

# UC Merced

## UC Merced Electronic Theses and Dissertations

### Title

Neighborhood Disadvantage and Parent-Adolescent Relationship Quality Associated with Type 1 Diabetes Management Among Late Adolescents Transitioning to Early Emerging Adulthood

### Permalink

<https://escholarship.org/uc/item/9z66p8h8>

### Author

Mello, Daniel

### Publication Date

2019

### Copyright Information

This work is made available under the terms of a Creative Commons Attribution-NonCommercial-NoDerivatives License, available at <https://creativecommons.org/licenses/by-nc-nd/4.0/>

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Neighborhood Disadvantage and Parent-Adolescent Relationship Quality Associated  
with Type 1 Diabetes Management Among Late Adolescents  
Transitioning to Early Emerging Adulthood

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

in

Psychological Sciences

by

Daniel Mello

Committee in charge:

Professor Deborah J. Wiebe, Chair  
Professor Jan Wallander  
Professor Matthew Zawadzki  
Professor Keke Lai

2019



© Daniel Mello, 2019

All rights reserved

The Dissertation of Daniel Mello is approved, and it is acceptable in quality and form  
for publication on microfilm and electronically:

---

Jan Wallander, Ph.D.

---

Matthew Zawadzki, Ph.D.

---

Keke Lai, Ph.D.

---

Deborah Wiebe, MPH, Ph.D. (Chair)

University of California, Merced

2019

## TABLE OF CONTENTS

List of Tables.....	v
List of Figures .....	vi
Acknowledgements .....	vii
Curriculum Vitae.....	viii
Abstract .....	xix
Chapter One: Introduction.....	1
Neighborhood Disadvantage and Type 1 Diabetes Management .....	1
Neighborhood Disadvantage and the Parent-Adolescent Relationship.....	2
The Parent-Adolescent Relationship and Type 1 Diabetes Management .....	2
Neighborhood Disadvantage Associated with Type 1 Diabetes Through the Parent-Adolescent Relationship.....	3
Chapter Two: Summary and Hypotheses.....	4
Chapter Three: Method .....	5
Participants .....	5
Procedure.....	5
Measures.....	6
Statistical Analysis Plan .....	7
Chapter Four: Results.....	9
SEM Models Examining Mothers’ and Fathers’ Relationship Quality Separately .....	11
SEM Model Examining Mother and Father Relationship Quality Simultaneously.....	16
Chapter Five: Discussion .....	18
Limitations .....	20
Conclusions and Implications .....	21
References .....	23

**LIST OF TABLES**

Table 1. Correlations Between Neighborhood Disadvantage, Maternal & Paternal Acceptance, and T1D Outcomes among Late Adolescents with Type 1 Diabetes .....

Table 2. Coefficients for Indirect Pathways in Growth Curves of T1D Outcomes among Late Adolescents and Emerging Adults .....

## LIST OF FIGURES

Figure 1. SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via mother-adolescent relationship quality among late adolescents transitioning into emerging adulthood .....

Figure 2. SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via father-adolescent relationship quality among late adolescents transitioning into emerging adulthood .....

Figure 3. SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via parent-adolescent relationship quality among late adolescents transitioning into emerging adulthood .....



## ACKNOWLEDGEMENTS

To Michelle: Forever, thank you for that initial push to pursue this dream!

To my Parents, Jenn, and Tony: Your unending support, psychoemotionally and financially, all these years has been instrumental to my success. Thank you!

To The Clarks, The Contes, The Malones, The Taylors, Snoozin, my homies from CSCCU and RCU, SRJC, SDMC, Drs. Fantino at UCSD, SDCCU, the staff and faculty at SSU, The Sally Casanova Predoctoral Scholarship, the McNair Program, Dr. Drew Elizabeth Glaser, The Komadinas, the 2013 UCM Psych Sciences Cohort!, the UCM Psychological Sciences Faculty!, the CETL, and all of the wonderful roommates and graduate student friends with whom I have had the pleasure of living, working, laughing, crying, and partying: This journey could not have happened without you! Please know that I often look back across these existential years to reflect on how lucky I am to have known you all, and to have been supported by you all. In the end, you all are partially responsible for this dissertation. In a way, each of you have a unique stamp on this work. Thank you! From the warmest part of my heart, thank you!

And to Dr. Jennifer Mendiola: Your friendship made grad life a whole hell of a lot easier, and much more fun. Thank you, Jenn! You will be remembered, always!

I am a firm believer that science cannot, and should not, exist in an intellectual vacuum. In light of this truism, this work is only possible due to exceptional collaborations between researchers, participant families, and the support of the National Institutes of Health. Foremost, the Wiebe Lab at the University of California in Merced, pioneered by Dr. Deb Wiebe, my amazing Dissertation Committee, and our irreplaceable colleagues at the University of Utah, spearheaded by Dr. Cindy Berg, have been instrumental in the production of this dissertation. The feedback garnered from Drs. Wiebe, Berg, and Butner, Wallander, Zawadzki, and Lai, as well as our brilliant graduate students, postdoctoral fellows, and talented research assistants, helped me solve this complex puzzle by challenging me to thoroughly examine each intricate piece. Only through their diverse, sophisticated perspectives was I able to uncover and correct the assumptions in my logic, leading to a study I am proud to call my seminal graduate work.

Undoubtedly, the participants of our larger longitudinal multi-site study are the stars of this research. I extend my sincerest gratitude to our participant families for their willingness to provide their unique insight, across multiple days and many years, into living and growing with type 1 diabetes. Behavioral medicine will advance only as long as there continues to be volunteers who believe in pushing the field forward for posterity.

Lastly, and perhaps foundationally, this dissertation could not have occurred without financial support from the National Institute of Diabetes and Digestive and Kidney Diseases at the National Institutes of Health (DK 092939). I am eternally grateful for the NIDDK to invest in our team's ideas!

If I am anything, it is because I have had incredible support. Thank you all!

## CURRICULUM VITAE

**Daniel Mello, Ph.D.**

Psychological Sciences, University of California, Merced  
5200 N. Lake Rd., Merced California 95343  
dmello2@ucmerced.edu

### EDUCATION

**Ph. D. Psychological Science**, University of California, Merced

- Major Emphasis: Health Psychology
- Minor Emphasis: Quantitative Methods
- Advisor: Dr. Deborah Wiebe

**B.A. Psychology**, Sonoma State University, 2012

- Graduated Magna Cum Laude with a departmental distinction
- Advisor: Dr. Elisa Velásquez-Andrade

**A.A. Psychology**, San Diego Mesa College, 2010

- Graduated Class of 2010 with High Honors
- Dean's Highest Honors & Honor List Fall '08, Spring '09

### ACADEMIC EXPERIENCE

**University of California, Merced – Psychological Science**

**Graduate Student Researcher: 2013 - Present**

- Advised by Dr. Deborah Wiebe
- Investigating sociocultural and family processes of type 1 diabetes management among adolescents and emerging adults

**Sonoma State University – Psychology Department**

**Non-Faculty Volunteer: 2012 - 2013**

- Mentored by Dr. Elisa Velasquez-Andrade
- Co-Facilitator for the Speed Diversity Dialogue (SDD) Workshop
- Co-Presenter at professional psychology conferences
- Co-Author of the Speed Diversity Dialogue Facilitator's Manual

**Senior Research Assistant: 2010 - 2012**

- Mentored by Dr. Elisa Velasquez
- Developed the experimental, mixed-method, action-research based multicultural excellence training tool Speed Diversity Dialogue
- Collected & analyzed qualitative data via Grounded Theory
- Collected & analyzed quantitative data via SPSS

**University of California, San Diego – Psychology Department**

**Research Assistant: 2010**

- Mentored by Dr. Stephanie Stolarz-Fantino
- 6-month appointment designing & conducting an experimental study to identify the variables affecting rule-governed behavior; Implemented the visual analogy model, Collected, entered & analyzed quantitative data

## **RESEARCH PUBLICATIONS**

### **Research Publications**

- Mello, D.**, Wiebe, D. J., and Berg, C. A. (2019). Maternal shift and persist coping, SES, and adolescent type 1 diabetes management. *Children's Health Care*. doi: 10.1080/02739615.2019.1570465
- Berg, C. A., Wiebe, D. J., Tracey, E. L., Kelly, C. S., **Mello, D.**, Turner, S. L., Butner, J., Mansfield, J., White, P., Murray, M., & Suchy, Y. (2019). Parental involvement and executive function in emerging adults with type 1 diabetes. *Journal of Pediatric Psychology*. Manuscript in press.
- Tracy, E. L., Berg, C. A., Baker, A., **Mello, D.**, Litchman, M. L., and Wiebe, D. J. (2018). Health-risk behaviors and type 1 diabetes outcomes in the transition from late adolescence to early emerging adulthood. *Children's Health Care*. doi: 10.1080/02739615.2018.1531758
- Wiebe, D. J., Berg, C. A., **Mello, D.**, & Kelly, C. S. (2018). Self- and social-regulation in type 1 diabetes management during late adolescence and emerging adulthood. *Current Diabetes Reports*, 18. doi:10.1007/s11892-018-0995-3
- Mello, D.**, Wiebe, D. J., Barranco, C., & Barba, J. (2017). The stress and coping context of type 1 diabetes management among Latino and non-Latino White early adolescents and their mothers. *Journal of Pediatric Psychology*, 42, 647–656. doi:10.1093/jpepsy/jsw109
- Queen, T. L., Baucom, K. J. W., Baker, A. C., **Mello, D.**, Berg, C. A., & Wiebe, D. J. (2017). Neighborhood disorder predicts HbA1c in late adolescents with type 1 diabetes. *Social Science & Medicine*, 183, 126-129. doi: 10.1016/j.socscimed.2017.04.052
- Luyckx, K., Ramsey, M. A., Wiebe, D. J., **Mello, D.**, Oris, L., Prikken, S., ... Berg, C. A. (2016). Brief report: Benefit finding and identity processes in type 1 diabetes: Prospective associations throughout adolescence. *Journal of Adolescence*, 49, 47-50. doi: 10.1016/j.adolescence.2016.02.007
- Mello, D.** (2012). Trees, technology and academia: Contemporary influences to student academic performance. *Sonoma State University NoGAP/McNair Scholars Research Journal*, 3.

### **Works In-Progress**

- Mello, D.**, Wiebe, D. J., Troxel, N. R., Baker, A., Butner, J., & Berg, C. A. (in-prep). Neighborhood disadvantage and parent-adolescent relationship quality associated with type 1 diabetes management among late adolescents transitioning to early emerging adulthood.
- Mello, D.**, Wiebe, D. J., Nunez, D., & Barba, J. (in-prep). The role of socioeconomic status in disparities among Latino youth with diabetes: A systematic review.
- Mello, D.**, & Wiebe, D. J. (in-prep). Sociocultural disparities in trajectories of glycemic control across childhood, adolescence, and emerging adulthood.

Wiebe, D. J., Ramirez, M., **Mello, D.**, Marino, J., Munion, A., Butner., J., & Berg, C. A. (in-prep). Executive functions and daily self-regulation to support adherence across the transition into emerging adulthood.

