:246-257.
33. Shloim N, Edelson LR, Martin N, Hetherington MM. Parenting styles, feeding styles, feeding practices, and weight status in 4-12 year-old children: A systematic review of the literature. *Front Psychol.* 2015;6:1849. doi: 10.3389/fpsyg.2015.01849 [doi].
34. Yee AZ, Lwin MO, Ho SS. The influence of parental practices on child promotive and preventive food consumption behaviors: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity.* 2017;14(1):47.
35. Miller JM, Kaylor MB, Johannsson M, Bay C, Churilla JR. Prevalence of metabolic syndrome and individual criterion in US adolescents: 2001–2010 national health and nutrition examination survey. *Metabolic syndrome and related disorders.* 2014;12(10):527-532.

36. Ogden CL, Carroll MD, Lawman HG, et al. Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014. *JAMA*. 2016;315(21):2292-2299.
37. Dabelea D, Mayer-Davis EJ, Saydah S, et al. Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. *JAMA*. 2014;311(17):1778-1786.
38. Penedo FJ, Brintz CE, LLabre MM, et al. Family environment and the metabolic syndrome: Results from the Hispanic community health study/study of latinos (HCHS/SOL) sociocultural ancillary study (SCAS). *Annals of Behavioral Medicine*. 2015;49(6):793-801.
39. Khandpur N, Blaine RE, Fisher JO, Davison KK. Fathers' child feeding practices: A review of the evidence. *Appetite*. 2014;78:110-121.
40. Morgan PJ, Collins CE, Plotnikoff RC, et al. The 'Healthy dads, healthy kids' community randomized controlled trial: A community-based healthy lifestyle program for fathers and their children. *Prev Med*. 2014;61:90-99.
41. Chung ML, Lennie TA, Mudd-Martin G, Moser DK. Adherence to a low-sodium diet in patients with heart failure is best when family members also follow the diet: A multicenter observational study. *J Cardiovasc Nurs*. 2015;30(1):44-50. doi: 10.1097/JCN.0000000000000089 [doi].
42. Gallagher P, Yancy Jr WS, Jeffreys AS, et al. Patient self-efficacy and spouse perception of spousal support are associated with lower patient weight: Baseline results from a spousal support behavioral intervention. *Psychol , Health Med*. 2013;18(2):175-181.
43. Crookes DM, Shelton RC, Tehranifar P, et al. Social networks and social support for healthy eating among Latina breast cancer survivors: Implications for social and behavioral interventions. *Journal of Cancer Survivorship*. 2016;10(2):291-301.
44. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW. Americans do not meet federal dietary recommendations. *J Nutr*. 2010;140(10):1832-1838.
45. Kirkpatrick SI, Dodd KW, Reedy J, Krebs-Smith SM. Income and race/ethnicity are associated with adherence to food-based dietary guidance among US adults and children. *Journal of the Academy of Nutrition and Dietetics*. 2012;112(5):624-635. e6.