## **Books**

**Mello, D.** (2012). *Wind: The First Element of the Mythus Ascendum Series*. Rohnert Park, California: Vidya Books.

## **TEACHING EXPERIENCE**

### **Teaching Assistantships – University of California, Merced**

#### **Stereotype and Prejudice – Spring 2019**

- Instructor of Record: Dr. Paul Carroll
- Duties: Lecturing, Assignment creation, Exam & Quiz proctoring, scoring, general grading
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
*TBD*

#### **Analysis of Psychological Data – Fall 2018**

- Instructor of Record: Dr. Keke Lai
- Duties: Hosting lab sections, Exam & Quiz proctoring, scoring, general grading
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
*6.7, SD = 0.7*

#### **Health Psychology – Fall 2017**

- Instructor of Record: Dr. Deborah Wiebe
- Duties: Quiz creation, proctoring, scoring, general grading
- Invited Lectures: Seeking Care Behavior & Adherence
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
*M = 6.2, SD = 0.7*

#### **Human Sexuality – Spring 2017**

- Instructor of Record: Dr. Ross Avilla
- Duties: Exam proctoring, scoring, general grading
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
*M = 6.3, SD = 1.1*

#### **Health Psychology – Fall 2016**

- Instructor of Record: Dr. Deborah Wiebe
- Duties: Quiz creation, proctoring, scoring, general grading
- Invited Lectures: Seeking Care Behavior & Adherence
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
*M = 6.0, SD = 1.5*

#### **Social Psychology – Spring 2016**

- Instructor of Record: Dr. Matthew Zawadzki
- Duties: Quiz creation, proctoring, scoring, general grading
- Invited Lectures: Attitudes and Attitude Change; Prejudice

- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.5, SD = 1.1$

#### **Psychology of Race, Ethnicity, and Culture – Fall 2015**

- Instructor of Record: Dr. Jim McDiarmid
- Duties: Exam creation, proctoring, scoring, general grading, class-wide material review sessions
- Invited Lectures: African Americans in the U.S. Today; The Native Americans; Discrimination
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.4, SD = 0.9$

#### **Psychological Methods – Spring 2015**

- Instructor of Record: Dr. Ross Avilla
- Duties: Exam proctoring, scoring, general grading
- Invited Lecture: Data analysis and interpretation
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.6, SD = 0.7$

#### **Stereotype and Prejudice – Fall 2014**

- Instructor of Record: Dr. Inga Maples
- Duties: Exam proctoring, scoring, general grading, in-class activity creation
- Invited Lecture: Prejudice and allies: A chance for change
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.4, SD = 1.0$

#### **Health Psychology – Spring 2014**

- Instructor of Record: Dr. Deborah Wiebe
- Duties: Quiz creation, proctoring, scoring, general grading
- Invited Lecture: Staying healthy: Primary prevention and positive psychology
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.3, SD = 0.6$

#### **Psychology of Race, Ethnicity, and Culture – Fall 2013**

- Instructor of Record: Dr. Jim McDiarmid
- Duties: Exam creation, proctoring, scoring, general grading, class-wide material review sessions
- Invited Lecture: Prejudice
- T.A. Competency Evaluation (1 [strongly disagree] – 7 [strongly agree]):  
 $M = 6.5, SD = 0.8$

#### **Teaching Development**

- Pedagogy Certifications:
  - Center for Engaged Teaching and Learning (CETL) Instructional Internship Alumni:
    - Mastering the Classroom with 1<sup>st</sup> Generation College Students
    - Developing Teaching Strategies
    - Improving Teaching by Assessing Learning

- Undergraduate Learning Outcomes Assessment: Pedagogy and Program Planning
  - Merritt Writing Program and the Center for Research on Teaching Excellence at the University of California, Merced
    - Undergraduate Learning Outcomes Assessment: Pedagogy and Program Planning Certificate Project and Learning Community
- Co-founder of the Graduate Pedagogy Association
  - The GPA bolsters the pedagogical development of TAs and educators of all levels by providing simple, effective, resources and workshops.

## **RESEARCH & QUANTITATIVE TRAINING**

### **Courses**

- Multilevel Modeling
  - Instructor: Dr. Keke Lai
- Linear Structural Modeling
  - Instructor: Dr. Sarah Depaoli
- Longitudinal Data Analysis & Bayesian Extensions
  - Instructor: Dr. Sarah Depaoli
- Research Design & Methodology
  - Instructor: Dr. William Shadish

### **Workshops**

- UC Health Psychology Consortium:
  - Measurement and Quantitative Techniques
    - Topics: Anthropometric Measurements & Biomarkers; Longitudinal Analyses, Working with Missing Data, and Meta-analytic Techniques
    - Speakers: Dr. Heather McCreath, Dr. Megan Robins, Dr. Jennifer Krull, Dr. Craig Enders, Dr. Bob Rosenthal
  - Resilience and Health
    - Topics: Four Waves of Resilience Research, Neurobiological Foundations of Stress & Resilience, Molecular Biological Perspectives on Subjective Well-being
    - Speakers: Dr. Ann Masten, Dr. Naomi Eisenberger, Dr. Steve Cole, et al.
- UC Merced Psychological Sciences Intensive Longitudinal Designs
  - On the Care and Feeding of Free-Range Humans: Ambulatory and Real-Time Intervention in Daily Life
    - Speaker: Dr. Joshua Smythe
  - Intro to Ecological Momentary Assessment Methods
    - Speaker: Dr. Kristin Heron
  - Statistical Mediation Analysis with Intensive Longitudinal Data: Opportunities and Challenges
    - Speaker: Dr. Jean-Philippe Laurenceau
- UC Merced Invited Lecture: Multiple Imputation
  - Speaker: Dr. Craig Enders

## **CONFERENCE PRESENTATIONS**

### **Invited Talks**

- Wiebe, D. J., Ramirez, M., **Mello, D.**, Marino, J., Munion, A., Butner, J., and Berg, C. (2018, April). Executive functions and daily self-regulation to support adherence across the transition into emerging adulthood. Paper presented at the 39th Annual Society of Behavioral Medicine Conference, New Orleans, LA.
- Mello, D.**, Wiebe, D. J., Baker, A., & Berg, C. A. (2017, March). Family relations and executive function mediate neighborhood disorder risk in adolescents with type 1 diabetes. In S. Domoff (Chair) *The importance of the family context in preventing and treating chronic health conditions in diverse children*. Symposium paper presented at the 38<sup>th</sup> Society of Behavioral Medicine Conference, San Diego, CA.
- Mello, D.** (2017, March). Trajectories of metabolic control among diverse youth from the Type 1 Diabetes Exchange Clinic Registry. Paper presented at the 4<sup>th</sup> Annual University of California, Merced Psychological Sciences Symposium. Merced, CA.
- Mello, D.**, Wiebe, D. J., & Berg, C. A. (2016, April). The stress and coping context of type 1 diabetes management among Latino and Caucasian adolescents and their mothers. In N. Zelikovsky (Chair) *Working with triple vulnerabilities: Ethnic minority youth with chronic health conditions*. Symposium paper presented at the 37<sup>th</sup> Society of Behavioral Medicine Conference, Washington, D.C.
- Mello, D.**, & Carroll, P. (2016, March). Assessing a new psychological methods supplemental session. Paper presented at the 2016 University of California, Merced Research Symposium. Merced, CA.
- Mello, D. (2015, April). Psi Chi Symposium. Lecture on The Graduate School Experience conducted from the University of California, Merced. Merced, CA.
- Velásquez-Andrade, E. R., **Mello, D.**, Quiroz, A., Tumas, J., Valverde, A., Sandoval, R., & Gutierrez, A. (2012, August). Speed diversity dialogue: Fostering multicultural awareness in higher education. In M. Fuentes (Chair) *Prejudice & Discrimination: Is There Hope For A Better Tomorrow?* Symposium paper presented at the 120<sup>th</sup> American Psychological Association Conference, (Continuing Education Credit), Orlando, FL.
- Mello, D.** (2012, May). Trees, technology, and academia: Contemporary influences to student academic performance. Paper presented at the McNair Scholars Symposium, Rohnert Park, CA.

### **Poster Presentations**

- Mello, D.**, & Velásquez-Andrade, E. R. (2018, August). Speed diversity dialogue: Multicultural excellence training for college students. Poster session presented at the 126th Annual Convention of the American Psychological Association, San Francisco, CA.

- Mello, D., & Wiebe, D. J.** (2018, April). Trajectories of glycemic control among diverse youth from the Type 1 Diabetes Exchange Clinic Registry. Poster session presented at the 39th Annual Society of Behavioral Medicine Conference, New Orleans, LA.
- Mello, D., & Wiebe, D. J.** (2018, April). The role of socioeconomic status in health disparities among Latino and non-Latino White youth with diabetes: A systematic review. Poster session presented at the 39th Annual Society of Behavioral Medicine Conference, New Orleans, LA.
- Mello, D., Wiebe, D. J., & Berg, C. A.** (2016, April). Socioeconomic associations with identity among emerging adults with type 1 diabetes. Poster session presented at the 37th Annual Society of Behavioral Medicine Conference, Washington, D.C.
- Nguyen, M., Patel, K., **Mello, D., & Wiebe, D. J.** (2016, April). Externalizing behaviors, disclosure, and diabetes management in adolescents with type 1 diabetes. Poster session presented at the 37th Annual Society of Behavioral Medicine Conference, Washington, D.C.
- Mello, D., Wiebe, D. J., & Berg, C. A.** (2015, April). Maternal Shift and Persist Coping, Low SES, and Adolescent Type 1 Diabetes Management. Poster session presented at the 36th Annual Society of Behavioral Medicine Conference, San Antonio, TX.
- Mello, D., Wiebe, D. J., & Berg, C. A.** (2015, March). Maternal Shift and Persist Coping, Low SES, and Adolescent Type 1 Diabetes Management. Poster session presented at the 2nd Annual University of California, Merced Symposium on the Child and Family. Merced, CA.
- Velásquez-Andrade, E. R., Martinez, P., Quiroz, A., Tumas, J., Valverde, A., **Mello, D.,** Watters, K. (2012, June). Diversity awareness in higher education: A call to action. Poster session presented at the 12th Annual Stanford Undergraduate Psychology Conference, Palo Alto, CA.
- Velásquez-Andrade, E. R., Quiroz, A., Tumas, J., **Mello, D.,** Sandoval, R., Valverde, A., Gutierrez, A. Watters, K. (2012, January). When student-faculty research collaboration works, we all benefit! Poster session presented at the Sonoma State University Faculty Retreat, Rohnert Park, CA.
- Velásquez-Andrade, E. R., Quiroz, A., **Mello, D.,** Tumas, J., Sandoval, R., Valverde, A., Espinoza, R. Cavanaugh, S, Lindgren, L., White, A. (2011, May). Speed Diversity Dialogue: Multicultural competence training. Poster session presented at the 11th Annual Stanford Undergraduate Psychology Conference, Palo Alto, CA.
- Velásquez-Andrade, E. R., Tumas, J., Quiroz, A., **Mello, D.,** Sandoval, R., (2011, April). Institutional commitment to diversity: Aligning needs and resources. Poster session presented at the 2nd Annual Berkeley Psychology Undergraduate Research Conference, Berkeley, CA.

## Workshops



- Mello, D., & Velásquez-Andrade, E. R.** (2018, March). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Velásquez-Andrade, E. R.** (2017, September). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Velásquez-Andrade, E. R.** (2017, May). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at Petaluma Health center. Petaluma, CA.
- Mello, D., & Velásquez-Andrade, E. R.** (2017, March). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Velásquez-Andrade, E. R.** (2016, October). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Briggs, G.** (2016, April). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Huff, A.** (2015, November). Improving Teaching by Assessing Learning. Workshop presented at the University of California, Merced. Merced, CA.
- Mello, D., & Gardner, A.** (2015, October). Critical Thinking. Workshop presented at the University of California, Merced. Merced, CA.
- Velásquez-Andrade, E. R., Lewis, M., & **Mello, D.** (2015, August). Speed Diversity Dialogue: A multicultural excellence workshop. Continuing Education workshop presented at the 123<sup>rd</sup> American Psychological Association Conference, Toronto, Canada.
- Mello, D., & Hoffman, C.** (2015, January). The TA and the IOR: Communicating Effectively. Workshop presented at the University of California, Merced. , Merced CA.
- Mello, D., & Velásquez-Andrade, E. R.** (2014, August). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at Ohio State Community College. Columbus, OH.
- Mello, D.** (2014, August). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at CSA Training Week at Sonoma State University. Rohnert Park, CA.
- Mello, D., Velásquez-Andrade, E. R., Quiroz, A., Tumas, J., & Valverde, A.** (2013, February). Speed Diversity Dialogue: Multicultural excellence for the leaders of tomorrow. Workshop presented at the 30<sup>th</sup> Annual Winter Roundtable Conference at Teacher's College. New York City, NY.
- Velásquez-Andrade, E. R., **Mello, D., Quiroz, A., Tumas, J., Valverde, A., Sandoval, R., & Gutierrez, A.** (2012, October). Speed Diversity Dialogue: A multicultural competence workshop. Workshop presented at The National Latino Psychological Association Conference, (Continuing Education Credit). New Brunswick, NJ.

Velásquez-Andrade, E. R., **Mello, D.**, Quiroz, A., Valverde, A., Tumas, J., & Martinez, P. (2012, June). Speed Diversity Dialogue: A multicultural excellence workshop. Workshop presented at the 11<sup>th</sup> Annual Hawaii International Conference on Social Sciences. Honolulu, HI.

Velásquez-Andrade, E. R., Quiroz, A., Tumas, J., **Mello, D.**, Sandoval, R., Valverde, A., Gutierrez, A. (2011, October). Speed Diversity Dialogue: A multicultural competency training technique. Workshop presented at the 3<sup>rd</sup> Annual Leadership & Social Justice Conference, Berkeley, CA.

## **AWARDS, SCHOLARSHIPS, & GRANTS**

### **Awards**

- 2018 Society of Behavioral Medicine Citation and Meritorious Abstract award for the submission entitled *Trajectories of Glycemic Control Among Diverse Youth from the Type 1 Diabetes Exchange Clinic Registry*
- 2018 Diabetes Special Interest Group Student Travel Award (\$500) for the submission entitled *Trajectories of Glycemic Control Among Diverse Youth from the Type 1 Diabetes Exchange Clinic Registry*
- 2018 Health and Equity Special Interest Group Trainee Award for the submission entitled *Trajectories of Glycemic Control Among Diverse Youth from the Type 1 Diabetes Exchange Clinic Registry*
- Spring 2018 Graduate Research Fellowship recipient
- 2017 Psychological Sciences Research Dissemination Award
- William R. Shadish Award for Leadership and Service: 2016, 2017
- 2017 Graduate Student Association Travel Award
- 2012 SSU Psychology Department Distinction Award
- 2011 Sally Casanova Pre-Doctoral Scholar Award
- 2011-2012 McNair Scholar
- Recipient of multiple Dean's Highest Honors awards

### **Scholarships**

- Sonoma State University 2012 McNair Scholar
- 2012 SSU School of Social Sciences Commencement Student Representative
- California Pre-Doctoral Program 2011 Sally Casanova Scholar

### **Grants**

- \$3,500
  - Project: "Identity Development during Adolescence and Emerging Adulthood among Youth with Type 1 Diabetes". (under review). Society of Personality Psychology International Collaboration Award to foster international collaboration between early-career researchers and experienced colleagues.
- \$1,500
  - Project: "Teaching Assistant Mentor Program." Fall 2017. New project grant awarded by the Center for Excellence in Teaching and Learning to design and facilitate a mentorship program that pairs graduate teaching assistants with more experienced educators in order to provide one-on-one

help with pedagogical development at the University of California, Merced.

- \$1,000
  - Project: “Speed Diversity Dialogue: A Multicultural Excellence Training.” Spring 2016. Diversity, Equity, and Inclusion grant from the Office of Campus Climate to host the SDD workshop during the CORE Friday series at the start of the Fall 2016 and Spring 2017 semesters at the University of California, Merced.
- \$200
  - Project: “Speed Diversity Dialogue: A Multicultural Competency Training Technique.” Fall Semester grant from the Richard A. Rodriguez Memorial Fund, to facilitate the SDD workshop at the 3<sup>rd</sup> Annual Leadership and Social Justice Conference at the University of California – Berkeley, August 2011.
- \$700
  - Project: “Speed Diversity Dialogue: A Multicultural Competency Training Technique.” Fall Semester grant from the Sonoma State University Undergraduate Research program, to purchase NVivo, software for qualitative data analysis, August 2010.
- \$200
  - Project: “Speed Diversity Dialogue: A Multicultural Competency Training Technique.” Fall Semester grant from the Richard A. Rodriguez Memorial Fund, to purchase materials for poster production and conference expenses, August 2011.

## **SERVICE**

### **Institutional & Professional Service**

#### **Health Sciences Research Institute Graduate Advisory Board – 2017 to Present**

- Provided advice to the HSRI institute on interdisciplinary activities and programming that might interest graduate students

#### **Graduate Intern with the Type 1 Diabetes Exchange Clinic Registry – 2017 to 2019**

- Developed, coordinated, and managed a large literature review
- Attended trainings to bolster researcher-participant interactions

#### **Graduate Pedagogy Association – 2016 to 2018**

- Co-Founder, Treasurer, and Co-Vice President
- Maintained financial records, petitioned for funding
- Awarded \$1,200 – UC Merced Graduate Student Association, 2016 – 2018
- Organized club events, including speaker arrangement, and venue assignment
- Co-developed the Teaching Assistant Mentor Program

#### **Graduate Dean’s Diversity Council – 2017/2018 academic year**

- Provided advice for diversity and inclusion-related issues on campus

**4<sup>th</sup> Annual Psychological Sciences Symposium – University of California, Merced Research Week 2017**

- Co-organized the Keynote and paper session speakers
- Designed marketing materials
- Coordinated presenter introductions and technological requirements
- Arranged symposium location set-up, tear-down

**Psychology Graduate Student Visitation Planning Committee – University of California, Merced Visitation Weekend 2016, 2017, 2018, 2019**

- Arranged travel to and from on-campus Visitation Weekend services
- Co-organized post-reception mixer for visiting potential graduate students

**Undergraduate Robing – University of California, Merced Commencement 2014, 2015, 2016**

- Ushered graduating students toward Commencement registration
- Coordinated tickets and seating for Commencement attendees
- Provided additional assistance to graduating student

**Committee Member – Richard A. Rodriguez Memorial Fund, 2012, 2013**

- Contributed to the advertisement of the call for proposals
- Evaluated proposals & organized award ceremony
- Developed proposal form

**Ad Hoc Reviewing**

- Journal of Pediatric Psychology
- Annals of Behavioral Medicine
- Health Psychology
- Pediatric Research
- Psychosomatic Medicine

**PROFESSIONAL AFFILIATIONS & HONOR SOCIETIES**

- American Psychological Association
- Society of Behavioral Medicine – Diabetes SIG, Health and Equity SIG
- Society of Clinical Child and Adolescent Psychology
- Graduate Pedagogy Association (G.P.A.), University of California, Merced
- Lifetime member of Psi Chi, the International Honor Society in Psychology
- Lifetime member of Psi Beta, the National Honor Society in Psychology

## ABSTRACT

I examined whether neighborhood disadvantage directly associates with concurrent and longitudinal type 1 diabetes (T1D) outcomes among late adolescents transitioning into early emerging adulthood, and whether such disadvantage indirectly links to outcomes through parent–adolescent relationship quality. Seniors in high school with T1D ( $N = 236$ ; mean age  $17.76 \pm 0.39$  years; 61% female; 73.7% non-Latino White) completed self-report measures of relationship quality with mothers and with fathers, and adherence to their diabetes regimen; glycemic control was measured using HbA1c assay kits. Both T1D outcomes (i.e., adherence, HbA1c) were assessed annually across the following two years. Census tract indicators of neighborhood disadvantage (e.g., % unemployed) were culled from participant addresses at baseline linked to American Community Survey data. Structural Equation Modeling was used to estimate direct and indirect links between neighborhood disadvantage and both concurrent and longitudinal trajectories of diabetes outcomes. All models showed excellent fit to the data. Greater neighborhood disadvantage associated with lower relationship quality with both parents. In models examining mother and father relationship quality separately, lower relationship quality with mothers directly linked to poorer concurrent adherence, and formed an indirect path linking neighborhood disadvantage with poorer concurrent adherence. Lower relationship quality with fathers directly linked to poorer concurrent adherence and glycemic control, and formed an indirect path linking neighborhood disadvantage to both outcomes concurrently. When relationship quality with each parent was modeled simultaneously, the indirect path linking neighborhood disadvantage to concurrent adherence through relationship quality with fathers remained significant, while the path through relationship quality with mothers did not. Neighborhood disadvantage and parent-adolescent relationship quality were generally unrelated to longitudinal trajectories of diabetes outcomes. Parent-adolescent relationship quality (especially with fathers) remains important for T1D outcomes among late adolescents on the cusp of emerging adulthood, but may be at risk among those living within a socioeconomically-disadvantaged neighborhood.

## CHAPTER ONE: INTRODUCTION

Type 1 diabetes (T1D) is a chronic autoimmune disease that requires daily vigilance to illness-related self-management behaviors in order to maintain healthy blood glucose levels (Chiang et al., 2018). Accomplishing these complex tasks every day, for the rest of life, is daunting at any time of development, but may be particularly true during late adolescence. In this stage of life, youth are becoming increasingly independent from parents and on the cusp of emerging into adulthood (ages 18-30; Arnett, 2016), facing new life changes and challenges to their well-being (e.g., going to college; increased risk of alcohol or substance use; Monaghan, Helgeson, & Wiebe, 2015), and experiencing uncertainty about their future (Arnett, 2016). Late adolescents with T1D take on greater responsibility for managing their illness (Wiebe et al., 2014), and are tasked with continual diabetes care while navigating these life transitions. T1D management steadily deteriorates across adolescence (e.g., poorer adherence, lower glycemic control), reaching a nadir in the late adolescence–early emerging adulthood period (Clements et al., 2016; Miller et al., 2015). This is concerning because poor diabetes management is associated with short- (e.g., diabetic ketoacidosis, hypoglycemia; Levine et al., 2001) and long-term health complications (e.g., nephropathy; White, 2015). Because patterns of diabetes management in adolescence may set the stage for management across emerging adulthood (Helgeson et al., 2017), it is imperative to understand factors that might contribute to lower adherence and higher HbA1c (i.e., poorer glycemic control) at this time of development.

### **Neighborhood Disadvantage and Type 1 Diabetes Management**

Evidence is accumulating to implicate lower SES as a risk factor to T1D outcomes. For example, lower SES is associated cross-sectionally with poorer adherence behaviors (Duke et al., 2008), a less-intensive insulin administration regimen and less overall knowledge of diabetes (Powell et al., 2013), fewer daily blood glucose checks (Powell, Chen, Kumar, Streisand, & Holmes, 2013), and higher HbA1c (Borschuk & Everhart, 2015; Duke et al., 2008; Redondo et al., 2014). We are aware of only two studies that have examined longitudinal associations between SES and subsequent T1D outcomes. Helgeson et al. (2017) found that youth from lower SES homes had riskier latent trajectories of glycemic control across adolescence and emerging adulthood, while Secrest et al. (2011) found that lower SES in early adulthood is a risk factor for the development of long-term complications later in life (e.g., neuropathy). Thus, the evidence shows a consistent link between lower SES and poorer T1D outcomes, with the potential for these associations to play out across developmental periods, suggesting long-reach risk. However, most work on these associations is cross-sectional, underscoring the imperative to examine concurrent and longitudinal links between lower SES and T1D management.

An emerging literature has identified neighborhood-level SES as a unique context linked to the health of developing youth. Research into neighborhood-level SES has harnessed US Census tract indicators of socioeconomic disadvantage (e.g., percent of the local population who are unemployed) to create an emergent “neighborhood disadvantage” construct suggestive of the environmental conditions within which

families attempt to live, work, play, and survive. This cross-sectional work revealed that neighborhood disadvantage associated with dysregulated cortisol during late childhood (Dulin-Keita, Casazza, Fernandez, Goran, & Gower, 2012), and higher body mass index and dysregulated cortisol profiles in late adolescence, over-and-above other measures of family SES (e.g., parental education, occupation, or income; Chen & Paterson, 2006). More recent work with the pediatric T1D population found that early and late adolescents from disadvantaged neighborhoods showed higher HbA1c (Clarke, Daneman, Curtis, & Mahmud, 2017). Similarly, Queen et al. (2017) used a cross-sectional subset of data from the sample for the current study, and found that late adolescents from disadvantaged neighborhoods had lower glycemic control above-and-beyond family SES (e.g., maternal education), as well as markers of healthcare access (e.g., insulin pump use).

### **Neighborhood Disadvantage and the Parent-Adolescent Relationship**

It may be that neighborhood disadvantage places T1D at risk partially by undermining parent-adolescent relationship quality. The Family Investment Model theorizes that socioeconomic limitations, including the neighborhood environment (e.g., inadequate housing), hinder the ability for parents to devote resources to their adolescent's development (e.g., having less time or space for parent-adolescent bonding that may facilitate social competence; Conger & Donnellan, 2007). Relatedly, the Family Stress Model posits that persistent socioeconomic distress (e.g., inability to make ends meet, potentially by inadequate employment opportunities) can adversely affect family functioning by creating marital relationship strain, and harsh, inconsistent parenting practices (Conger & Donnellan, 2007). SES-related distress may be overtaxing parents' abilities to effectively parent, which may strain their relationship with their adolescent and ultimately place their adolescent's health at risk. Consistent with these models, lower household SES is linked to poorer affective involvement within families across different pediatric chronic illnesses (Herzer et al., 2010), and neighborhood-level risk is linked to poorer relationship quality between parents and adolescents (Kotchick & Forehand, 2002; Simons et al., 2016), underscoring the unique importance of neighborhood disadvantage during adolescence.

### **The Parent-Adolescent Relationship and Type 1 Diabetes Management**

Warm and accepting relationships with parents play a central role in how T1D is managed during adolescence (Berg et al., 2008; Palmer et al., 2011), and may set the stage for T1D management during the transitional time from late adolescence into early emerging adulthood (Wiebe, Helgeson, & Berg, 2016). Parental Acceptance-Rejection Theory (Rohner, Khaleque, & Cournoyer, 2005) emphasizes how warmth and caring from parents characterizes the emotional bond of acceptance. As the authoritative structure between parents and adolescents changes from being hierarchical (i.e. parents establishing rules) to more shared decision-making (Collins & Laursen, 2004) across adolescence, parents often transition to being a backup system of "guiding agents" who are available to help in case of life and T1D difficulties (Hilliard et al., 2014; Sparud-Lundin, Öhrn, & Danielson, 2010). Yet, the emotional connection between parents and late adolescents remains important, and may set the stage for how T1D is managed across the transition into early emerging adulthood (Rohner & Britner, 2002; Wiebe, Berg,

Mello, & Kelly, 2018; Wiebe et al., 2016). Supportive parent-adolescent relationships are linked to better adherence and glycemic control during adolescence (Helgeson et al., 2014; Main et al., 2015), and longitudinal research has shown that better parent-adolescent relationship quality predicts less deterioration in adherence from late adolescence into early emerging adulthood (Helgeson et al., 2014). Emerging adults with T1D report that parents remain their most trusted source of support and help with T1D due to a shared history of managing the illness (Sparud-Lundin et al., 2010), with some evidence that positive relationships with parents are more strongly linked to T1D outcomes during emerging adulthood than at younger ages (Goethals et al., 2017). Taken together, these findings suggest that late adolescents' experience of a high-quality relationship with parents may provide a familiar source of available support that is likely to be important not only for concurrent T1D outcomes, but also for determining T1D outcomes across the transition into early emerging adulthood.

It is important to note the potential for mothers' and fathers' acceptance to have differential implications for late adolescent T1D outcomes. Adolescents perceive mothers to be more accepting (Miranda, Affuso, Esposito, & Bacchini, 2016) and to display more emotional warmth than fathers (Worrall-Davies, Owens, Holland, & Haigh, 2002), but differential links to T1D outcomes are inconsistent. Perceptions of acceptance by both mothers and fathers have been related to better adherence and glycemic control among early adolescents (Drew et al., 2011; King, Berg, Butner, Butler, & Wiebe, 2014) and late adolescents (Main et al., 2015). However, other findings show differential associations between mothers' and fathers' acceptance with T1D outcomes. Berg et al. (2008) found that early adolescents perceived mothers to be more accepting than fathers, and that greater mothers' acceptance was associated with better adherence, while greater father's acceptance was associated with better adherence and glycemic control. Given the mixed literature, and the increasing importance of fathers' unique involvement in pediatric chronic illness (Wysocki & Gavin, 2004), it remains important to examine if different relational processes between late adolescents and their mothers and fathers may occur, and are associated with T1D management.

### **Neighborhood Disadvantage Associated with Type 1 Diabetes Through the Parent-Adolescent Relationship**

Given evidence that neighborhood disadvantage is linked to parent-adolescent relationship processes, and that these processes are associated with T1D, it is possible that neighborhood disadvantage associations with T1D management may occur indirectly through parent-adolescent relationship processes. Diabetes self-management deteriorates across the adolescent years as management is transferred away from direct parental oversight, and placed more under the adolescent's independent control (King et al., 2014; Wiebe et al., 2014). High-quality parent-adolescent relationships may stave off some of this degradation (King et al., 2014), but if neighborhood disadvantage is placing relationship quality at risk (Kotchick & Forehand, 2002; Simons et al., 2016), then the parent-adolescent relationship may be mediating its association with T1D. Support for this possibility has been reported in samples of early adolescents. Both Drew et al. (2011) and Thomas et al. (2018) found that lower family SES associated with poorer adherence and lower glycemic control indirectly via poorer parent-adolescent relationship quality.



There is the potential for this mediating process to occur during late adolescence when warmth and support from parents becomes especially salient to T1D, and these processes may set a foundation for how late adolescents manage their T1D as they navigate the transitions into early emerging adulthood. However, such processes have not been examined during this developmental period.

## **CHAPTER TWO: SUMMARY AND HYPOTHESES**

In sum, the current study examined how living within a socioeconomically-disadvantaged neighborhood may uniquely hinder T1D management during late adolescence and across the transition into emerging adulthood through lower parent-adolescent relationship quality. Prior research on SES links to T1D via relationship quality have primarily focused on younger adolescence (Drew et al., 2011; Thomas et al., 2018), despite the potential for acceptance from parents to remain an important factor to adherence and glycemic control levels during late adolescence and emerging adulthood (Helgeson et al., 2014; Main et al., 2015). Moreover, the risk of lower SES in young adulthood to long-term complications later in life (Secretst et al., 2011) highlight the necessity for examining the initial potential for lower-SES risk during this transitional period. I hypothesized that, during late adolescence, 1) high neighborhood disadvantage would have a direct link to poorer concurrent levels and longitudinal trajectories of adherence and glycemic control, 2) high neighborhood disadvantage will associate with poorer parent-adolescent relationship quality, 3) lower parent-adolescent relationship quality with either or both parents will be associated with poorer concurrent levels and longitudinal trajectories of adherence and glycemic control, and 4) the link between neighborhood disadvantage and diabetes management will occur indirectly through parent-adolescent relationship quality with either or both parent. The potential differential roles of mothers and fathers were tested in the models, but limited and mixed findings in the previous literature prevented specific hypotheses.

## CHAPTER THREE: METHOD

### Participants

The current study used data from three annual assessments of a large multi-site longitudinal study examining how self-regulation and social relationships are linked to T1D management across the transition from late adolescence into early emerging adulthood. High school seniors with T1D ( $N = 236$ ) were recruited from outpatient endocrinology clinics in two southwestern cities. Of the qualifying 507 individuals approached, 301 (59%) agreed to participate. Of those who initially agreed, 247 (82%) were enrolled in the study. Reasons for not participating included lack of interest (33%) or being too busy in their senior year to participate (34%); 20% declined to give a reason. The institutional review board at one site permitted comparison of those who did versus did not participate. Compared with those who declined, participants were slightly younger,  $M (SD) = 17.77 (0.43)$  versus  $17.91 (0.48)$  years,  $t(203) = 2.274, p = .024$ , and more likely to be Latino (21% vs. 11%),  $\chi^2(df = 1) = 3.88, p = .049$ . However, participants did not differ from those who declined on glycemic control, time since diagnosis, gender, or pump status ( $ps > .05$ ).

Eligibility criteria included being diagnosed with type 1 diabetes for at least one year, English as the primary language, being in the final year of high school, living with a parent (82.1% lived in two-parent homes), being able to have regular contact with parents over the subsequent two years (consistent with objectives of the broader longitudinal study), and having no condition that would prohibit study completion (e.g., severe intellectual disability, blindness, etc.) Adolescents who had dropped out of high school were eligible if they met all other criteria.

At baseline, participants were 17.76 years old on average ( $SD = 0.39$ ), 61% female, 73.9% non-Latino White, 14.3% Latino, 6.1% as African American, and 5.7% either Asian/Pacific Islander, American Indian, or more than one race. Average time since diagnosis was 7.37 years ( $SD = 3.91$ ); 44.4% reported using an insulin pump. Among parents, 12.9% of mothers and 18.2% of fathers had a high school education or less, 37.2% of mothers and 25.1% of fathers reported having some college or a vocational degree, and 34% of mothers and 46.3% of fathers had a bachelor's degree or higher. Census tract data showed the median household income in the neighborhood to be approximately \$68,300 ( $SD \approx \$30,500$ ), distributed as  $< \$20,000 (.9\%)$ ,  $\$20,000$  to  $< \$40,000 (9.7\%)$ ,  $\$40,000$  to  $< \$60,000 (24.1\%)$ ,  $\$60,000$  to  $< \$80,000 (32.9\%)$ ,  $\$80,000$  to  $< \$100,000 (17.1\%)$ ,  $\$100,000$  to  $< \$120,000 (6.9\%)$ ,  $\$120,000$  to  $< \$140,000 (5.1\%)$ , and  $\$140,000+$  (3.2%).

### Procedure

Participants were scheduled for an initial research appointment. Adolescents who were 18 years or older provided signed informed consent, while adolescents who were younger than 18 provided signed assent and a parent provided parental consent; those who assented provided signed informed consent after turning 18. Recruitment for the study took place between August 2011 and May 2014. Procedures for the first of three annual waves of data collection used in the current study took place in several stages. During an in-person research session, adolescents were trained in the use of a secure and

confidential on-line survey, and in the use of a dried blood-spot HbA1c assay kit to measure glycemic control across the course of the longitudinal study. Participants were then sent a link to complete the confidential online survey at home during the senior year of high school (Time 1), and again one (Time 2) and two years later (Time 3). Upon completion of the survey, adolescents were sent the HbA1c assay kit to complete and send to a central lab for processing. Adolescents were paid \$50 for the first two assessments (online survey and assay), and \$75 for the third assessment.

## Measures

**Neighborhood disadvantage.** The 2010 American Community Survey (ACS) was used to cull neighborhood-level data with which to assess risk. When data collection for the longitudinal study began in 2011, 83.5% of participants had been living in their current residence for five years or more. The 2010 ACS thus provides an index of neighborhood risk to which the participants had been exposed for some time. The home addresses of participants were used to determine individuals' Census tracts, which were then linked to the ACS data. Census tracts are smaller, contiguous regions than zip codes, and cover an overall wider geographical area, thereby providing greater resolution with which to capture neighborhood-level characteristics. Consistent with previous work (Dulin-Keita et al., 2012; Queen et al., 2017), ACS indicators chosen to represent the SES of neighborhood residents, as well as the physical environment, included: a) the percent of the population under 25 years old with less than a high school education; b) the percent under 18 years old living in poverty; c) the percent who are unemployed; d) the percent who are receiving public assistance; and e) the percent of vacant housing units. A neighborhood disadvantage composite variable was created by summing the standardized scores of these Census indicators. Higher values on the composite variable denote living in a more disadvantaged and impoverished neighborhood.

**Parent-adolescent relationship quality.** Relationship quality was measured using the acceptance subscale of the Mother-Father-Peer scale (Epstein, 1983). Five items were rated on a 1 (*strongly disagree*) to 5 (*strongly agree*) Likert scale to assess late adolescents' perceptions of feeling emotionally close to and accepted by mothers and fathers. Participants reported on relationship quality separately for mother and father, responding to items such as "My [mother/father] gives me the feeling that s(he) likes me as I am". Previous work has shown that this scale has acceptable reliability in parent-adolescent samples (e.g.,  $\alpha$  range: .69 – .83), and is associated longitudinally with T1D adherence across the adolescent years (King et al., 2014). In the current sample,  $\alpha = .86$  for mothers' acceptance and  $\alpha = .88$  for fathers' acceptance.

**Glycemic control.** Adolescent glycated hemoglobin (HbA1c) was obtained annually using dried blood spot HbA1c mail-in assay kits. HbA1c is a 3–4 month average of blood glucose levels, where higher HbA1c levels indicate poorer glycemic control given their links to adverse health outcomes. Assay kits were acquired from and processed by CoreMedica Laboratories, accredited by the College of American Pathologists ([www.coremedica.net](http://www.coremedica.net)). These kits were chosen over the more typical approach of extracting HbA1c from medical records because they provided a common measurement of glycemic control across sites and participants during subsequent waves of data collection, were time-matched to other portions of the study, and could be

obtained even if participants did not establish an adult care physician immediately after leaving pediatric care. At baseline, the HbA1c values from the mail-in assay kits were highly correlated with point-of-care assays in medical records ( $r = .74$ ;  $p < .001$ ). For all time points, participants had average HbA1c levels ( $M$  range: 8.26 – 9.27;  $SD$  range: 1.63 – 2.06) higher than clinical recommendations of  $< 7.5\%$  (Chiang et al., 2018).

**Adherence.** Adherence to prescribed diabetes self-management regimens was captured with the Diabetes Behavior Rating Scale (DBRS; Iannotti et al., 2006). This 37-item scale measures illness management behaviors, and is scored by calculating a proportion of the maximum possible score, ranging from 0 to 1. This scale has been shown to correlate highly with more time-intensive interview measures (Iannotti, Schneider, et al., 2006). Higher scores denote better adherence, and the scale showed good reliability across all time points ( $\alpha$  range: .84 – .91). In the current sample, late adolescents showed moderate adherence on average across all time points ( $M$  range: .59 – .61;  $SD$  range: .12 – .15).

### Statistical Analysis Plan

Across the variables of interest, 50.42% of cases had incomplete data, though missingness at the variable level was relatively small (7.14%). To account for the missing data, five imputations were created using the Markov-Chain Monte Carlo method in SPSS 23 (Graham, 2009). Other variables beyond those for the current study were included in the imputation procedure to ensure a “missing-at-random” model. These additional variables reflected aspects of self-regulation (e.g., measures of executive functioning) and social relationship processes related to diabetes management at this time of development (e.g., mother/father diabetes knowledge).

Structural Equation Modeling (SEM) was employed to estimate the hypothesized direct and indirect pathways between neighborhood disadvantage and diabetes management. Previous latent growth curve analyses with this sample showed longitudinal deterioration in both adherence and HbA1c from late adolescence into emerging adulthood, with significant between-person variability at baseline and across time (Berg et al., 2018). With these trajectories of risk established, we tested three SEM models. Relationship quality with mothers and with fathers were initially tested in separate models (Models 1 and 2) to determine the patterns for mothers and fathers individually. We then tested a third model examining relationship quality with mothers and with fathers simultaneously to determine unique associations.

Adherence behaviors and HbA1c are related (Asche, LaFleur, & Conner, 2011), but conceptually distinct (Asche et al., 2011; Hood, Peterson, Rohan, & Drotar, 2009). HbA1c is a physiological indicator of average blood glucose levels over the past 3-4 months (Chiang et al., 2018), while adherence is a set of behaviors (e.g., checking blood glucose, counting carbohydrates, administering insulin, etc.) that patients are advised to follow to promote optimal blood glucose control (Hood et al., 2009). Given this, these two variables were modeled as correlated outcomes. The residual errors for the latent intercepts of adherence and glycemic control were allowed to correlate within the SEM models to account for their concurrent relationship, and the residuals for their latent slopes were allowed to correlate to account for their longitudinal link. The residual errors for the latent intercepts and slopes within each outcome were also allowed to correlate

(i.e. intercept and slope of glycemic control and of adherence were allowed to correlate).

Given our interest in examining relationship quality with mothers and with fathers individually, we conducted preliminary analyses to discern whether the adolescent's living arrangements may have influenced the findings. We were particularly concerned that relationship quality with fathers would appear to be less relevant to T1D management in cases when the adolescent did not live with their primary father figure. To examine this possibility, we first assessed how many late adolescents were living with their father, and then estimated if living with father moderated the direct link of father-adolescent relationship quality with T1D outcomes. The vast majority of participants (82.6%) reported living with the father on whom they were reporting. Living situation was negatively related to neighborhood disadvantage ( $r = -.34, p < .001$ ), but did not moderate the association between father relationship quality and any T1D outcome (concurrent or longitudinal;  $ps > .203$ ). Given that different patterns of associations across mother and father relationship quality were unlikely to reflect living situation, this variable was dropped to maintain model parsimony.

In all models, gender, ethnicity, and insulin pump status were covaried with all exogenous/endogenous intercepts and slopes because they were correlated with the T1D outcomes (see Table 1). Similar to prior work and recommendations (Leventhal & Brooks-Gunn, 2000; Queen et al., 2017), parental education was covaried to discern if neighborhood disadvantage had unique associations with relationship quality and T1D outcomes above-and-beyond individual SES. All analyses used  $\alpha = .05$  (two-tailed), and were estimated using Mplus (v8.0). Because bootstrapped confidence intervals are unavailable for imputed data in this version of Mplus, the default delta method estimated  $p$ -values for indirect effects. Model fit was evaluated using goodness-of-fit indices: the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean square of the Residuals (SRMR). A model with a CFI  $> 0.95$ , TLI  $> 0.95$ , RMSEA  $< 0.07$ , and SRMR  $< .08$  was considered for good fit (Hooper, Coughlan, & Mullen, 2008).

## CHAPTER FOUR: RESULTS

Descriptive statistics and correlations among study variables are shown in Table 1. Greater neighborhood disadvantage was associated with lower mothers' and fathers' acceptance, and higher HbA1c at all time points. Neighborhood disadvantage was not correlated with adherence at any time point. Higher mothers' acceptance was linked to higher concurrent adherence and lower HbA1c at Time 1, but not to subsequent T1D outcomes at Times 2 or 3. Higher fathers' acceptance, however, was linked to higher adherence and lower HbA1c both concurrently at Time 1, and prospectively one and two years later.

Table 1.  
*Correlations Between Neighborhood Disadvantage, Maternal & Paternal Acceptance, and T1D Outcomes among Late Adolescents with Type 1 Diabetes (N = 236)*

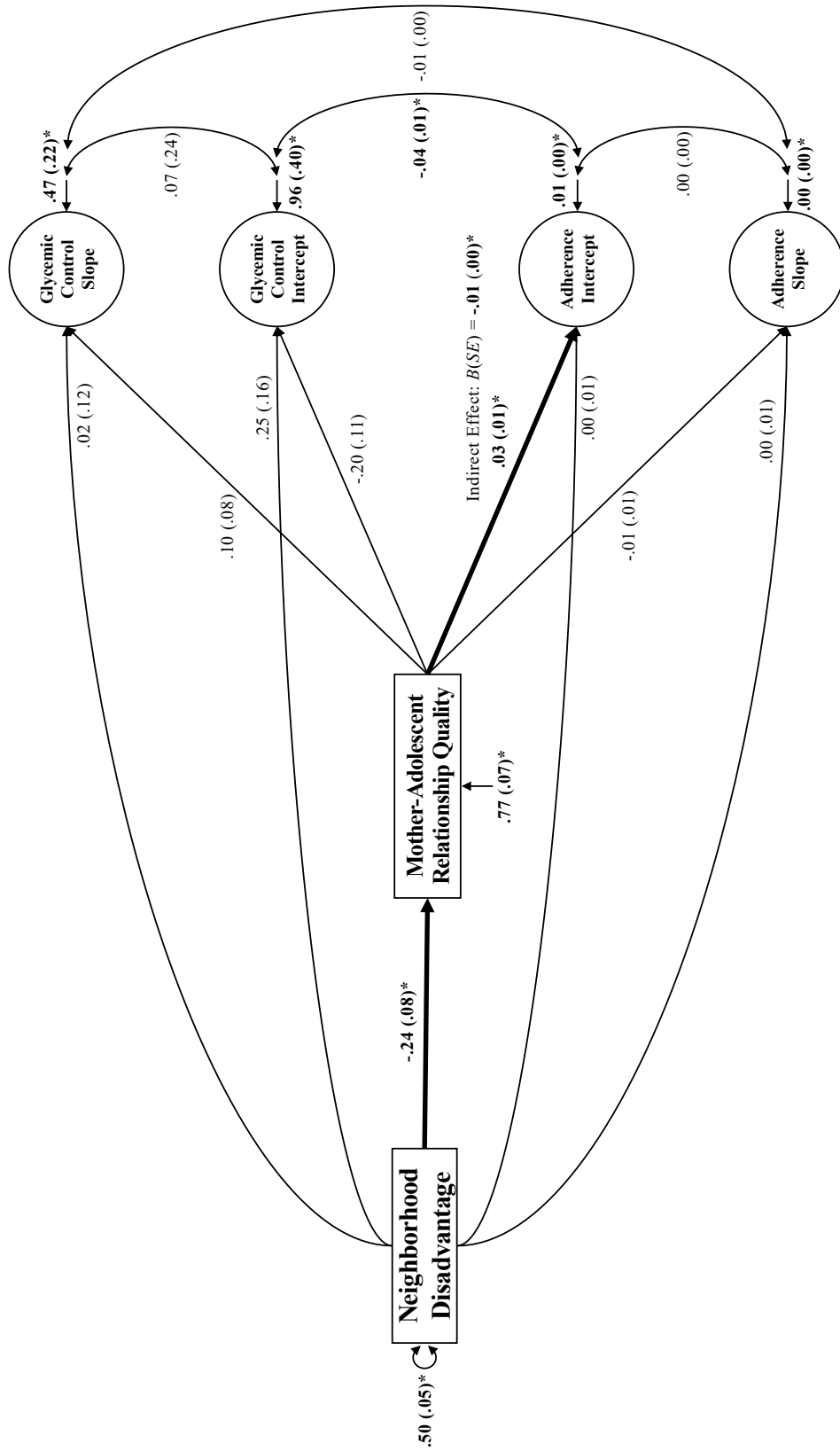
	M (SD)	1	2	3	4	5	6	7	8	9
1. Neighborhood Disadvantage	.00 (.70)	--								
2. Maternal Acceptance	4.32 (.89)	<b>-.19*</b>	--							
3. Paternal Acceptance	4.28 (.90)	<b>-.16*</b>	<b>.53*</b>	--						
4. Time 1 Glycemic Control	8.26 (1.63)	<b>.25*</b>	<b>-.14*</b>	<b>-.24*</b>	--					
5. Time 2 Glycemic Control	8.99 (1.97)	<b>.18*</b>	-.09	<b>-.25*</b>	<b>.47*</b>	--				
6. Time 3 Glycemic Control	9.27 (2.06)	<b>.16*</b>	-.03	<b>-.17*</b>	<b>.47*</b>	<b>.63*</b>	--			
7. Time 1 Adherence	.61 (.12)	-.02	<b>.21*</b>	<b>.36*</b>	<b>-.21*</b>	<b>-.23*</b>	<b>-.19*</b>	--		
8. Time 2 Adherence	.59 (.13)	-.05	.05	<b>.29*</b>	<b>-.17*</b>	<b>-.25*</b>	<b>-.20*</b>	<b>.67*</b>	--	
9. Time 3 Adherence	.59 (.15)	.05	.07	<b>.17*</b>	<b>-.27*</b>	<b>-.27*</b>	<b>-.29*</b>	<b>.56*</b>	<b>.65*</b>	--
10. Gender (% Female)	61% (n = 144)	-.11	-.04	-.03	<b>.20*</b>	.08	<b>.15*</b>	-.03	.06	-.11
11. Race/Ethnicity (% White)	73.9% (n = 170)	<b>.41*</b>	.10	-.02	<b>.29*</b>	<b>.26*</b>	<b>.22*</b>	.06	-.11	.00
12. Pump Status (% Insulin Pump)	44.4% (n = 104)	<b>-.31*</b>	.07	.04	<b>-.35*</b>	<b>-.24*</b>	<b>-.23*</b>	-.03	.05	<b>.16*</b>
13. Parental Ed (% College Degree)	59.3% (n = 118)	<b>-.35*</b>	.09	.09	<b>-.31*</b>	<b>-.20*</b>	<b>-.23*</b>	.07	.12	.01

Note. Values averaged across 5 imputed datasets. **Bold\*** values significant at or below  $p = .05$  level.

### **SEM Models Examining Mothers' and Fathers' Relationship Quality Separately**

**Mother-adolescent relationship quality.** This SEM model is shown in Figure 1, and showed excellent fit to the data,  $\chi^2 (35, N = 236) = 38.55, p = .312, CFI = .99, TLI = .99, RMSEA = .02, SRMR = .04$ . Neighborhood disadvantage was not directly related to concurrent levels (i.e., intercepts) or trajectories of T1D outcomes (i.e., slopes;  $ps > .061$ ). As predicted, however, greater neighborhood disadvantage was associated with lower mother-adolescent relationship quality, and lower mother-adolescent relationship quality was directly linked to lower concurrent adherence. Moreover, tests of indirect effects reported in Table 2 revealed that neighborhood disadvantage was indirectly related to concurrent adherence through mother-adolescent relationship quality. Mother-adolescent relationship quality did not predict concurrent HbA1c, nor trajectories of either outcome ( $ps > .056$ ). This model accounted for 3.6% of the variance in mother-adolescent relationship quality, 33.3% of the variance in latent concurrent HbA1c, 2.9% of the variance in latent trajectories of HbA1c, 5.0% of the variance in latent concurrent adherence, and 10.3% of the variance in latent trajectories of adherence.





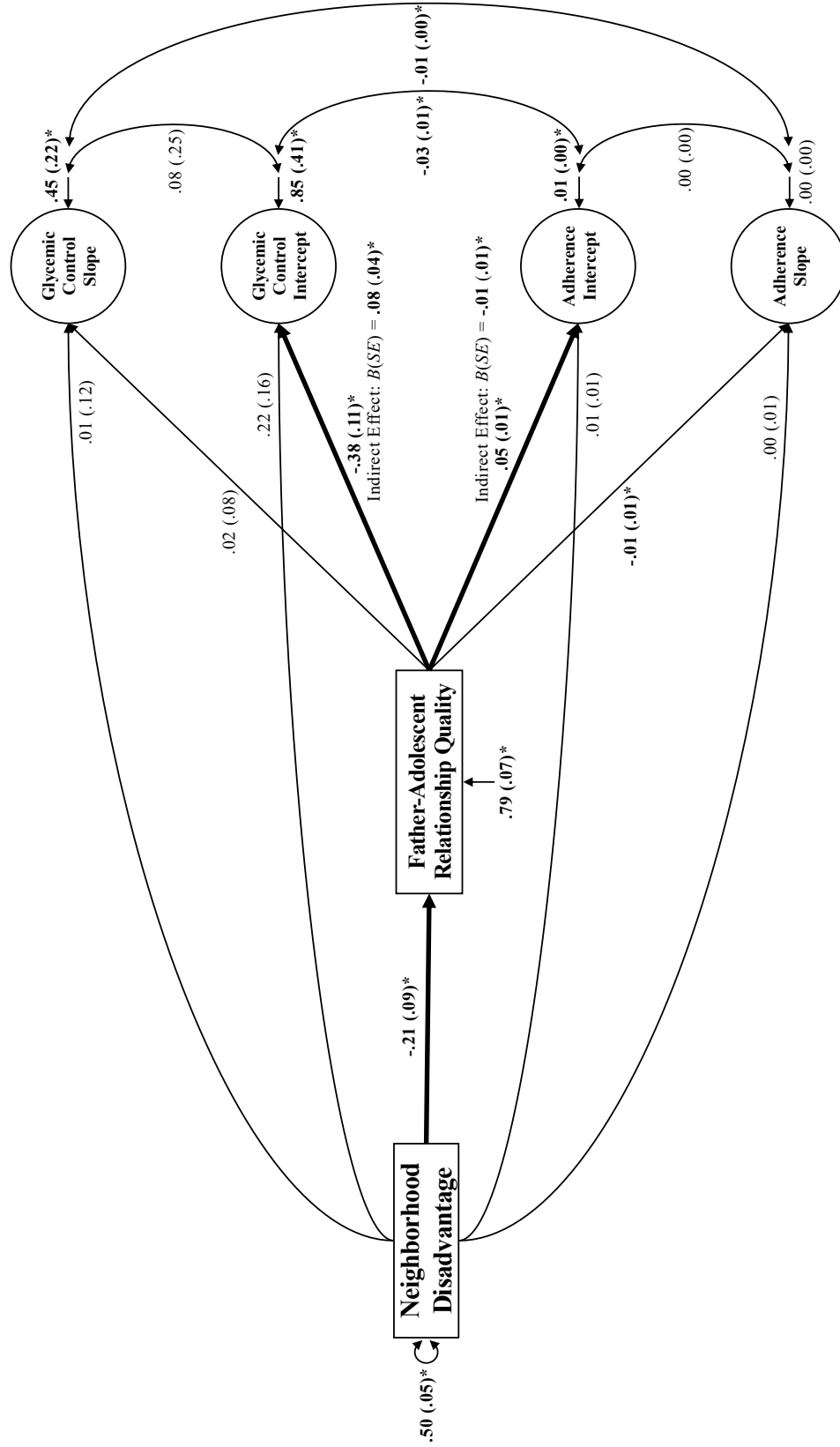
**Figure 1.** SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via mother-adolescent relationship quality among late adolescents transitioning into emerging adulthood. Coefficients shown as unstandardized parameter (standard error). **Bold\* coefficients** are significant at the  $p = .05$  level. **Bold lines** denote significant indirect paths. Gender, ethnicity, pump status, and parental education were covaried (not shown).  $\chi^2 (35, N = 236) = 38.55, p = .312, CFI = .99, TLI = .99, RMSEA = .02, SRMR = .04$ .

Table 2.  
*Coefficients for Indirect Pathways in Growth Curves of T1D Outcomes among Late Adolescents and Emerging Adults (N = 236)*

<b>Indirect Path Coefficient</b>	<b>Adherence</b>	<b>Glycemic Control</b>
Concurrent (Latent Intercept)		
Mother-Adolescent Only Model	<b>-.01 (.00)*</b>	.05 (.03)
Father-Adolescent Only Model	<b>-.01 (.01)*</b>	<b>.08 (.04)*</b>
Full SEM Model		
Mother-Adolescent Relationship Quality	.00 (.00)	.00 (.03)
Father-Adolescent Relationship Quality	<b>-.01 (.01)*</b>	.08 (.04)
Trajectories (Latent Slope)		
Mother-Adolescent Only Model	.00 (.00)	-.02 (.02)
Father-Adolescent Only Model	.00 (.00)	-.01 (.02)
Full SEM Model		
Mother-Adolescent Relationship Quality	.00 (.00)	-.03 (.02)
Father-Adolescent Relationship Quality	.00 (.00)	.01 (.02)

*Note.* **Bold\*** values significant at  $p < .05$ . Gender, Race, Pump Status, and Parental Education covaried (not shown). Full SEM Models examined mother and father relationship quality variables simultaneously.

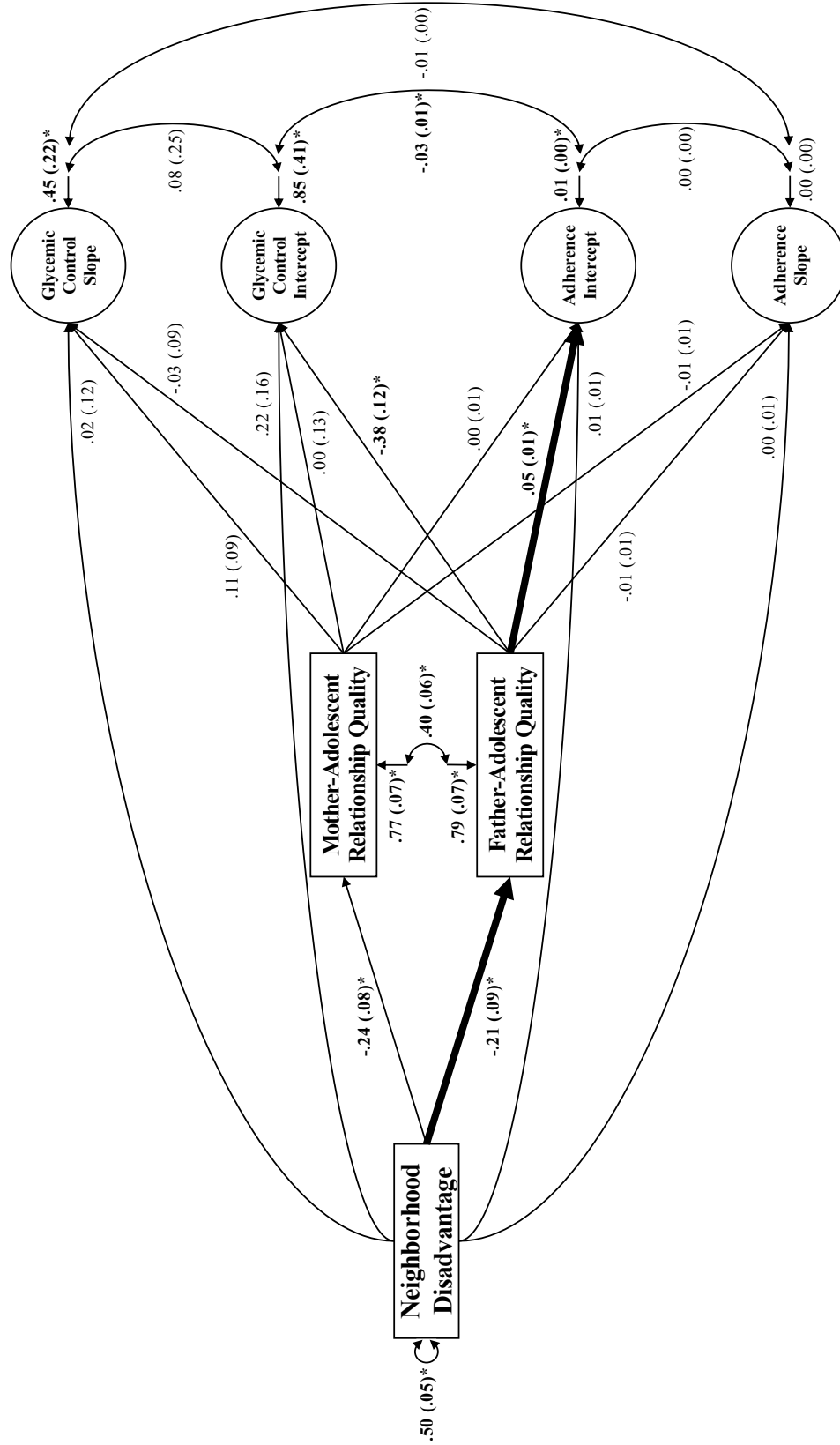
**Father-adolescent relationship quality.** This SEM model is shown in Figure 2, and showed excellent fit to the data,  $\chi^2 (35, N = 236) = 33.56, p = .538, CFI = 1.00, TLI = 1.01, RMSEA = .00, SRMR = .04$ . Similar to the mother-adolescent model, neighborhood disadvantage was not directly related to concurrent levels or trajectories of T1D outcomes in the father-adolescent model ( $ps > .168$ ). As predicted, greater neighborhood disadvantage was associated with lower father-adolescent relationship, and lower father-adolescent relationship quality was linked to lower concurrent adherence and higher HbA1c. Further, neighborhood disadvantage was indirectly related to concurrent adherence and HbA1c through father-adolescent relationship quality (Table 2). Although relationship quality did not predict trajectories of HbA1c ( $ps > .168$ ), lower relationship quality was unexpectedly linked to trajectories of better adherence (i.e., slower deterioration in adherence) across time. This model accounted for 2.8% of the variance in father-adolescent relationship quality, 39.9% of the variance in latent concurrent HbA1c, 1.3% of the variance in latent trajectories of HbA1c, 17.4% of the variance in latent concurrent adherence, and 14.3% of the variance in latent trajectories of adherence.



**Figure 2.** SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via father-adolescent relationship quality among late adolescents transitioning into emerging adulthood. Coefficients shown as unstandardized parameter (standard error). **Bold\* coefficients** are significant at the  $p = .05$  level. **Bold lines** denote significant indirect paths. Gender, ethnicity, pump status, and parental education were covaried (not shown).  $\chi^2 (35, N = 236) = 33.56, p = .538, CFI = 1.00, TLI = 1.01, RMSEA = .00, SRMR = .04$ .

### **SEM Model Examining Mother and Father Relationship Quality Simultaneously**

The SEM model examining relationship quality with mothers and fathers simultaneously is shown in Figure 3, and showed excellent fit to the data,  $\chi^2 (41, N = 236) = 42.90, p = .390, CFI = 1.00, TLI = .99, RMSEA = .01, SRMR = .04$ . Again, neighborhood disadvantage was not directly associated with any T1D outcomes in the full model ( $ps > .167$ ). As predicted, greater neighborhood disadvantage was associated with lower parent-adolescent relationship quality for both mothers and fathers. In this combined model, however, relationship quality with mothers was no longer associated with concurrent T1D outcomes ( $ps > .936$ ), while lower father-adolescent relationship quality remained linked to lower concurrent adherence and higher HbA1c. Relationship quality with either parent was not associated with trajectories of T1D outcomes ( $ps > .100$ ). Neighborhood disadvantage was indirectly related only to concurrent adherence through father-adolescent relationship quality. All other indirect paths were non-significant ( $p > .273$ ). Overall, this full model accounted for 3.6% of the variance in mother-adolescent relationship quality, 2.8% of the variance in father-adolescent relationship quality, 40% of the variance in latent concurrent HbA1c, 3.1% of the variance in latent trajectories of HbA1c, 17.4% of the variance in latent concurrent adherence, and 16.1% of the variance in latent trajectories of adherence.



**Figure 3.** SEM model for direct and indirect pathways between neighborhood disadvantage, adherence, and glycemic control via parent-adolescent relationship quality among late adolescents transitioning into emerging adulthood. Coefficients shown as unstandardized parameter (standard error). **Bold\* coefficients** are significant at the  $p = .05$  level. **Bold lines** denote a significant indirect path:  $B(SE) = -.01^* (.01^*)$ . Gender, ethnicity, pump status, and parental education were covaried (not shown).  $\chi^2 (41, N = 236) = 42.90, p = .390, CFI = 1.00, TLI = .99, RMSEA = .01, SRMR = .04$ .

## CHAPTER FIVE: DISCUSSION

Parent-adolescent relationship quality continues to be important for T1D outcomes among late adolescents on the cusp of emerging adulthood, but living within a socioeconomically-disadvantaged neighborhood may be placing relationship quality at considerable risk. The present study extends research linking greater neighborhood disadvantage to poorer T1D outcomes among youth by using an iterative series of SEM models to understand whether neighborhood disadvantage is associated with adherence or HbA1c concurrently during late adolescence, as well as prospectively across the transition into early emerging adulthood. We also examined whether such associations might occur indirectly through the quality of relationships with mothers or fathers. In the SEM models, greater neighborhood disadvantage was linked to poorer adolescent relationship quality with each parent, but was not directly associated with T1D outcomes. Lower relationship quality with parents was linked to poorer T1D outcomes, and formed an indirect path linking neighborhood disadvantage to T1D outcomes concurrently. These direct and indirect paths were more consistently found for father-adolescent relationship quality, suggesting that mothers and fathers may be playing unique roles in their late adolescent's T1D at this important developmental threshold. Moreover, associations to T1D were found primarily for concurrent outcomes, suggesting that risky neighborhood and family relationship social contexts do not determine T1D management across the transition into early emerging adulthood.

Relationship quality among parents and late adolescents may be at unique risk when families live in a disadvantaged neighborhood. As predicted, families from socioeconomically-disadvantaged neighborhoods reported lower parent-adolescent relationship quality. This association was found for both mother-adolescent and father-adolescent relationships, even when simultaneously modeled, and were independent of a family-level SES marker of parental education. Thus, neighborhood-level SES risks, such as neighborhood disadvantage, may present a uniquely distressing socioenvironmental context that is straining family functioning, where parents and adolescents struggle to develop warm and accepting relationships. This risk to parenting has been studied in younger children and adolescents (Drew et al., 2011). The present study lends further support to this prior literature and to the Family Stress Model (Conger & Donnellan, 2007) by extending to the late adolescent context, when young people are spending increasing time away from parents.

Relationship quality with parents continues to be an important factor for T1D management during late adolescence, but relationships with fathers appeared to be particularly important for understanding family processes linked to T1D during this transitional period. Positive relationship quality with parents is crucial for T1D during adolescence (King et al., 2014; Palmer et al., 2011), and the relationship with parents may continue to play a key role during the transition into early emerging adulthood (Goethals et al., 2017; Sparud-Lundin et al., 2010; Wiebe et al., 2016). In SEM models that independently examined late adolescents' relationship quality with mothers and fathers, better relationship quality with mothers was linked to higher concurrent adherence, while better relationship quality with fathers was linked to higher concurrent levels of both adherence and HbA1c. While it is important that youth are able to assume

increasing responsibility for their T1D management across adolescence (Wiebe et al., 2014), the current study is consistent with a growing literature demonstrating that relationships with parents continue to matter for how T1D is managed during this transitional period (Goethals et al., 2017; Helgeson et al., 2014; Wiebe et al., 2018).

The current study also extends this literature by highlighting differential links between mother and father relationship quality with late adolescent T1D. Prior research has commonly examined “parental” involvement in T1D management without specifying individual aspects of mother and father involvement. Nevertheless, indirect evidence suggests that mothers and fathers play a different role in T1D management, such that mothers may be more involved in the daily aspects of T1D management (reflected in adherence behaviors) while fathers are more likely to be involved with larger problems (reflected in HbA1c; Berg et al., 2016; Butner et al., 2017). Thus, a potential explanation for the current study’s findings may be that relationship quality with fathers is linked to how fathers take a more stable perspective of their adolescent’s illness management, which includes both adherence behaviors and glycemic control.

As predicted, neighborhood disadvantage was indirectly linked to late adolescent T1D outcomes via poorer parent adolescent relationship quality, though this pathway was most consistent for relationship quality with fathers. While neighborhood disadvantage was correlated with HbA1c at all three timepoints, it did not directly associate with T1D outcomes once parent-adolescent relationship quality was included in the SEM models. In models where relationship quality with mothers and fathers was estimated independently, greater neighborhood disorder was indirectly linked to poorer concurrent adherence via relationship quality with either parent, and relationship quality with fathers provided an additional indirect path to concurrent HbA1c. Moreover, while previous work with early adolescents found that family income was indirectly linked to adherence via both mother- and father-adolescent relationship quality when parents were added simultaneously in the model (Drew et al., 2011), the current study showed that greater neighborhood disadvantage indirectly linked only to poorer concurrent adherence via father-adolescent relationship quality, with no indirect pathway through mother-adolescent relationship quality. It is possible that differences between Drew et al. (2011) and the current study in measures of SES (family income vs. neighborhood disadvantage) and path analyses (adherence predicted glycemic control vs. adherence and glycemic control allowed to correlate) may have contributed to the differences in findings.

However, the unique indirect pathways through mothers or fathers may also be reflecting the conceptualization of how neighborhood disadvantage is differentially linked to relationship quality with either parent. Previous work discovered that mothers’ parenting practices may be more adaptive in the face of socioeconomic adversity (Szepeswol, Simpson, Griskevicius, & Raby, 2015), and thus they may be somewhat more capable than fathers of deflecting the harshness of living within socioeconomically-disadvantaged neighborhoods away from their adolescent’s illness management routines. This ‘maternal–buffering’ effect may be further evidenced by work that has shown how mothers, but not fathers, from chronically-impooverished families continue to be as emotionally and behaviorally engaged with their adolescent as mothers of higher SES (Harris & Marmer, 1996). And similar to the current study, Harris and Marmer’s results were independent of parental education, providing further evidence that neighborhood



disadvantage may have unique associations with family processes and late adolescent T1D.

Although associations were found linking neighborhood disadvantage and relationship quality to concurrent T1D outcomes, these variables generally did not predict trajectories across the transition into early emerging adulthood. This was surprising given prior research and theory indicating that a foundation of warm and accepting relationships with parents sets the stage for how adolescents transition (Berg et al., 2017), and that relationship quality with parents longitudinally predicts T1D outcomes across adolescence (King et al., 2014) and into emerging adulthood (Helgeson et al., 2014). There are notable differences between the current study and this prior work that may have contributed to these differences (e.g., different developmental periods, measures of parent-adolescent relationship, analytic approaches). Nevertheless, these findings emphasize that associations between relationship quality may have more proximal associations with T1D than broader neighborhood disadvantage. For example, in additional work with the present sample, we found that relationship quality does not change linearly across the transition out of high school, but that acceptance shifted from year-to-year after high school, and these within-person shifts were associated with changes in T1D outcomes. This work suggests that parent-adolescent relationships continue to transform into early emerging adulthood, and more proximal markers of relationship quality are associated with T1D outcomes during this transitional period (Berg et al., in press).

It is important to note that there was one surprising association between relationship quality with fathers and adherence trajectories in the independent father model. Lower relationship quality with fathers during late adolescence predicted better adherence trajectories into early emerging adulthood (i.e., slower deterioration). It is conceivable that late adolescents who experience very low relationship quality with fathers show improvements in their adherence behaviors as they develop more independence from the parental home. However, relationship quality with fathers was generally quite high, making it unlikely that low levels suggest a toxic home environment in the present sample. We do not have a clear explanation and are hesitant to interpret this finding because it was in the opposite direction of hypotheses, there is no precedent for such a finding that we are aware of in the literature, and the association washed out in the combined mother-father model. Future research will be necessary to determine whether this effect is replicable.

### **Limitations**

The findings of the current study should be interpreted in the context of limitations. First, the mediation model used to estimate indirect effects assumes a temporal order among the variables of interest, which was not uniformly present. Our neighborhood disadvantage measure was compiled using addresses at which the vast majority of participants had been living for the past five or more years, consistent with the presumed temporal ordering. However, the relationship quality variables were measured concurrently with the baseline T1D outcomes. It is possible that lower relationship quality is a response to poor T1D management. While prior longitudinal work has demonstrated the hypothesized ordering tested in the model (Helgeson et al.,

2014; King et al., 2014), alternative explanations cannot be ruled out. Future studies would benefit by explicitly ordering the assessment of neighborhood disadvantage, relational quality, and diabetes management across time in order of precedence. Second, acceptance is a major component of the parent-adolescent relationship (Rohner et al., 2005), and while hypothesized as a potent indirect pathway linking neighborhood disadvantage and T1D (Drew et al., 2011), other aspects of the relationship may have differential associations to neighborhood disadvantage and T1D outcomes. Third, neighborhood disadvantage showed unique associations beyond individual-level SES, but it is not an exhaustive measure and did not include other indicators of neighborhood-level SES (e.g., physical surroundings; Clarke et al., 2017). Fourth, although the sample was fairly representative of youth who develop T1D (Dabelea et al., 2014), it was mostly non-Latino White. The results may not generalize to more diverse samples, given evidence that SES (Cheng & Goodman, 2015) and relationship quality (Kotchick & Forehand, 2002) may be associated with different developmental outcomes across race/ethnicity groups during adolescence.

### **Conclusions and Implications**

The current study has important clinical implications by identifying pathways linking experiences of living in a socioeconomically-disadvantaged neighborhood with family relationship processes and T1D management during the crucial developmental transitional period of late adolescence and early emerging adulthood. Systematically examining the direct and indirect pathways of socioeconomically-disadvantaged neighborhoods on T1D through the parent-adolescent relationship might further inform currently effective family-based interventions (e.g., Hilliard, Powell, & Anderson, 2016; McBroom & Enriquez, 2009) by highlighting specific aspects of the parent-adolescent relationship that may be most strongly linked to late adolescent diabetes adherence. Interventions focusing on communication and problem-solving skills among youth and their parents have shown promise in enhancing diabetes management during early adolescence (Nansel, Thomas, & Liu, 2015), and may also contribute to maintaining good T1D management practices among late adolescents on the cusp of emerging adulthood. Moreover, the current study informs interventions by highlighting unique direct and indirect pathways via relationship quality with fathers. Given a growing literature suggesting that fathers have a unique role to play in their child's illness management (e.g., mothers are more involved in day-to-day management, while fathers often get pulled in only when bigger management issues occur; Butner et al., 2017; Wysocki & Gavin, 2004), future research may wish to replicate these findings to inform clinicians in how to best engage fathers before relationship quality and T1D problems arise. Another way the current study might advance extant research and interventions is by showing that greater neighborhood disadvantage is associated with poorer parent-adolescent relations in general. Given the possibility that parents' coping may buffer the risk of low SES on T1D outcomes among older adolescents (Mello, Wiebe, & Berg, 2019), future work may want to examine the potential parental coping processes or other resilience factors to moderate the risks of neighborhood disadvantage on relationship quality and T1D management among families coping with pediatric T1D. Overall, the current study could help researchers and clinicians be better equipped to design effective

interventions that target important elements of the parent-adolescent relationship among these at-risk youth transitioning into adulthood.

## REFERENCES

- Arnett, J. J. (2016). *The oxford handbook of emerging adulthood*. New York, NY: Oxford University Press. doi:10.1093/oxfordhb/9780199795574.001.0001
- Asche, C., LaFleur, J., & Conner, C. (2011). A review of diabetes treatment adherence and the association with clinical and economic outcomes. *Clinical Therapeutics*, *33*, 74–109. doi:10.1016/j.clinthera.2011.01.019
- Berg, C. A., Butler, J. M., Osborn, P., King, G., Palmer, D. L., Butner, J. E., ... Wiebe, D. J. (2008). Role of parental monitoring in understanding the benefits of parental acceptance on adolescent adherence and metabolic control of type 1 diabetes. *Diabetes Care*, *31*, 678–683. doi:10.2337/dc07-1678
- Berg, C. A., Butner, J. E., Turner, S. L., Lansing, A. H., King, P. S., & Wiebe, D. J. (2016). Adolescents', mothers', and fathers' reports of adherence across adolescence and their relation to HbA1c and daily blood glucose. *Journal of Behavioral Medicine*, *39*, 1009–1019. doi:10.1007/s10865-016-9771-5
- Berg, C. A., Queen, T. L., Butner, J. E., Turner, S. L., Lansing, A. H., Main, A., ... Wiebe, D. J. (2017). Adolescent disclosure to parents and daily management of type 1 diabetes. *Journal of Pediatric Psychology*, *42*, 75–84. doi:10.1093/jpepsy/jsw056
- Berg, C. A., Wiebe, D. J., Suchy, Y., Turner, S. L., Butner, J., Munion, A., ... Nutrition, E. (2018). Executive function predicting longitudinal change in type 1 diabetes management during the transition to emerging adulthood. *Diabetes Care*, *41*, 1–8. doi:10.2337/dc18-0351
- Berg, C. A., Wiebe, D. J., Tracy, E. L., Kelly, C. S., Mello, D., Turner, S. L., ... Suchy, Y. (in press). Parental involvement and executive function in emerging adults with type 1 diabetes. *Journal of Pediatric Psychology*.
- Butner, J. E., Berg, C. A., Munion, A. K., Turner, S. L., Hughes-Lansing, A., Winnick, J. B., & Wiebe, D. J. (2017). Coordination of self- and parental-regulation surrounding type 1 diabetes management in late adolescence. *Annals of Behavioral Medicine*, 1–13. doi:10.1007/s12160-017-9922-0
- Chen, E., & Paterson, L. Q. (2006). Neighborhood, family, and subjective socioeconomic status: How do they relate to adolescent health? *Health Psychology*, *25*, 704–714. doi:10.1037/0278-6133.25.6.704
- Cheng, T. L., & Goodman, E. (2015). Race, ethnicity, and socioeconomic status in research on child health. *Pediatrics*, *135*, e225-37. doi:10.1542/peds.2014-3109
- Chiang, J. L., Maahs, D. M., Garvey, K. C., Hood, K. K., Laffel, L. M., Weinzimer, S. A., ... Schatz, D. (2018). Type 1 diabetes in children and adolescents: A position statement by the American Diabetes Association. *Diabetes Care*, *41*, 1–19. doi:10.2337/dci18-0023
- Clarke, A. B. M., Daneman, D., Curtis, J. R., & Mahmud, F. H. (2017). Impact of neighbourhood-level inequity on paediatric diabetes care. *Diabetic Medicine*, *34*, 794–799. doi:10.1111/dme.13326
- Clements, M. A., Foster, N. C., Maahs, D. M., Schatz, D. A., Olson, B. A., Tsalikian, E., ... Beck, R. W. (2016). Hemoglobin A1c (HbA1c) changes over time among adolescent and young adult participants in the T1D exchange clinic registry.

- Pediatric Diabetes*, 17, 327–336. doi:10.1111/pedi.12295
- Collins, W. A., & Laursen, B. (2004). Parent-Adolescent Relationships and Influences. In R. M. Lerner & L. Steinberg (Eds.), *Handbook of Adolescent Psychology* (2nd ed., pp. 331–361). Hoboken, NJ: John Wiley & Sons, Inc.  
doi:10.1002/9780471726746.ch11
- Conger, R. D., & Donnellan, M. B. (2007). An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology*, 58, 175–199. doi:10.1146/annurev.psych.58.110405.085551
- Dabelea, D., Mayer-Davis, E. J., Saydah, S., Imperatore, G., Linder, B., Divers, J., ... Hamman, R. F. (2014). Prevalence of type 1 and type 2 diabetes among children and adolescents from 2001 to 2009. *Jama*, 311, 1778–1786.  
doi:10.1001/jama.2014.3201
- Drew, L. M., Berg, C., King, P., Verdant, C., Griffith, K., Butler, J., & Wiebe, D. J. (2011). Depleted parental psychological resources as mediators of the association of income with adherence and metabolic control. *Journal of Family Psychology*, 25, 751–758. doi:10.1037/a0025259
- Duke, D. C., Geffken, G. R., Lewin, A. B., Williams, L. B., Storch, E. A., & Silverstein, J. H. (2008). Glycemic control in youth with type 1 diabetes: Family predictors and mediators. *Journal of Pediatric Psychology*, 33, 719–727.  
doi:10.1093/jpepsy/jsn012
- Dulin-Keita, A., Casazza, K., Fernandez, J. R., Goran, M. I., & Gower, B. (2012). Do neighbourhoods matter? Neighbourhood disorder and long-term trends in serum cortisol levels. *Journal of Epidemiology & Community Health*, 66, 24–29.  
doi:10.1136/jech.2009.092676
- Epstein, S. (1983). *Scoring and interpretation of the Mother-Father-Peer scale*. Unpublished manuscript, University of Massachusetts; Amherst, Massachusetts.
- Goethals, E. R., Oris, L., Soenens, B., Berg, C. A., Prikken, S., Van Broeck, N., ... Luyckx, K. (2017). Parenting and treatment adherence in type 1 diabetes throughout adolescence and emerging adulthood. *Journal of Pediatric Psychology*, 1–11. doi:10.1093/jpepsy/jsx053
- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549–576.  
doi:10.1146/annurev.psych.58.110405.085530
- Harris, K. M., & Marmer, J. K. (1996). Poverty, paternal involvement, and adolescent well-being. *Journal of Family Issues*, 17, 614–640.  
doi:10.1177/019251396017005003
- Helgeson, V. S., Palladino, D. K., Reynolds, K. a, Becker, D. J., Escobar, O., & Siminerio, L. (2014). Relationships and health among emerging adults with and without type 1 diabetes. *Health Psychology*, 33, 1125–1133.  
doi:10.1037/a0033511.
- Helgeson, V. S., Vaughn, A. K., Seltman, H., Orchard, T., Libman, I., Becker, D., & Mbbc, H. (2017). Trajectories of glycemic control over adolescence and emerging adulthood: An 11-year longitudinal study of youth with type 1 diabetes. *Journal of Pediatric Psychology*, 1–11. doi:10.1093/jpepsy/jsx083
- Herzer, M., Ph, D., Godiwala, N., Hommel, K. a, Driscoll, K., Mitchell, M., ... Modi, A.

- C. (2010). Family functioning in the context of pediatric chronic conditions. *Journal of Developmental & Behavioral Pediatrics, 31*, 1–14. doi:10.1097/DBP.0b013e3181c7226b.Family
- Hilliard, M. E., Perlus, J. G., Clark, L. M., Haynie, D. L., Plotnick, L. P., Guttman-Bauman, I., & Iannotti, R. J. (2014). Perspectives from before and after the pediatric to adult care transition: A mixed-methods study in type 1 diabetes. *Diabetes Care, 37*, 346–354. doi:10.2337/dc13-1346
- Hilliard, M. E., Powell, P. W., & Anderson, B. J. (2016). Evidence-based behavioral interventions to promote diabetes management in children, adolescents, and families. *American Psychologist, 71*, 590–601. doi:10.1037/a0040359
- Hood, K. K., Peterson, C. M., Rohan, J. M., & Drotar, D. (2009). Association between adherence and glycemic control in pediatric type 1 diabetes: A meta-analysis. *Pediatrics, 124*, 1171–1179. doi:10.1542/peds.2009-0207
- Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modelling: Guidelines for determining model fit. *The Electronic Journal of Business Research Methods, 6*, 53–60. doi:10.1037/1082-989X.12.1.58
- Iannotti, R. J., Nansel, T. R., Schneider, S., Haynie, D. L., Simons-Morton, B., Sobel, D. O., ... Clark, L. (2006). Assessing regimen adherence of adolescents with type 1 diabetes. *Diabetes Care, 29*, 2263–2267. doi:10.2337/dc06-0685
- Iannotti, R. J., Schneider, S., Nansel, T. R., Haynie, D. L., Plotnick, L. P., Clark, L. M., ... Simons-Morton, B. (2006). Self-efficacy, outcome expectations, and diabetes self-management in adolescents with type 1 diabetes. *Developmental and Behavioral Pediatrics, 27*, 98–105. doi:10.1097/00004703-200604000-00003
- King, P. S., Berg, C. a., Butner, J. E., Butler, J. M., & Wiebe, D. J. (2014). Longitudinal trajectories of parental involvement in type 1 diabetes and adolescents' adherence. *Health Psychology, 33*, 424-432. doi:10.1037/a0032804
- Kotchick, B. A., & Forehand, R. (2002). Putting parenting in perspective: A discussion of the contextual factors that shape parenting practices. *Journal of Child and Family Studies, 11*, 255–269. doi:10.123/A:1016863921662
- Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin, 126*, 309–337. doi:10.1037//0033-2909.126.2.309
- Levine, B. S., Anderson, B. J., Butler, D. A., Antisdel, J. E., Brackett, J., & Laffel, L. M. B. (2001). Predictors of glycemic control and short-term adverse outcomes in youth with type 1 diabetes. *Journal of Pediatrics, 139*, 197–203. doi:10.1067/mpd.2001.116283
- Main, A., Wiebe, D. J., Van Bogart, K., Turner, S. L., Tucker, C., Butner, J. E., & Berg, C. A. (2015). Secrecy from parents and type 1 diabetes management in late adolescence. *Journal of Pediatric Psychology, 40*, 1075–1084. doi:10.1093/jpepsy/jsv060
- McBroom, L. A., & Enriquez, M. (2009). Review of family-centered interventions to enhance the health outcomes of children with type 1 diabetes. *The Diabetes Educator, 35*, 428–438. doi:10.1177/0145721709332814
- Mello, D., Wiebe, D. J., & Berg, C. A. (2019). Maternal shift and persist coping, SES, and adolescent type 1 diabetes management. *Children's Health Care.*

doi:10.1080/02739615.2019.1570465

- Miller, K. M., Foster, N. C., Beck, R. W., Bergensta, R. M., DuBose, S. N., DiMeglio, L. A., ... Tamborlane, W. V. (2015). Current state of type 1 diabetes treatment in the U.S.: Updated data from the t1d exchange clinic registry. *Diabetes Care*, *38*, 971–978. doi:10.2337/dc15-0078
- Miranda, M. C., Affuso, G., Esposito, C., & Bacchini, D. (2016). Parental acceptance–rejection and adolescent maladjustment: Mothers’ and fathers’ combined roles. *Journal of Child and Family Studies*, *25*, 1352–1362. doi:10.1007/s10826-015-0305-5
- Monaghan, M., Helgeson, V., & Wiebe, D. J. (2015). Type 1 diabetes in young adulthood. *Current Diabetes Reviews*, *11*, 239–50. doi:10.2174/1573399811666150421114957
- Nansel, T. R., Thomas, D. M., & Liu, A. (2015). Efficacy of a behavioral intervention for pediatric type 1 diabetes across income. *American Journal of Preventative Medicine*, *49*, 930–934. doi:10.1016/j.amepre.2015.05.006
- Palmer, D. L., Osborn, P., King, P. S., Berg, C. A., Butler, J., Butner, J. E., ... Wiebe, D. J. (2011). The structure of parental involvement and relations to disease management for youth with type 1 diabetes. *Journal of Pediatric Psychology*, *36*, 596–605. doi:10.1093/jpepsy/jsq019
- Queen, T. L., Baucom, K. J. W., Baker, A., Mello, D., Berg, C. A., & Wiebe, D. J. (2017). Neighborhood disorder and type 1 diabetes glycemic control in adolescence. *Social Science & Medicine*, *183*, 126–129. doi:10.1016/j.socscimed.2017.04.052
- Rohner, R. P., & Britner, P. A. (2002). Worldwide mental health correlates of parental acceptance-rejection: Review of cross-cultural and intracultural evidence. *Cross-Cultural Research*, *36*, 16–47. doi:10.1177/106939710203600102
- Rohner, R. P., Khaleque, A., & Cournoyer, D. E. (2005). Parental acceptance-rejection: Theory, methods, cross-cultural evidence, and implications. *Ethos*, *33*, 299–334. doi:10.1525/eth.2005.33.3.299
- Secrest, A. M., Costacou, T., Gutelius, B., Miller, R. G., Thomas, J., & Orchard, T. J. (2011). Associations between socioeconomic status and major complications in type 1 diabetes: The Pittsburgh epidemiology of diabetes complication (EDC) study. *Annals of Epidemiology*, *21*, 374–381. doi:10.1016/j.annepidem.2011.02.007
- Simons, L. G., Wickrama, K. A. S., Lee, T. K., Landers-Potts, M., Cutrona, C., & Conger, R. D. (2016). Testing family stress and family investment explanations for conduct problems among african american adolescents. *Journal of Marriage and Family*, *78*, 498–515. doi:10.1111/jomf.12278
- Sparud-Lundin, C., Öhrn, I., & Danielson, E. (2010). Redefining relationships and identity in young adults with type 1 diabetes. *Journal of Advanced Nursing*, *66*, 128–138. doi:10.1111/j.1365-2648.2009.05166.x
- Szepeswol, O., Simpson, J. A., Griskevicius, V., & Raby, K. L. (2015). The effect of unpredictable early childhood environments on parenting in adulthood. *Journal of Personality and Social Psychology*, *109*, 1045–1067. doi:10.1037/pspi0000032
- Thomas, D. M., Lipsky, L. M., Liu, A., & Nansel, T. R. (2018). Income relates to

- adherence in youth with type 1 diabetes through parenting constructs. *Journal of Developmental & Behavioral Pediatrics*, 39, 508–515.  
doi:10.1097/DBP.0000000000000579
- White, N. H. (2015). Long-term outcomes in youth with diabetes mellitus. *Pediatric Clinics of North America*, 62, 889–909. doi:10.1016/j.pcl.2015.04.004.
- Wiebe, D. J., Berg, C. A., Mello, D., & Kelly, C. S. (2018). Self- and social-regulation in type 1 diabetes management during late adolescence and emerging adulthood. *Current Diabetes Reports*, 18. doi:10.1007/s11892-018-0995-3
- Wiebe, D. J., Chow, C. M., Palmer, D. L., Butner, J. E., Butler, J. M., Osborn, P., & Berg, C. A. (2014). Developmental processes associated with longitudinal declines in parental responsibility and adherence to type 1 diabetes management across adolescence. *Journal of Pediatric Psychology*, 39, 532–541.  
doi:10.1093/jpepsy/jsu006
- Wiebe, D. J., Helgeson, V. S., & Berg, C. A. (2016). The social context of managing diabetes across the life span. *American Psychologist*, 71, 526–538.  
doi:10.1037/a0040355
- Worrall-Davies, A., Owens, D., Holland, P., & Haigh, D. (2002). The effect of parental expressed emotion on glycaemic control in children with Type 1 diabetes. *Journal of Psychosomatic Research*, 52, 107–113. doi:10.1016/S0022-3999(01)00293-8
- Wysocki, T., & Gavin, L. (2004). Psychometric properties of a new measure of fathers' involvement in the management of pediatric chronic diseases. *Journal of Pediatric Psychology*, 29, 231–240. doi:10.1093/jpepsy/jsh024